UNIVERSITY OF
ILLINOIS LIBRARY
AT URBANA-CHAMPAIGN
BOOKSTACKS

LIBRARY U. S. ARMY ENGINEER SCHOOL FORT BELVOIR, VA.

LIBRARY U. OF I. URBANA-CHAMP. 1961

016, 33391
Se48

102

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 17
SEPTEMBER 1, 1976

W76-08751 -- W76-09400
CODEN: SWRABW

LIBRARY U. OF S. DAKOTA

SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

SELECTED WATER RESOURCES ABSTRACTS (SWRA) is available to Federal agencies and their contractors or grantees in water resources research upon request, citing contract or grant number and sponsoring agency. Write: Manager, Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior, Washington, DC 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from NTIS, 5285 Port Royal Road, Springfield, VA 22161. Annual subscription rates are: SWRA Journal only, $75 ($95 foreign); Journal and Annual Indexes, $100 ($125 foreign); Indexes only, $50 ($65 foreign).

Some documents abstracted in this journal can be purchased from NTIS at prices shown in the entry; prices subject to change. Other documents are available from originating organizations or authors as indicated in the citation.

SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 17
SEPTEMBER 1, 1976

W76-08751 -- W76-09400

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

Doc
I 1.94/2:
9/17-20

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

2. WATER CYCLE

2A. General

INTERCONTINENTAL COMPARISON OF EVAPORATION ESTIMATES,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W76-08800

ON THE COMPONENTS OF TIME SERIES; THE REMOVAL OF SPATIAL DEPENDENCE,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Applied Mathematics.
For primary bibliographic entry see Field 2B.
W76-08803

RATIONALE FOR A WATER POLLUTION CODE PART 1: THE WASTE SYSTEM AND THE NATURAL SYSTEM,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W76-08839

DESERT ECOSYSTEMS: HIGHER TROPHIC LEVELS,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
I. Noy-Meir.
Annual Review of Ecology and Systematics, Vol. 5, p. 195-214, 1974. 1 fig, 114 ref.

Descriptors: *Xerophilic animals, *Soil microorganisms, *Trophic level, *Cycling nutrients, *Deserts, Vegetation effects, Mathematical models, *Ecosystems, Food webs, Soil erosion, Water balance, Droughts, Food habits, Arid lands.

This second part of this study (first part, see W74-13150) on desert ecosystems deals with the higher trophic levels of animals and decomposers, man in the desert system, feedbacks between different components and levels, and modelling of arid ecosystems. Desert ecosystems are in their own way at least as complex as most temperate systems. Major problems in desert ecology are related to one or more of the following features: the dominant influence of space-time distribution and water dynamics (sometimes in conjunction with heat and salt) on energy flows and species adaptations; discrete pulses of the major input and numerous biological activities; reserve forms and stages and the transfers between them and active pulses; random environmental variation and the special adaptation to uncertainty; impact of spatial heterogeneity on total energy, water and nutrient flows and on survival of many species; opportunistic feeding of animals, causing complex food webs; and different 'stabilities' of the ecosystem at distinct time scales and relative to different 'disturbances'. Various ecological simulation models relevant to desert ecosystems are described. (Jahns-Arizona)
W76-09064

THE NATURE AND CAUSES OF DESERTIZATION,
International Livestock Centre for Africa, Addis Ababa (Ethiopia).
For primary bibliographic entry see Field 4C.
W76-09069

A PRELIMINARY WATER AND ENERGY BUDGET ANALYSIS OF MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4B.
W76-09072

SIMULATION OF DEEP SEEPAGE TO A WATER TABLE,
Connell/Metcalf and Eddy, Coral Gables, Fla.
For primary bibliographic entry see Field 2F.
W76-09245

EVALUATION OF A MONTHLY WATER YIELD MODEL,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
C. T. Haan.
Transactions of the American Society of Agricultural Engineers, Vol 19, No 1, p 55-60, January-February 1976. 6 fig, 3 tab, 11 ref.

Descriptors: *Model studies, *Watersheds(Basins), *Runoff, Mathematical models, Precipitation(Atmospheric), Rainfall, Evapotranspiration, Seepage, Soil water, Streamflow, Hydrographs, Hydrology, *Water yield.

The results of evaluating the performance of a monthly water yield model on 46 watersheds located in Kentucky, North Carolina, South Carolina, Tennessee and Virginia were reported. In general, whenever the watershed being modeled met the assumptions under which the model was developed, the model performance was satisfactory. The assumptions included: (1) no runoff due to snow, (2) daily rainfall evenly distributed over the entire watershed, (3) short delays between rainfall and runoff, (4) stationary response characteristics between rainfall and runoff, and (5) record available for parameter estimation is representative of watershed behavior. (Sims-ISWS)
W76-09246

UNIT HYDROGRAPHS - A COMPARATIVE STUDY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W76-09254

2B. Precipitation

ON THE COMPONENTS OF TIME SERIES; THE REMOVAL OF SPATIAL DEPENDENCE,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Applied Mathematics.
T. G. J. Dyer.
Quarterly Journal of the Royal Meteorological Society, Vol. 102, No. 431, p 157-165, January 1976. 4 fig, 4 tab, 12 ref.

Descriptors: *Stochastic processes, *Numerical analysis, *Statistical methods, *Precipitation(Atmospheric), Time series analysis, Temporal distribution, Correlation analysis, Variability, Frequency, Africa.
Identifiers: *Spectral analysis, *South Africa, Trend analysis, Eigenvalues, Spatial dependence, Annual precipitation, Linear models, Null hypothesis, Normality, Significance.

A linear model was fitted to the precipitation series of each group of stations formed by principal component analysis on 157 precipitation records (Dyer 1975). Precipitation was thus decomposed into independent components one each for regional temporal effect, regional spatial effect, and a residual or micro-effect. Each region has a temporal effect which was analyzed for trend, enabling the conclusion to be made that Southern Africa's precipitation budget is stationary. On the other hand, trend on a microscale is present over randomly distributed parts of the country. Spectral analysis showed the oscillatory behavior of the regional temporal effects, and provided information useful to the fitting of stochastic forecasting models to the data. The technique solves the problem of dependence between meteorological time series, and can be applied to any variable. (Jones-ISWS)
W76-08803

DEVELOPMENT OF A MATHEMATICAL MODEL OF INFILTRATION WHICH INCLUDES THE EFFECTS OF RAINDROP IMPACT,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2G.
W76-08844

FOG FORMATION AND FOG ELIMINATION,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
For primary bibliographic entry see Field 5G.
W76-08854

COOLING TOWER EXPERIENCE AND THE METEOROLOGICAL CONSEQUENCES OF THERMAL DISCHARGES FROM NUCLEAR POWER PLANTS IN THE FEDERAL REPUBLIC OF GERMANY,
Deutscher Wetterdienst, Offenbach am Main (West Germany).
For primary bibliographic entry see Field 5G.
W76-08855

MOUNTAINOUS WINTER PRECIPITATION: A STOCHASTIC EVENT-BASED APPROACH,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
L. Duckstein, M. Fogel, and D. Davis.
In: National Symposium on Precipitation Analysis for Hydrologic Modeling, June, 1975, Davis, California, 18 p. 15 fig, 16 ref. OWRT B-032-ARIZ(17)

Descriptors: *Stochastic processes, *Precipitation(Atmospheric), *Model studies, *Winter, *Mountains, Probability, Systems analysis, Synthetic hydrology, Analytical techniques, Time series analysis, Frequency analysis, Weather data.
Identifiers: Poisson process.

The purpose is to provide decision makers with a stochastic model of winter precipitation that relies on the analysis of a minimal amount of readily available data and which can incorporate the effects of mountainous terrain on precipitation. Two probabilistic precipitation models are considered. The first assumes that the arrival of winter storms is a Poisson process, implying that the number of events in any time interval is independent of the number in any other interval. A second model is developed which employs a mixed distribution to describe the number of events in an interval of time, using the assumption that there is some persistence in the weather and that the occurrence of a particular event or sequence of events is somewhat dependent on past events. Both models possess considerable flexibility (one may choose the level of complexity matching the data and problem at hand). The second model, based on both prior observation and experimental evidence, does not seem to be substantially better than the simpler first model. The strength of the models is such that an asymptotic normal process is reached after one season only (150 days) which leads to a simplified approximate generation scheme. Internal consistency checks of the model tend to confirm that the assumptions may be reasonable and that data should be gathered along event-based lines rather than equispaced intervals. (Robinett-Arizona)
W76-09062

DESERT ECOSYSTEMS: HIGHER TROPHIC LEVELS,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 2A.
W76-09064

COMPARATIVE EVALUATION OF YEARLY CLIMATIC FACTORS WITH THE FIVE YEARS AVERAGES FOR FUDHALIYA AGRO-METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
G. F. Kaka, and M. S. Kettaneh.
Technical Report 2, March, 1975. 31 p. 7 fig. 9 tab.

Descriptors: *Agroclimatology, *Meteorological data, *Average, *Variability, Climatic data, Data collections, Climatology, Environment, Agriculture, Precipitation(Atmospheric), Evaporation, Measurement, Soil temperature, Humidity, Cloud cover, Solar radiation, Wind velocity, Frost.
Identifiers: *Fudhaliya Agro-meteorological Station(Iraq), Climatic extremes.

Variations of all climatic factors recorded at the Fudhaliya Agro-meteorological station, located near Baghdad, Iraq, are discussed for the period 1969 to 1973. Deviations of these climatic factors from the five year average together with their extremes are instrumental in obtaining a better insight into agricultural yield, irrigation needs, growth of forests, incidence of pests, diseases of plants, and other related factors. Important climatic factors studied include air temperature, ground frost, soil temperature, relative humidity, rainfall, evaporation, wind speed, cloud cover, sunshine duration, and solar radiation. For all elements except relative humidity and wind speed, departures from their respective averages were least in the summer and greatest in the winter, tapering off slowly during autumn and spring (more slowly in spring). For relative humidity and wind speed the reverse was true. This information will aid scientists in other fields and the country's planners to gain insight into how weather affected the country's overall growth and yield, particularly agriculture and related branches. (Robinett-Arizona)
W76-09066

COMPARATIVE EVALUATION OF CLIMATIC FACTORS AND CONDITIONS AT FUDHALIYA AGRO-METEOROLOGICAL STATION AND BAGHDAD AIRPORT METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
G. F. Kaka.
Technical Report 1, September, 1974. 21 p, 7 fig, 7 tab.

Descriptors: *Meteorological data, *Precipitation(Atmospheric), *Evaporation, *Agroclimatology, *Measurement, Climatic data, Weather data, Humidity, Cloud cover, Solar radiation, Data collections, Microenvironment, Soil temperature, Instrumentation, Wind velocity.
Identifiers: *Fudhaliya Agro-meteorological Station(Iraq), Baghdad Airport Meteorological Station(Iraq).

Data collected from 1969-1972 at the Fudhaliya agro-meteorological station are compared with data collected at the Baghdad airport meteorological station situated about 40 km from Fudhaliya and having similar topographical features. These data include air temperature, soil temperature, relative humidity, rainfall, evaporation, wind speed and direction, cloud cover, sunshine duration, and solar radiation. Little discrepancy in the measurement of these factors by the two stations was found. Part of the differences that were found can be explained by environmental influences such as the presence of trees close to the station, irrigation experiments, differences in soil and vegetation, and other related factors. Other differences could originate from lack of proper maintenance of instruments and inexperience of workers at Fudhaliya. (Robinett-Arizona)
W76-09067

THE NATURE AND CAUSES OF DESERTIZATION,
International Livestock Centre for Africa, Addis Ababa (Ethiopia).
For primary bibliographic entry see Field 4C.
W76-09069

THE SAHEL: TIME FOR A NEW APPROACH,
For primary bibliographic entry see Field 4C.
W76-09070

RAINFALL TRENDS IN THE WEST AFRICAN SAHEL,
Reading Univ. (England). Dept. of Geophysics; and Reading Univ. (England). Dept. of Agricultural Botany.
A. H. Bunting, M. D. Dennett, J. Elston, and J. R. Milford.
Quarterly Journal of the Royal Meteorological Society, Vol. 102, No. 431, p 59-64, January 1976. 3 fig, 3 tab, 15 ref.

Descriptors: *Droughts, *Correlation analysis, *Statistical methods, *Africa, Wet seasons, Forecasting, Precipitation(Atmospheric), Frequency, Rainfall.
Identifiers: *Rainfall trends, *West African Sahel, Addis Ababa(Ethiopia), Periodicity, Intertropical convergence zone, Coefficient of variation, Spectral analysis.

A statistical analysis has been made of long-term rainfall records from West Africa. No established trends or periodicities can be detected, and the recent succession of drought years falls within statistical expectation. Sahelian rainfall is not clearly linked to the frequency of westerly weather over Britain. (Jones - ISWS)
W76-09269

A RAPID METHOD OF ESTIMATING MEAN AREAL RAINFALL,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Water Resources Bulletin, Vol. 12, No. 2, p 307-315, April 1976. 4 fig, 4 tab, 6 ref.

Descriptors: *Rainfall, *Linear programming, Hydrologic equation, Hydrology, Computers, Hydrologic aspects, Altitude, Average, Estimating.
Identifiers: *Rainfall estimation, *Mean areal rainfall, Trend surface analysis, Linear surface, Computer technology, Linear functions, Weight coefficients, Reciprocal distance squared method, Altitudinal effects.

A special case of generalized trend surface analysis was examined, which included a linear surface. It was shown that for most hydrologic problems this case determined mean area rainfall sufficiently accurately. Based on this conclusion, equations for rapid computation of mean areal rainfall were derived for this linear case. Results of the linear case were compared with other traditional methods of estimating mean areal rainfall. For most hydrologic studies a linear surface was sufficiently accurate. More complex functions had no particular advantage over the linear functions; rather they suffered from traditional numerical problems. For rapid computation of mean areal rainfall, the linear surface or the simple arithmetic mean was used. For complex physiographic regions, either the altitudinal effects in the computation or comparison with the isohyetal method had to be included. (Roberts - ISWS)
W76-09368

2C. Snow, Ice, and Frost

ZONATION OF SNOW CONDITIONS IN FOREST-TUNDRA, HUDSON BAY, NEW QUEBEC, (IN FRENCH),
Laval Univ., Quebec. Centre d'Etudes Nordiques.
S. Payette, J. Ouzilleau, and L. Filion.
Can J Bot. 53(10), p 1021-1030, 1975.

Descriptors: *Canada, *Snow management, Bays, *Tundra, *Forest management.
Identifiers: *Hudson Bay, Krummholz formations, New Quebec, Picea-Glauca, Picea-Mariana, Taiga, Zonation(Snow conditions).

Data on snow depth and snow density of various forest-tundra coniferous stands are presented. A latitudinal pattern in snow conditions is observed in the forest-tundra environment. This phytogeographical region is subdivided into a forested subzone in the southern part and a shrub subzone (or krummholz) in the northern part and into a maritime ecoclimatic area near Hudson Bay (Canada) and a continental ecoclimatic area inland. The most snowy coniferous stands are located in the shrub subzone; snow density rises gradually from the taiga to the tundra. The highest values in snow properties are found in the maritime ecoclimatic area. Maximum snow depth measured in the northern part of the forest-tundra is explained by an increase of barren ground cover and by the presence of more open coniferous stands, which favor snow drifting and snow trapping. The gradual increase in snow density is related to more rigorous climatic conditions; wind exposure is rather important since these sites are getting more open. The differences in snow conditions between the ecoclimatic areas show that the maritime environment is more windy; the presence of scattered and erected white spruce (Picea glauca (Moench) Voss) in various krummholz formations in that area favors more efficient snow traps than those of krummholz formations located in the contintental area. The latter is dominated by prostrate and erect black spruce (P. mariana (Mill.) BSP.) always densely agglomerated. The latitudinal pattern in snow conditions reflects the climatic conditions of the forest-tundra, and this determines the specific ecological distribution of coniferous stands.--Copyright 1975, Biological Abstracts, Inc.
W76-08759

SELECTIVE FISH MORTALITY RESULTING FROM LOW WINTER OXYGEN,
For primary bibliographic entry see Field 5C.
W76-08788

SOLUTIONS FOR SOME PROBLEMS RESULTING FROM REFREEZING OF PERMAFROST AROUND A WELLBORE,
Atlantic Richfield Co., Plano, Tex. Production Research Center.
For primary bibliographic entry see Field 8G.
W76-08892

ENVIRONMENTAL AND INTRINSIC CONTROL OF FILTERING AND FEEDING RATES IN ARCTIC DAPHNIA,
State Univ. of New York at Albany. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-08933

PRIMARY PRODUCTION AND THE FACTORS CONTROLLING PHYTOPLANKTON GROWTH IN THE ANTARCTIC SEAS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08942

APPARATUS AND METHOD FOR MAKING SNOW WITH UNIFORM DROP SIZE,
Hedco, Inc., Paramus, N.J. (Assignee).
For primary bibliographic entry see Field 7B.
W76-09051

RESPONSES OF ARCTIC MARINE CRUSTACEANS TO CRUDE OIL AND OIL-TAINTED FOOD,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
For primary bibliographic entry see Field 5C.
W76-09123

OVERSNOW RUNOFF EVENTS AFFECT STREAMFLOW AND WATER QUALITY,
Wyoming Univ., Laramie.
D. L. Sturges.
In: Snow Management on Great Plains Symposium, July, 1975, Bismarck, North Dakota. Proceedings Great Plains Agricultural Council Publication No. 73, p 105-117. 6 fig, 2 ref, 3 tab.

Descriptors: *Snowmelt, *Surface runoff, *Streamflow, *Water quality, *Wyoming, Sediment load, Watersheds(Basins), Water sources, Rocky Mountain Region, Melt water, Flow rates.

Oversnow flow is the movement of snowmelt water across the snow surface and develops when a high snowmelt rate occurs early in the melt season. Well-developed oversnow runoff occurred in 2 of the 7 years of streamflow measurements on a big sagebrush watershed in southcentral Wyoming. Maximum flow rates in years with oversnow flow were 3-5 times greater than in years without the flow, while snowmelt runoff expressed as a percent of winter precipitation was four times as large. Suspended sediment concentrations were also much higher. (Witt-IPC)
W76-09274

2D. Evaporation and Transpiration

INTERCONTINENTAL COMPARISON OF EVAPORATION ESTIMATES,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
R. D. Burman.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR1, Proceedings Paper 11958, p 109-118, March 1976. 3 fig, 6 tab, 18 ref, 2 append.

Descriptors: *Evaporation, *Air-water interfaces, *Hydrologic cycle, Irrigation, Water utilization, Water loss, Climatic data, Solar radiation, Wind velocity, Estimating, Evaporation pans, United States, Asia, Africa, Australia, Europe.
Identifiers: *Kohler method, *Oliver method, *Christiansen method, Class A pan.

The success of estimating pan evaporation by three methods was evaluated by comparing estimates with measured values for nine locations in the United States, Africa, Europe, and Australia. The locations represented coastal, inland, humid, equatorial, high latitude, and high elevation locations. The Christiansen, Kohler-Nordenson-Fox, and Oliver methods were evaluated. Pan evaporation estimates by the Kohler, et al method fit measurements best over a wide range of conditions. The Christiansen method provided excellent estimates under some conditions. The Oliver method estimated the poorest fit, but required the least input data. None of the three methods gave satisfactory estimates for all locations. (Roberts - ISWS)
W76-08800

COMPARATIVE EVALUATION OF CLIMATIC FACTORS AND CONDITIONS AT FUDHALIYA AGRO-METEOROLOGICAL STATION AND BAGHDAD AIRPORT METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W76-09067

A PRELIMINARY WATER AND ENERGY BUDGET ANALYSIS OF MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4B.
W76-09072

SURFACE RESIDUE, WATER APPLICATION, AND SOIL TEXTURE EFFECTS ON WATER ACCUMULATION,
Agricultural Research Service, Bushland, Tex.; and Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 2G.
W76-09258

2E. Streamflow and Runoff

HYDROLOGIC UNIT MAP--1974, STATE OF MINNESOTA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09131

STATISTICS OF DATA TRANSFER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-09133

A TECHNIQUE FOR ESTIMATING THE TIME OF TRAVEL OF WATER IN INDIANA STREAMS,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 4A.
W76-09138

UNIT HYDROGRAPHS - A COMPARATIVE STUDY,
Illinois State Water Survey, Urbana.
K. P. Singh.
Water Resources Bulletin, Vol. 12, No. 2, p 381-392, April 1976. 2 fig, 2 tab, 4 ref.

Descriptors: *Unit hydrographs, Computers, *Linear programming, Hydrology, Least squares method, Storms, Rainfall, Mathematics, Runoff, Surface runoff, Effective precipitation, *Maryland, *Potomac River.
Identifiers: *Normal equations, North Branch Potomac River(Md), Subroutines, Absolute deviations, Surface runoff hydrographs, Inherent errors.

Unit hydrographs derived using two methods, linear programming and least squares, were compared. Test data comprised rainfall and runoff information from four storms over the North Branch Potomac River near Cumberland, Maryland. The mathematical bases of these methods for unit-hydrograph derivation were explained. The linear programming method minimized the sum of absolute deviations, and the least squares method minimized the sum of the squares of deviations. Computer subroutines were readily available for application of these methods. The unit hydrographs derived with the two methods were practically the same for two of the storms but differed somewhat for two other storms. However, the reconstituted direct surface runoff hydrographs were similar to those observed with the exception of the hydrograph for fourth storm which had a relatively more non-uniform rainfall excess of a considerably larger duration. (Roberts - ISWS)
W76-09254

OVERSNOW RUNOFF EVENTS AFFECT STREAMFLOW AND WATER QUALITY,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 2C.
W76-09274

THE PO RIVER AT THE ISLAND OF SERAFINI, (IN ITALIAN),
Milan Univ. (Italy). Laboratorio di Zoologia.
M. C. Ramusino, and B. Rossaro.
Ist Lombardo Accad Sci Lett Rend Sci Biol Med B. 108, p 89-128, 1974.

Descriptors: Europe, *Data collections, River flow, *Salts, Dissolved solids, Mollusks, Diptera, Water pollution, Crustanceans, Copepoda, Mayflies, Islands, Aquatic plants.
Identifiers: Hemiptera, Hirudinea, Mollusk, Oligochaetes, Serafini Island, Typha-Latifolia, *Italy(Po River).

Some physical-chemical and biological data referring to the Po River near the island of Serafini (province of Piacenza (Italy)), where an electronuclear center for the Commune of Caorso is in an advanced state of construction, are given. The area is probably not endangered by pollution. Variations in river flow affect the concentration of dissolved salts. The future discharge canal from the nuclear plant is at present a biological reservoir for the Po River. Among the abundant littoral vegetation, especially Typha latifolia, annelids (Oligochetes and Hirudinae), larvae of Ephemeroptera and Diptera, Hemiptera, Crustacea (Cladocera and Copepods) and mollusks predominate.--Copyright 1975, Biological Abstracts, Inc.
W76-09305

2F. Groundwater

TRANSFORM APPROACH TO SOLUTION OF GROUNDWATER FLOW EQUATIONS,
Nevada Univ., Las Vegas. Center for Water Resources Research.
C. M. Case, M. K. Peck, and C. L. Carnahan.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 955, $3.50 in paper copy, $2.25 in microfiche. Nevada Water Resources Center, Reno, Completion Report, May 1976. 17 p, 6 tab, 14 ref. OWRT A-059-NEV(2), 14-31-0001-5028.

Descriptors: Numerical analysis, Mathematical studies, *Groundwater movement, *Base flow, *Equations, Methodology, *Model studies, Aquifers, Fourier analysis, *Aquifer systems, Flow characteristics.
Identifiers: Flow equations, Diffusion-dispersion equations.

A method of obtaining approximate integral transforms of second-order partial differential equations with non-constant coefficients is discussed. The inverse of these transforms may be found using the appropriate standard inversion techniques. Finite and infinite Fourier transforms are discussed as particular cases. The application of these transforms to groundwater flow equations is discussed briefly via two examples. The potential advantages of this technique for aplication to numerical solution of flow equations and diffusion - dispersion equations are (1) for each independent variable that can be transformed, a dimension that would otherwise need to be considered numerically is eliminated, thus making larger problems accessible to computer analysis and (2) the solution can be generated at the spatial and temporal locations only, thus effecting further efficiencies in modeling a given aquifer system. (Fallon - Nevada)
W76-08922

HYDROGEOLOGICAL CONDITIONS OF AL-HAMAD AREA, IRAQ,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
H. A. Hassan, A. F. Eloubaidy, and F. E. El-Kike.
Technical Report 3, December, 1974. 18 p, 3 fig, 1 tab, 19 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Water storage, *Water chemistry, *Geohydrologic units, Groundwater, Water quality, Geologic formations, Geology, Climatology, Aquifers, Marine geology, Sedimentation, Groundwater recharge, Infiltration, Geologic history.
Identifiers: *Al-Hamad Plain(Iraq).

Al-Hamad plain is located to the north-northwest of the Northern Desert of Iraq, extending from Jordan, through Syria, Iraq, and Saudia Arabia. In Iraq, it covers an area of about 20,000 sq km. Information is presented on hydrological parameters, hydrogeological conditions, water type, water genesis, hydrochemical formation, and the paleohydrological conditions of the water bearing formations, using existing data on climatology, geology, and chemical composition of groundwater. Recharge to the aquifer is 1,375,000 cu m/year, and total storage is estimated at 13,800 million cu m. Groundwater characterized by chloride, sulfate, and bicarbonate waters. The chloride and sulfate water types are due to the MgC12 of marine genesis, while the bicarbonate originates from both the marine and the Na2S04 type of continental condition. These hydrochemical parameters indicate that sedimentation of the Cretaceous aquifer took place under a marine environment. Study of the Cretaceous aquifer took place under a marine environment. Study of the underground formation suggests that hydrochemical composition is probably due to dilution, mixing, and removal of original marine solution by infiltrating water when continental conditions prevailed over the area. (Robinett-Arizona)
W76-09068

A PRELIMINARY WATER AND ENERGY BUDGET ANALYSIS OF MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4B.
W76-09072

THE EFFECTS OF GROUND-WATER DEVELOPMENT ON THE WATER SUPPLY IN THE POST HEADQUARTERS AREA, WHITE SANDS MISSILE RANGE, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W76-09137

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--CALIFORNIA REGION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-09139

HYDROLOGIC CONCEPTS OF ARTIFICIALLY RECHARGING THE FLORIDAN AQUIFER IN EASTERN ORANGE COUNTY, FLORIDA--A FEASIBILITY STUDY,
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 4B.
W76-09150

SIMULATION OF DEEP SEEPAGE TO A WATER TABLE,
Connell/Metcalf and Eddy, Coral Gables, Fla.
T. G. King, and J. R. Lambert.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 50-60, January-February 1976. 8 fig, 12 ref.

Descriptors: *Model studies, *Seepage, *Water table, *Deep percolation, Soil water, Soil moisture, Percolation, Groundwater, Root zone, Water table aquifers, Evapotranspiration, Precipitation(Atmospheric), Rainfall, Hydraulic conductivity, Hydrology, Groundwater movement.

A dynamic simulation model has been developed to trace the movement of precipitation to the water table. One submodel uses measured precipitation to simulate the amount and distribution of water leaving the root zone. A second submodel describes the subsequent movement of this water until it reaches the phreatic surface. The model has been used to simulate conditions on a Piedmont watershed with a water table at approximately 20 m depth. The results presented include computed evapotranspiration, moisture profiles for the unsaturated region, and water table movement as compared to observed data. (Sims-ISWS)
W76-09245

DETERMINATION OF THE HYDRAULIC CONDUCTIVITY - DRAINABLE POROSITY RATIO FROM WATER TABLE MEASUREMENTS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 73-84, January-February 1976. 13 fig, 25 ref.

Descriptors: *Hydraulic conductivity, *Porosity, *Specific yield, *Water table, Drawdown, Drainage systems, Groundwater movement, Drains, Dupuit-Forchheimer theory, Equations, Numerical analysis, Computers, Measurement, Graphical analysis, Heterogeneity, Anisotropy, Evapotranspiration, Saturated flow.
Identifiers: *K/f ratio, *Parallel drains, Drain spacing, Errors.

A method was presented for determining field effective values of the hydraulic conductivity-drainable porosity (K/f) ratio from water table measurements. Solutions were presented in graphical form for parallel drains and for a single drain in a semi-infinite medium. K/f can be determined from these solutions from either water table drawdown or rise measurements. Solutions were also presented for simultaneous drainage and vertical losses and may be used to evaluate the effect of evapotranspiration or deep seepage on K/f determinations. Errors due to unaccounted vertical losses can be minimized by making water table measurements close to the drain. (Visocky-ISWS)
W76-09249

A FINITE ELEMENT MODEL OF CONTAMINANT MOVEMENT IN GROUNDWATER,
Chile Univ., Santiago, Centro de Recursos Hidraulicos.
For primary bibliographic entry see Field 5B.
W76-09253

DETERMINING THE HYDRAULIC CONDUCTIVITY OF SOIL CORES BY CENTRIFUGATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 2G.
W76-09256

HYDROLOGICAL PROBLEMS ASSOCIATED WITH DEVELOPING GEOTHERMAL ENERGY SYSTEMS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-09260

THE ROLE OF GROUND WATER.
Ground Water Age, Vol. 10, No. 5, p. 18-22, 26, January, 1976. 2 fig.

Descriptors: *Water management(Applied), *Hydrologic cycle, *Hydrologic equation, Aquifer characteristics, Groundwater movement, Hydraulic models.
Identifiers: *Groundwater management, *Aquifer stress, Hydraulic stress, Thermal stress, Chemical stress, Alluvial aquifers, Consolidated rock aquifers.

Ground water represents a relatively underdeveloped resource that can help meet future water requirements of the United States. A definite relationship exists between ground water and environmental stresses. Environmental stresses are categorized as hydraulic, thermal and chemical. Response to stress is in accordance with the laws of conservation of energy and mass. In the case of hydraulic stress, this would be represented as: inflow - outflow = change in storage. Similar equations could be used to express thermal and chemical stress situations. Ground water response takes the following rational: (1) the flow system reacts to each stress in accordance with the laws of conservation of mass and energy; (2) any given stress or combination of stresses on a flow system may result in a trifold response--hydraulic, thermal and chemical; (3) the system response is uniquely dependent upon the geometry and physical/chemical characteristics of the system. The stress-response mechanism is described in three general types of ground water systems: (1) alluvial aquifers associated with perennial streams, (2) sand and gravel aquifers including coastal plains, high plains and western valley aquifers, (3) consolidated rock aquifers of which sandstone, limestone and basalt are the most important. (Heiss-NWWA)
W76-09353

2G. Water In Soils

A SIMULATION MODEL OF BIOPHYSIOCHEMICAL TRANSFORMATIONS OF NITROGEN IN TILE-DRAINED CORN BELT SOIL,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 5B.
W76-08761

IMPROVED PROCEDURE FOR ION EXCHANGE EXPERIMENTS WITH SOILS USING LEACHING TUBES, AND HANDLING OF WATER REPELLENT SOILS, (IN GERMAN),
B. Beyme.
Z Pflanzenernaehr Bodenkd. 133(1/2), p 41-45, 1972.

Descriptors: *Soil analysis, *Analytical techniques, Model studies, *Ion exchange.
Identifiers: Leaching, tubes.

By means of a separatory funnel held in position by a rubber stopper, which closes the leaching tube air-tight, and a specially prepared rubber tubing put at the end of the stem, leaching of the soil may be improved. Water repellency of some soils may be overcome by evacuating. Wetting occurs when the stopcock is opened during evacuation.--Copyright 1974, Biological Abstracts, Inc.
W76-08762

POTENTIALLY BENEFICIAL USES OF SULFURIC ACID IN SOUTHWESTERN AGRICULTURE,
Arizona Univ. Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3F.
W76-08766

THE RELATIONSHIP BETWEEN HEAT CONDUCTANCE AND THE MOISTURE CONTENT OF THE SOIL, (IN DUTCH),
R. Hartmann, H. Verplancke, and M. De Boodt.
Meded Fac Landbouwwet Rijksuniv Gent. 37(4), p 1249-1260, 1972.

Descriptors: *Soil properties, *Measurement, *Analytical techniques, Soil analysis, Moisture content, Soil moisture, Heat transfer, Thermal conductivity.

An indirect method for the measurement of the soil moisture content, based on the soil thermal properties, is discussed. Use is made of a non-stationary heat flow to determine the thermal conductivity of a soil which is a function of the moisture content and a number of other soil parameters. The latter can be kept constant for a given soil. After calibration of the copper-constantan thermocouple, the relation between the thermal conductivity and the water content in a loamy sand was established. There is a pronounced influence of the spatial arrangement, the soil structure, of the soil particles. The thermal conductivity occurs mainly along the contact points.--Copyright 1974, Biological Abstracts, Inc.
W76-08769

WATER RETENTION BY CORE AND SIEVED SOIL SAMPLES,
Agricultural Research Service, Bushland, Tex.
P. W. Unger.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1197-1200, November-December 1975. 2 fig, 2 tab, 13 ref.

Descriptors: *Soil water, *Soil moisture, Moisture availability, Moisture content, Retention, Soil properties, Soil texture, Soil management, Water storage, Storage capacity, Cultivation, Sampling.
Identifiers: Sieved soil.

Mechanical analyses and water retention by core and sieved soil at -1/3 and -15 bar matric potentials were determined for samples from 26 sites ranging in texture from sand to clay. Objectives were to obtain a basis for identifying which soils may be influenced by deep tillage and profile modification with respect to water storage capacity and to determine the magnitude of errors possible when using sieved soils to establish field soil water contents. At -1/3 bar potential, cores retained more water than sieved soil when the water content was below 11%. The opposite occurred at higher water contents. At -15 bars potential, cores contained about 1 percentage point more water than sieved soils throughout the water content range encountered. These results showed that treatments which thoroughly disrupt the natural soil structure may decrease and increase the storage capacity of coarse- and fine-textured soils, respectively. When expressed as a percent of the core water content, differences between core and sieved soil contents at -1/3 bar potential ranged from -40 to +25% at 5 and 40% core water contents, respectively. At -15 bars potential, the range was from -52 to -4% at 5 and 25% core water contents, respectively. These differences indicate caution should be used when using sieved soils to infer water retention by field soils, regardless of texture. (Gibb-ISWS)
W76-08802

DEVELOPMENT OF A MATHEMATICAL MODEL OF INFILTRATION WHICH INCLUDES THE EFFECTS OF RAINDROP IMPACT,
Arizona Water Resources Research Center, Tucson.
C. B. Cluff, and D. Evans.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 773 $4.00 in paper copy, $2.25 in microfiche. Completion Report, (1975). 25 p, 12 fig, 6 tab, 10 ref. OWRT A-027-ARIZ(2), 14-31-0001-3503.

Descriptors: *Infiltration, *Gamma rays, *Compaction, *Rainfall simulators, *Mathematical models, Watersheds(Basins), Soil types, Soil profiles, Hydraulic conductivity, Model studies, Soil compaction.
Identifiers: *Raindrop impact.

The purpose was to use an existing mathematical model of infiltration to assist in determining which factors, including raindrop impaction, were responsible for infiltration characteristics of a bare semi-arid watershed. The infiltration model developed by Roger Smith (1970) was selected as best suited for this investigation. Several laboratory and field rainfall simulator runs were modeled. Good correlation was found between the modeled and experimental results for both the infiltration data and the saturation profiles, for both bare and grass covered plots. For the lab and field experiments a realistic rotating disk rainfall simulator was used. In the field bare and grass covered plots were tested. In the lab specially constructed soil boxes were used that permitted measurement of infiltration and saturation profiles with time. Gross changes in saturated hydraulic conductivities due to crusting effects were also measured. Gamma ray attenuation techniques were used to obtain density and soil moisture profiles for the laboratory experiments. It was found that the Smith model can be used to simulate infiltration from different surface conditions as long as there is some method to calibrate the model. Carefully obtained saturated and unsaturated hydraulic properties for the soil types present in the watershed are needed in addition to infiltration data from a realistic rainfall simulator or through hydrograph analysis from unit subwatersheds.
W76-08844

THE EFFECT OF CERTAIN SYNTHETIC MACROMOLECULAR SUBSTANCES ON THE PHYSICO-CHEMICAL PROPERTIES OF SOIL AND ON THE FERTILIZER UTILIZATION COEFFICIENT, (IN FRENCH),
Academia de Stiinte Agricole si Silvice, Bucharest (Rumania).
A. Dorneanu, S. Andrei, M. Dobre, M. Handra, and R. Lacatusu.
Bull Acad Sci Agric For. 1, p 111-129, 1972.

Descriptors: *Soil amendments, *Soil physical properties, Fertilizers, Nutrients.
Identifiers: *Acrylamide, *Polyacrylamides.

Polyacrylamide in amounts of 150-200 kg/ha improves soil macro- and microstructure and its water permeability, increases the resistance of soil to settling and its ion exchange capacity, increases the amount of hydrolyzable N and the availability of soluble P and N, and improves the fertilizer utilization. Since the polymer is water-soluble it can be applied by spraying with standard spraying equipment. Polyacrylamide application to soil is recommended where improvement of soil physicochemical properties is indicated.--Copyright 1974, Biological Abstracts, Inc.
W76-08981

SOME COMMENTS ON INTERFERENCES BY CU(II) IONS AND AG(I) IONS ON THE WET REDUCTION-FLAMELESS ATOMIC ABSORPTION DETERMINATION OF MERCURY,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 5A.
W76-09039

PLANT COLLECTION FOR SALTLAND REVEGETATION AND SOIL CONSERVATION,
Western Australia Dept. of Agriculture, South Perth. Soils Div.
For primary bibliographic entry see Field 2I.
W76-09071

EFFECT OF THE MOZHAYSK RESERVOIR ON SOIL OF THE BANK AREA OF THE SURROUNDING TERRITORY, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
V. E. Korenevskaya, L. B. Borovinskaya, and L. V. Komissarova.
Vestn Mosk Univ Ser 6 Biol Pochvoved. 29(4), p 101-107, 1974.

Descriptors: *Reservoirs, *Podzols, Soil properties, Soil moisture, Clays, *Seepage, *Banks, *Embankments.
Identifiers: Gley, *USSR(Mozhaysk reservoir).

During a 12-yr period seepage from the Mozhaisk reservoir (USSR) changed the derno-podzolic soils of bank area into derno-podzolic-gley and derno-podzolic gleyic soils, as characterized by their specific water regime and physico-chemical features.--Copyright 1975, Biological Abstracts, Inc.
W76-09081

CONDITIONS FOR USING A TENSIONPLATE AS A LYSIMETER, (IN GERMAN),
Agricultural Univ., Wageningen (Netherlands). Lab. of Agricultural Chemistry.
F. F. R. Koenigs.
Z Pflanzenernaehr Bodenk. 133(1/2), p 1-4, 1972.

Descriptors: *Lysimeters, *Moisture meters, Instrumentation, *Tensiometers, *Soil water movement.

With downward flow the tensionplate will function as a lysimeter when the soil water tension immediately above the plate will be equal to that beside the plate at the same level. With upward flow water tension immediately below the plate should not be altered by the plate. Flow from and to the soil below (downward flow) or above (upward flow) the plate should be prevented.--Copyright 1974, Biologicaal Abstracts, Inc.
W76-09082

NITROGEN AND PHOSPHORUS LEVELS IN SOILS BENEATH SEWAGE DISPOSAL PONDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-09197

SIMULATION OF DEEP SEEPAGE TO A WATER TABLE,
Connell/Metcalf and Eddy, Coral Gables, Fla.
For primary bibliographic entry see Field 2F.
W76-09245

VERTICAL FLOW OF AIR AND WATER WITH A FLUX BOUNDARY CONDITION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
D. B. McWhorter.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 2, p 259-265, March-April 1976. 3 fig, 1 tab, 7 ref.

Descriptors: *Soil water movement, *Air-water interfaces, *Infiltration, Air, Viscosity, Compressibility, Equations, Darcys law, Permeability, Saturation, Density, Pore pressure, Atmospheric pressure, Water pressure, Hydraulic conductivity, Porosity, Boundaries(Surfaces), Soil properties, Continuity equation, Ponding, Approximation method, Graphical methods.
Identifiers: *Air flow, Relative permeability, Incompressible flow, Richards equation.

The effects of viscous resistance to air flow on the downward movement of infiltrating water in soil were analyzed. A conceptual model was used in which air was replaced by a hypothetical incompressible fluid with a viscosity equal to that of air.

An equation analogous to Darcy's law was derived which incorporated resistance to flow of both air and water. The flow equation was later transformed to a dimensionless form. An important assumption used in deriving the equation was that the volume flux of the air is everywhere equal to and opposite in direction to that of water. An approximate solution was obtained using Parlange's technique of successive approximation, and the range of applicability for the solution was determined graphically. Numerical examples were presented which indicated that resistance to flow of an incompressible fluid with a viscosity equal to that of air would significantly influence both ponding time and the maximum infiltration rate short of ponding. Apparently the actual time-to-ponding must be between the two extremes predicted by single-phase and two-phase incompressible flow theory. (Visocky - ISWS)
W76-09251

HYDRAULIC PROPERTIES OF A POROUS MEDIUM: MEASUREMENT AND EMPIRICAL REPRESENTATION,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
R. W. Gillham, A. Klute, and D. F. Heermann.
Soil Science Society of America Journal, Vol. 40, No. 2, p 203-207, March-April 1976. 6 fig, 3 tab, 16 ref.

Descriptors: *Hydraulic properties, *Soil water, *Hysteresis, Laboratory tests, Soil moisture, Moisture content, Soil water movement, Groundwater movement, Infiltration, Drainage, Evaporation, Soil moisture meters, Hydrostatic pressure, Pressure head, Wetting, Drying, Soils, *Porous media.
Identifiers: Water retention.

The hysteretic water content-pressure head relationship and the hydraulic conductivity-water content relationship for a porous material are needed in the solution of the water flow equation to predict behavior of a given flow system. These hydraulic properties were measured in an unsteady-state manner using gamma ray attentuation for the water content and strain gage pressure transducer tensiometry for the pressure head. Envelope curves and four to six primary wetting and drying scanning curves of the water content-pressure relationship were determined. A convenient method of representation of the scanning curves by an empirical function was developed for use in computer solutions of the water flow equation. (Sims - ISWS)
W76-09255

DETERMINING THE HYDRAULIC CONDUCTIVITY OF SOIL CORES BY CENTRIFUGATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
M. H. Alemi, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Journal, Vol. 40, No. 2, p 212-218, March-April 1976. 5 fig, 2 tab, 15 ref, 1 append.

Descriptors: *Hydraulic conductivity, *Soils, *Centrifugation, *Infiltration, Laboratory tests, Groundwater movement, Permeability, Diffusivity, Conductivity, Hydrologic properties, Soil water, Soil moisture, Moisture content, Soil properties.
Identifiers: Centrifuges.

Two centrifugal techniques were proposed for determining the hydraulic conductivity of cores of natural soil. Experimental results were presented for one technique in which the change in weight of one end of the sample, previously centrifuged, was measured with a balance. The mathematical equations describing this redistribution process were developed and fitted to the data to ascertain the soil water diffusivity D. The value of the hydraulic conductivity K was obtained from K = bD, where b is also calculated. Calculated values of K agreed with previously published values. The second technique for which a theory was presented but no experimental values were provided depends upon the measurement of the volumetric outflow of water from a soil core when the speed of centrifugation is suddenly increased. (Sims - ISWS)
W76-09256

VARIABILITY OF HYDRAULIC CONDUCTIVITY IN TWO SUBSURFACE HORIZONS OF TWO SILT LOAM SOILS,
Wisconsin Univ., Madison. Dept. of Soil Science.
F. G. Baker, and J. Bouma.
Soil Science Society of America Journal, Vol. 40, No. 2, p 219-222, March-April 1976. 3 fig, 10 ref. EPA R802874.

Descriptors: *Hydraulic conductivity, *Soils, *Soil properties, *Variability, Loam, Loess, Silts, Subsoil, Soil horizons, Soil investigations, Infiltration, Groundwater, Groundwater potential, Soil moisture, Soil water movement, Soil science.
Identifiers: Crust tests, Soil variability.

Hydraulic conductivity was measured in the B22t and B31t horizons of 12 pedons of two soils developed in loess deposits overlying glacial till. Conductivity measurements were made with the crust test technique for unsaturated conditions and with a new related in situ method for saturated conditions. Nonlinear regression yielded simple well-fitting curves. Variability within and between major horizons in these soil series was found to be relatively low. The four horizons in these two silt loam soils had statistically identical hydraulic conductivity characteristics, even though morphological soil structure and soil genesis differed significantly. (Sims - ISWS)
W76-09257

SURFACE RESIDUE, WATER APPLICATION, AND SOIL TEXTURE EFFECTS ON WATER ACCUMULATION,
Agricultural Research Service, Bushland, Tex.; and Southwestern Great Plains Research Center, Bushland, Tex.
P. W. Unger.
Soil Science Society of America Journal, Vol. 40, No. 2, p 298-300, March-April 1976. 2 fig, 14 ref.

Descriptors: *Soil water, *Farm management, *Water storage, *Great Plains, *Organic matter, Mulching, Soils, Loam, Clay loam, *Evaporation, Precipitation(Atmospheric), Irrigation, Crops, Wheat, Soil properties, Soil science.
Identifiers: *Surface residue, Residue management.

Surface residue rates and water application amounts affect evaporation from soil. These factors were evaluated for their effects on water accumulation in a clay loam and a fine sandy loam soil. Surface residue rates ranged from 0 to 12,000 kg/ha and water was added at 0.25, 0.5, 1.0, or 2.0 cm/addition. At low residue rates and water applications, little or no water accumulated in the soils. The amount of water that accumulated in the soils increased as surface residue rates and water applications increased. Results for the two soils were remarkably similar, apparently because the liquid and vapor flow characteristics for the two soils were similar at high water contents, even though their water retention characteristics differed markedly. The results of this laboratory study were discussed with regard to residue management practices for low (dryland) and high (irrigated) residue production systems of the Great Plains. (Sims - ISWS)
W76-09258

DRAINAGE SYSTEM EFFECTS ON PHYSICAL PROPERTIES OF A LAKEBED CLAY SOIL,
Ohio State Univ., Columbus. Dept. of Agronomy.
S.S. Hundal, G. O. Schwab, and G. S. Taylor.
Soil Science Society of America Journal, Vol. 40, No. 2, p 300-305, March-April 1976. 7 fig, 1 tab, 11 ref.

Descriptors: *Drainage effects, *Crop response, *Soil properties, Drainage, Drainage practices, Soils, Soil physical properties, Soil strength, Compressive strength, Soil texture, Pores, Porosity, Land management, Surface drainage, Subsurface drainage, Hydraulic conductivity, Agriculture.
Identifiers: Crust density, Soil surface penetration.

The long-term effects of drainage on physical properties of a lakebed silty clay soil were evaluated 16 years after initiation of a field experiment. The treatments were undrained, surface drainage, subsurface drainage, and a combination of surface and subsurface drainage. Soil conditions were characterized by surface penetration resistance and by unconfined compressive strength, hydraulic conductivity, and pore size distribution in the 0-30 cm depth. Subsurface drainage resulted in greater soil hydraulic conductivity, less unconfined compressive strength, and less surface crust resistance than treatments without subsurface drainage. Subsurface drainage also decreased bulk density and increased the volume of air-filled pores at 0.02 to 1.0-bar suctions, but these effects were of smaller magnitude. An alfalfa-timothy mixture was grown during the period of these measurements. The survival of alfalfa and the total hay yield decreased in the order: combined surface and subsurface drained, subsurface drained, surface drained, and undrained treatments. (Sims - ISWS)
W76-09259

DETERMINING BOTH WATER CHARACTERISTICS AND HYDRAULIC CONDUCTIVITY OF A SOIL CORE AT HIGH WATER CONTENTS FROM A TRANSIENT FLOW EXPERIMENT,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
L. R. Ahuja, and S. A. El-Swaify.
Soil Science, Vol. 121, No. 4, p 198-204, April 1976. 6 fig, 1 tab, 7 ref.

Descriptors: *Hydraulic conductivity, *Soil properties, *Soil tests, Soil physical properties, Soil water, Soil water movement, Soil investigations, Laboratory tests, Soils, Clay loam, Wetting, Drying, Soil moisture, Moisture content, Porosity, Soil science.

A method of calculating both the water characteristics and hydraulic conductivity of a short soil core at high water contents from a single transient flow experiment was described and evaluated. The method was based on measurements of cumulative inflow or outflow of the water entering or leaving the core through a high-resistance porous plate on one end, and measurements of soil-water suction at theother end. The results indicated possibilities of good determinations in the soil-water region between 0-100 or 150 cm H2O suctions. Higher porous plate resistances gave better calculations over a wider range of water contnts than did the low resistances. The higher hydraulic conductivity values for an Inceptisol from Hawaii and the tendency of these values to decrease more sharply with decreases of water content than corresponding values fo Yolo soil were confirmed by this method. (Sims - ISWS)
W76-09271

SEWAGE EFFLUENT INFILTRATES FROZEN FOREST SOIL,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 5B.
W76-09288

2H. Lakes

THE EFFECTS OF INCREASING SALINITY ON THE PYRAMID LAKE FISHERY,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev.
For primary bibliographic entry see Field 5C.
W76-08753

THE EFFECTS OF WASTE WATER DIVERSION ON HEAVY METAL LEVELS IN THE SEDIMENTS OF A LARGE URBAN LAKE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-08754

THE EFFECT OF DURSBAN UPON FRESH WATER PHYTOPLANKTON,
Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
For primary bibliographic entry see Field 5C.
W76-08773

EFFECTS OF THERMAL CIRCULATION ON PHYTOPLANKTON PHOTOSYNTHESIS,
For primary bibliographic entry see Field 5C.
W76-08785

SELECTIVE FISH MORTALITY RESULTING FROM LOW WINTER OXYGEN,
For primary bibliographic entry see Field 5C.
W76-08788

FISH POPULATIONS IN A LARGE GROUP OF ACID-STRESSED LAKES,
For primary bibliographic entry see Field 5C.
W76-08790

ASSESSMENT AND ERADICATION OF HEAVY METAL POLLUTION IN A PLANNED URBAN ENVIRONMENT,
For primary bibliographic entry see Field 5C.
W76-08795

INFLUENCE OF MINERAL FERTILIZATION OF LAKES ON FISH GROWTH,
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
For primary bibliographic entry see Field 5C.
W76-08799

WIND-DRIVEN FLOW OF WATER INFLUENCED BY A CANOPY,
Texas A and M Univ., College Station. Dept. of Oceanography.
R. O. Reid, and R. E. Whitaker.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineering, Vol. 102, No. WW1, Proceedings Paper 11926, p 61-77, February 1976. 15 fig, 1 tab, 6 ref, 2 append. Army DACW72-71-C-0011.

Descriptors: *Model studies, *Winds, *Flow, *Flow, *Vegetation effects, Mathematical models, Numerical analysis, Vegetation, *Canopy, Drag, Storm surge, Wind pressure, Lakes, Estuaries, Fluid mechanics, Hydrodynamics.
Identifiers: *Wind-driven flow.

A time-dependent numerical model, which treats fully evolved wind-driven canopy flow as a coupled two-layer system, was developed. The interfacial stress was formulated in terms of a coupling coefficient and the flow differential. The resistance afforded by a vegetative canopy was parameterized in terms of a drag coefficient and dimensional properties of the canopy elements. With flow confined strictly to the canopy, the calming effect of the canopy was introduced through a sheltering coefficient. The canopy was modeled as a set of rigid uniform structures orientated normal to the flow and evenly distributed with specified density over the bottom. The algorithm was tested by simulating the steady-state water-surface profiles observed in a laboratory channel containing wire screen obstructions. The model was applied next to a wind-driven rectangular basin with simulated vegetation specified over half the bottom. (Sims-ISWS)
W76-08801

BIOMASS PARAMETERS AND PRIMARY PRODUCTION AT A NEARSHORE AND A MIDLAKE STATION OF LAKE ONTARIO DURING IFYGL,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-08825

OBSERVATIONS OF COLONIAL MULTIPLICATION IN A RAPIDLY GROWING ALGA, GONIUM MULTICOCCUM POCOCK (VOLVOCACEAE),
Hokkaido Univ., Muroran (Japan). Inst. of Algological Research.
For primary bibliographic entry see Field 5C.
W76-08826

SUMMER PHYTOPLANKTON PHOTOSYNTHESIS IN A NORTHEASTERN OHIO GLACIAL LAKE,
Akron Univ., Ohio. Dept of Biology.
For primary bibliographic entry see Field 5C.
W76-08828

A RESERVOIR COVE ECOSYSTEM MODEL,
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-08830

EFFECTS OF INITIAL FLOODING ON FOREST VEGETATION AT TWO OKLAHOMA LAKES,
Oklahoma State Dept. of Agriculture, Oklahoma City.
For primary bibliographic entry see Field 4A.
W76-08831

ZOOPLANKTON OF WESTERN LAKE ERIE AT PUT-IN-BAY: A QUANTITATIVE STUDY, APRIL 1973-MARCH 1974,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 5C.
W76-08833

CHANGES IN THE ALGAL FLORA OF EAST HARBOR, OTTAWA COUNTY, OHIO, SINCE 1900,
Ohio State Univ., Columbus. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-08834

NUTRIENT-PRIMARY PRODUCTION RELATIONSHIPS IN CENTRAL LAKE ERIE: A SIMPLE CORRELATION APPROACH,
Canada Centre for Inland Waters, Burlinton (Ontario).
For primary bibliographic entry see Field 5C.
W76-08836

A MODEL FOR SALT DRIFT DEPOSITION FROM SPRAY PONDS,
Massachusetts Institute of Tech., Cambridge.
For primary bibliographic entry see Field 5B.
W76-08866

THERMAL DISCHARGE STUDIES ON THE GREAT LAKES-THE CANADIAN EXPERIENCE,
Ontario Hydro, Toronto.
For primary bibliographic entry see Field 5G.
W76-08869

ECOLOGY OF ARTIFICIALLY HEATED STREAMS, SWAMPS AND RESERVOIRS ON THE SAVANNAH RIVER PLANT, THE THERMAL STUDIES PROGRAM OF THE SAVANNAH RIVER ECOLOGY LABORATORY,
Savannah River Ecology Lab. Aiken, S. C.
For primary bibliographic entry see Field 5C.
W76-08870

THERMAL STUDIES ON TROPICAL MARINE ECOSYSTEMS IN PUERTO RICO,
Puerto Rico Nuclear Center, Rio Piedras. Radioecology Div.
For primary bibliographic entry see Field 5C.
W76-08872

BEHAVIOURAL RESPONSES OF LAKE MICHIGAN FISHES TO A NUCLEAR POWER PLANT DISCHARGE,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W76-08876

EFFECTS OF HEAT ENRICHMENT ON SPECIES SUCCESSION AND PRIMARY PRODUCTION IN FRESH-WATER PLANKTON,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs; and Atomic Energy of Canada Ltd., Chalk River (Ontario). Biology and Health Physics Div.
For primary bibliographic entry see Field 5C.
W76-08879

FIELD EVALUATION OF A PREDICTIVE MODEL FOR THERMAL STRATIFICATION IN LAKES AND RESERVOIRS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
J. M. Colonell.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 961, $7.75 in paper copy, $2.25 in microfiche. Water Resources Research Center, Amherst, Publication No. 60, Completion Report FY-76-7, January 1976. 204 p, 23 fig, 19 tab, 27 ref, 8 append. OWRT B-021-MASS(2). 14-31-0001-3595

Descriptors: *Reservoirs, *Lakes, Management, Evaluation, Evaporation, *Forecasting, Data collections, Monitoring, *Thermal stratification, *Mathematical models, Model studies, Solar radiation, Radiation, Thermocline, Air temperature, Wind velocity, Humidity.
Identifiers: Wind-induced mixing processes.

The major portion of this work was devoted to experimental investigation of the response of a reservoir to hydrologic and meteorologic influences. For this purpose an automatic data collection system was designed and constructed. Five meteorologic parameters (solar and long wave radiation, mean wind speed, air temperature, and relative humidity) were monitored. Surveillance of the thermodynamic state of the reservoir was maintained by thermal surveys at intervals of seven to ten days throughout the field observational season. In addition, effort was devoted to the evaluation of a mathematical model for prediction of the thermodynamic and hydrodynamic behavior of a reservoir in response to climatic influences. Based on analyses of the comparison of measured and predicted temperature profiles the mathematical model performed satisfactorily. The longest continuous data period available for the evaluation was 33 days. The model predicted temperature gradients quite successfully but signifi-

cant errors occurred in determination of thermocline depth.
W76-08920

SEDIMENT LOADING, ITS EFFECT ON A SOUTHERN ARIZONA LAKE AND THE EMERGING SPRING ZOOPLANKTON COMMUNITY,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2J.
W76-09073

INFECTION OF BROAD-CLAWED CRAYFISH WITH BRANCHIOBDELLA AND CONTROL MEASURES AGAINST THEM, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
A. A. Mazhilis.
Liet Tsr Mokslu Akad Darb Ser C. 3, p 107-113, 1973.

Descriptors: *Crayfish, *Fish parasites, *Fish diseases, Europe, Lakes, *Pest control, Potassium compounds.
Identifiers: *Branchiobdella, Branchiobdella-Astaci, *Branchiobdella-Pentodonta, USSR, *Lithuanian SSR, Baka Lake, Siemetis Lake.

Investigation of 290 broad-clawed crayfish in the Baka and Siemetis lakes (Lithuanian SSR, Trakai district (USSR)), in 1971 showed that the crayfish had 2 spp. of Branchiobdella, Branchiobdella pentodonta Whitman and B. astaci Odier. All the specimens of commercially valuable crayfish in the Baka lake were intensively infected with B. pentodonta. The B. astaci infection was considerably lower. In the Siemetis lake the crayfish were more intensively infected with B. astaci than with B. pentodonta. Intensity of infection by B. pentodonta in the Baka lake was lowest in winter, in comparison to that in other seasons. The spread of the B. pentodonta infection was favored by direct contact between infected and uninfected crayfish. A KMnO4 solution (1:15,000, 20 min) appeared to be effective as it killed branchiobdellids and did not harm the crayfish.--Copyright 1976, Biological Abstracts, Inc.
W76-09086

MOLLUSKS OF THE CERATOPHYLLUM CARPETS OF LAKE CHAD: BIOMASSES AND SEASONAL VARIATIONS OF THE DENSITY, (IN FRENCH).
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
K. Leveque.
Cah O R S T O M Ser Hydrobiol. 9(1); p.

Descriptors: Mollusks, Africa, Lakes, *Seasonal, *Biomass, *Snails, Sampling.
Identifiers: Bilharziasis, Biomphalaria-Pfeifferi, *Bulinus-Truncatus-Rohlfsi, *Ceratophyllum, Chad, *Lake Chad.

Snails were collected monthly for 1 yr in 4 Ceratophyllum carpels of Lake Chad, Africa. For most of the species, variations in abundance during the year were not correlated with the main ecological factors of the lake. Bulinus truncatus rohlfsi was always found in sample sites and in other stations; Biomphalaria pfeifferi was also frequent. These 2 spp. are bilharsiasic vectors. Bulinus forskalii, Anisus coretus, Gyraulus costulatus, Segmentorbis angustus, Lymnaea natalensis and Ferrissia sp. were also found. Biomass (alcoholic weight per 100 g dry weight of plants) is generally between 1.5-7 g.--Copyright 1976, Biological Abstracts, Inc.
W76-09094

PLANT ASSOCIATIONS OF LAKE MIELIWO AND THE ADJACENT PEAT BOGS IN THE BRODNICA DISTRICT, (IN POLISH),
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology; and Nicolas Copernicus Univ. of Torun (Poland). Zaklad Botaniki Ogolnej.
K. Kepczynski, and A. Zielski.
Acta Univ Nicolai Copernici Biol. 16, p 125-167, 1974.

Descriptors: Lakes, Europe, *Plant groupings, Aquatic plants, Bogs, Forests, Peat, Soils, Willow trees.
Identifiers: Blysmus-Compressus, Brodnica, *Najas-Marina, *Poland(Lake Mieliwo), Potamogeton-Natans.

The size, shape, bottom sludge layer and surrounding deciduous and mixed forests of the lake (in Poland) are described. Najas marina, which is fairly rare, occurs in large numbers. The soil and water conditions of the biotopes of the unclassified willow and meadow formations and the Hydrocharitetum morsus-ranae, Potametum lucentis, Parvopotamo-Zannichellietum najadetosum, Potamogeton natans, Myriophyllo-Nupharetum, Ceratophyllum demersum, Scirpo-Phragmitetum, Acoretum calami, Caricetu paniculatae, Caricetum appropinquatae, Cariectum acutiformis, Caricetum vesicariae, Caricetum ripariae, Scirpetum silvatici, Blysmus compressus, Caricetum lasiocarpae, Carici-Agrostietum caninae, Caricetum diandre and Carici elongatae-Alnetum associations, are also described.--Copyright 1976, Biological Abstracts, Inc.
W76-09099

DIGESTIVE ACTIVITIES OF CARP AS A MAJOR CONTRIBUTOR TO THE NUTRIENT LOADING OF LAKES,
For primary bibliographic entry see Field 5C.
W76-09103

PHOSPHOROUS FLUX THROUGH FISHES,
For primary bibliographic entry see Field 5C.
W76-09104

RECLAMATION OF ACIDIFIED LAKES - MIDDLE AND LOHI, SUDBURY, ONTARIO,
For primary bibliographic entry see Field 5G.
W76-09108

THE CRUSTACEAN PLANKTON OF AN ACID RESERVOIR,
For primary bibliographic entry see Field 5C.
W76-09109

ENVIRONMENTAL CHANGES IN A PORTION OF LAKE ONTARIO FOLLOWING POLLUTION ABATEMENT,
For primary bibliographic entry see Field 5C.
W76-09119

DISCHARGE OF TREATED WASTE WATER IN LAKES (DIE EINLEITUNG VON GEREINIGTEM ABWASSER IN SEEN),
For primary bibliographic entry see Field 5B.
W76-09216

AN EVALUATION OF ERTS DATA FOR OCEANOGRAPHIC USES THROUGH GREAT LAKE STUDIES,
National Environmental Satellite Service, Washington, D.C.
A. E. Strong, and M. G. Stumpf.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-26467, $9.00 in paper copy, $2.25 in microfiche. Final Report, December 1974. 184 p, 63 fig, 10 tab, 45 ref, 1 append.

Descriptors: *Remote sensing, *Great Lakes, *Satellites(Artificial), Water temperature, Algae, Biomass, Circulation, Water circulation, Chemical precipitation, Ice, Lake ice, Pollutants, Water pollution, Lakes, Surface waters.
Identifiers: *ERTS, *NOAA-2, Sunglints.

The main objective of this ERTS-1 work was to exploit satellite-obtained multispectral data for Great Lakes observations. Near-coincident NOAA-2 satellite data were also utilized to provide additional information in the thermal-infrared part of the spectrum. A broad-based approach permitted the development of techniques for monitoring high concentrations of surface biomass and algal blooms in the Great Lakes during late summer and early fall. Chemical precipitation in the near-surface layer was readily observed by ERTS-1 and was found more extensive than previously believed. The high resolution of the MSS instrument permitted ice vector movement studies on successive days where overlapping data were available. These opportunities were infrequent because of extensive cloud cover. Water color displayed a positive correlation with surface water temperature during the spring and early summer months. This correlation reverses for fall and early winter. The most troubling finding was the extensive sunglint contamination. A nearly-complete set of circulation charts were presented for five Great Lakes areas that revealed numerous natural color tracers. (Sims-ISWS)
W76-09244

TEMPERATURE, OXYGEN, AND NUTRIENT DISTRIBUTION PATTERNS IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-09262

OXYGEN DEPLETION IN THE CENTRAL AND EASTERN BASINS OF LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W76-09263

AN AUTOMATIC RELEASE INSTRUMENT WITH UNDERWATER BUOY FOR MARKING OF FIELD EQUIPMENT,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
For primary bibliographic entry see Field 7B.
W76-09268

THE SEDIMENTS OF HIGH MOUNTAIN LAKE: STRUCTURE: NATURE AND POPULATIONS, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 2J.
W76-09347

THERMAL STRUCTURE OF LAKE MASCARDI (PROVINCE OF RIO NEGRO, ARGENTINA, (IN SPANISH),
Instituto National de Limnologia, Santo Tome (Argentina).
C. E. Drago.
Physis Aguas Cont Org Secc B. 33(87), p 207-216, 1974.

Descriptors: South America, Lakes, Heat budget, *Heat transfer, *Energy budget, *Thermal stratification.
Identifiers: *Argentina(Lake Mascardi), Province Rio-Negro(SA).

The thermal structure of Lake Mascardi and its energy budget and heat transfer at different depths was analyzed during May, 1971-April, 1972. The

lake shows a circulation period from the end of July to the beginning of Oct.; the stratification period extends from the end of Oct. until April. The metalimnion is generally located between 10-40 m depth and the water temperature is always above 5C. The lake belongs to the warm monomictic type. The annual heat budget was 27,934 cal cm-2 with a maximum of 43,442 cal cm-2 (Feb., 1972) and a minimum of 15,508 cal cm-2 (Aug., 1971). The largest negative heat flux (toward the atmosphere) was registered in Aug. (-351 cal cm-2 day -1) while the maximum flux value toward the lake occurred in Oct. (483 cal cm-2 day -1). The thermal characteristics of the lake are similar to those observed in other deep lakes in the temperate region.--Copyright 1975, Biological Abstracts, Inc.
W76-09358

A LAKE POPULATION: THE INTHA OF LAKE INLE. (SOUTHERN SHAN STATES, BURMA), (IN FRENCH),
Ecole Pratique des Hautes Etudes, Paris (France).
M. Bruneau, and L. Bernot.
J Agric Trop Bot Appl. 19(10/11); p 401-441, 1972(1974).

Descriptors: Asia, Lakes, Rice, Human population, Forests, Geography, Water hyacinth, Nuisance algae, Bibligraphies.
Identifiers: *Burma, Ceratophyllum, *Dipterocarpus-Tuberculatus, Eichornia-Crassipes, Ephydatia-Fluviatilis, Hydrilla, *Imperata, Inle, Intha, Shan, Utricularia.

Cultural data on the people and a bibliography of geographic, ethnographic and biological works on this area are provided. The Yaungshwe basin contains 2 distinct types of forest: one characterized by Dipterocarpus tuberculatus and associated plants; the other by Imperata. The lacustral zone occupies a portion of the basin and is composed of 3 sections: the central section, characterized by Ceratophyllum; the area around the lake, composed of floating islands of living and dead plants, especially the water hyacinth Eichornia crassipes, a rapidly growing South American plant which is considered a nuisance; and the intermediate paludal zone, the bottom of which is covered with Hydrilla, Ceratophyllum and Utricularia. This last zone is also rich in the sponge, Ephydatia fluviatilis. The principal industry in the area is rice growing.--Copyright 1975, Biological Abstracts, Inc.
W76-09361

FORMATION OF FISH FAUNA OF THE BERDYANSK RESERVOIR IN THE FIRST TWELVE YEARS OF ITS EXISTENCE, (IN RUSSIAN),
Melitopolskii Pedagogicheskii Institut (USSR).
A. S. Loshakov.
Vestn Zool. 5, p 38-44, 1974.

Descriptors: *Reservoirs, *Fish hatcheries, Carp.
Identifiers: Alburnus-Alburnus, Berdyansk Reservoir, Chalcalburnus-Chalcoides-Danubicus, Cobitis-Taenia, Gobio-Gobio, Leucaspius-Delineatus, Leuciscus-Cephalus, Lucioperca-Lucioperca, Neogobius-Fluviatilis, Perca-Fluviatilis, Preterorhinus-Marmoratus, Rhodeus-Sericeus-Amarus, Rutilus-Frisii, Rutilus-Rutilus, Scardinius-Erythrophthalmus, Ukrainian-SSR, Vimba-Vimba-Vimba-Natio-Carinata, *USSR.

The Berdyansk Reservoir (Ukrainian SSR, USSR) is a habitat for 16 fish species and subspecies (Leuciscus cephalus, Scardinius erythreophthalmus, Leucaspius delineatus, Gobio gobio, Alburnus alburnus, Cyprinus carpio, Rutilus rutilus, R. frisii, Chalcalburnus chalcoides danubicus, Vimba vimba vimba natio Carinata, Cobitis taenia, Neogobius fluviatilis, Preterorhinus marmoratus, Rhodeus sericeus amarus, Lucio-perca lucioperca, Perca fluviatilis), including valuable food-fish (C. carpio L., C. chalcoides danubicus Antipa, V. vimba vimba natio carinata Pall. (21.43%)), food-fish and fish of little value (50%) and 'weed' species (28.57%). In the 1st years of the existence of the reservoir, the quantity of 'weed' and low-value species grew rapidly; then the quantity of valuable food fish increased.--Copyright 1975, Biological Abstracts, Inc.
W76-09392

DISTRIBUTION, CIRCULATION AND EVOLUTION OF NUTRIENTS, PARTICULARLY INORGANIC PHOSPHORUS IN LAKE ETANG DEBERRE: INFLUENCE OF RIVER DURANCE WATERS, (IN FRENCH),
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Oceanographie.
For primary bibliographic entry see Field 5B.
W76-09393

LIMNOPLANKTON OF SOME INLAND WATERS OF DACCA CITY,
Dacca Univ. (Bangladesh). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-09400

2I. Water In Plants

WATER REGIME IN GROWING POINTS OF WHEAT SHOOTS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
L. P. Chel'tsova.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina. 8,p 16-18, 1974.

Descriptors: *Wheat, Crops, Cereal crops, Grains(Crops), *Water requirements, Analysis, *Moisture uptake.

The uptake of water into the growing points of wheat shoots, suction force and osmotic pressure of the sap of the cells of the growing points and leaves as a function of the stage of organogenesis was determined. In the II stage, the uptake of water into the growing points decreased; the decrease was more pronounced in spring than in winter wheat varieties.--Copyright 1976, Biological Abstracts, Inc.
W76-08757

SELF-REGULATION OF THE POPULATION AND BIOMASS OF SCHOOLS OF YEARLING CARP, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
Yu. G. Andreyashkin, and L. A. Dobrinskaya.
Ekologiya. 5(5), p 44-48, 1974.

Descriptors: *Carp, *Fish populations, Biomass, Schools(Fish), Analysis, Regulation, Fisheries.

The density regulation mechanism of coexisting 1st yr carp Cyprinus carpio L. was studied in nursery ponds and aquariums. Statistical analyses show that various factors such as the size and weight of the body, population density, nutritional conditions, reproduction and death rate interact to determine a carp population.--Copyright 1976, Biological Abstracts, Inc.
W76-08832

ZINC NUTRITION OF RICE IN RELATION TO IRON AND MANGANESE UPTAKE UNDER DIFFERENT WATER REGIMES,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India).
For primary bibliographic entry see Field 3F.
W76-08974

EFFECT OF SOIL-MOISTURE REGIMES AND N AND P FERTILIZATION ON BERSEEM GROWN FOR FODDER,
Indian Agricultural Research Inst., New Delhi. Div. of Agronomy.
For primary bibliographic entry see Field 3F.
W76-08987

EFFECTS OF LIME, PHOSPHATE AND SOIL CONDITIONER ON GROWTH AND FRUIT QUALITY OF NETTED MELON, (IN JAPANESE),
Tsuishin Jr. Coll. of Agriculture, Aichi (Japan).
For primary bibliographic entry see Field 3C.
W76-08989

PROBLEM OF BLOOD-SUCKING FLIES IN THE ZONES AFFECTED BY BIG WATER RESERVOIRS IN THE UKRAINIAN SSR, (IN RUSSIAN),
Zaporozhskii Gosudarstvennyi Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5G.
W76-08991

PLANT COLLECTION FOR SALTLAND REVEGETATION AND SOIL CONSERVATION,
Western Australia Dept. of Agriculture, South Perth. Soils Div.
C. V. Malcolm, and A. J. Clarke.
Western Australia Department of Agriculture, Technical Bulletin No. 21, October, 1973. 34 p, 4 ref.

Descriptors: *Revegetation, *Soil conservation, *Soil-water-plant relationships, *Saline soils, *Planting management, Forages, Salt tolerance, Plant groupings, Drought tolerance, Australia, Africa, Asia.
Identifiers: Israel, Tunisia, Algeria.

Listings of over 350 plants were added to a collection of 343 already under observation to determine suitability for forage production in saline and arid regions. New accessions for the test program include shrubs from Tunisia, Algeria, Israel, and Australia. Some plants were collected for their special suitability in revegetation of coastal dunes, road verges and mine spoil dumps. The extensive tables provide information on both the botanical and common name, locality and altitude, habitat, and description of the species added. Habitats include rainfall where known, character of soils, and particular water environment such as salt lakes, margins of seepage, beaches, swamps, river banks, and flood plains. (Jahns-Arizona)
W76-09071

LATE PLEISTOCENE AND MODERN PLANT COMMUNITIES OF SHINUMO CREEK AND PEACH SPRINGS WASH, LOWER GRAND CANYON, ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
T. R. Van Devender, and J. T. Mead.
Journal of the Arizona Academy of Science, Vol. 11, No. 1, p 16-22, February, 1976. 1 fig, 1 tab, 10 ref.

Descriptors: *Pleistocene epoch, *Plant populations, *Vegetation, *Plant groupings, *Environmental effects, Paleoclimatology, Juniper trees, Forests, Xerophytes, Biological communities, Desert plants, Arid climates, Pinyon pine trees, Climates, *Arizona.
Identifiers: *Plant fossils, Shinumo Creek(Ariz), Peach Springs Wash(Ariz), *Climatic depression, Grand Canyon, Rampart Cave(Ariz), Packrat middens.

Plant macrofossils in late Pleistocene packrat (Neotoma sp) middens were found near Shinumo Creek and Peach Springs Wash in the Grand Canyon. Plant fossils preserved in such deposits provide excellent records of contemporary local

plant communities as well as past vegetation and climate. The two middens reported document xerophilous woodland as low as 735 and 860 m in the Grand Canyon from 12,000 to 13,600 radiocarbon years ago. Most plants identified from the samples now occur at 1200 m elevation. Using this as a modern analogue, estimates of climatic depression of these early plant communities are 340-465 m, although similar vegetation occurred at that time as low as 430 m in the Rampart Cave area, with a depressional estimate of at least 1000 m. Of more interest than the species found was the absence of Pinus monophylla or P. edulis and Artemisia tridentata in midden samples, although the present lower limits for pinyon and juniper are very close in this area. Juniper woodland had a greater elevational amplitude then today in the Grand Canyon. These records support the hypothesis that plant species respond to changing environments individualistically rather than plant communities being depressed in units. (Jahns-Arizona)
W76-09074

GROWTH, WATER CONSUMPTION, AND SALT UPTAKE OF TOMATO PLANTS IN HIGH HUMIDITY- HIGH CARBON DIOXIDE GREENHOUSE ENVIRONMENTS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 3C.
W76-09075

THE PHRAGMITETEA AND MOLINIETALIA ASSOCIATIONS IN THE THAYA, MARCH AND DANUBE RIVER BASINS OF AUSTRIA, (IN GERMAN),
For primary bibliographic entry see Field 4A.
W76-09076

THE PERIPHERAL FLOOD ZONES OF GNIEWKOWO LOWLAND FROM 1969 TO 1972, (IN POLISH),
Nicolas Copernicus Univ. of Torun, Ilawa (Poland). Dept. of Hydrobiology.
J. Wilkon-Michalska, and N. Dmitrenko.
Acta Univ Nicolai Copernici Biol. 16, p 169-190, 1974.

Descriptors: Europe, Succession, Meadows, Pastures, Reeds, Floods, *Aquatic plants, Stagnant water, Shrubs.
Identifiers: Ceratophyllum-Demersum, Deschampsia-Caespitosa, Oenanthe-Aquatica, Phragmites-Communis, *Poland(Gniewkowo), Polygonum-Amphibium-f-Natans, Potamogeton-Lucens, Potentilla-Supina, *Aquatic plant succession.

The plant successions at 10 localities (in Poland) containing stagnating flood water were studied. Typical hydrophytes, Ceratophyllum demersum, Potamogeton lucens and Polygonum amphibium f. natans, predominated in the water. Reeds, especially Phragmites communis, covered 1/3 of the flooded meadows, pastures and fields. Dense Oenanthe aquatica occupied shallow, sludgy, dried up reservoirs; these were later replaced by shrubs. The northern periphery of the flood areas was covered with therophytes, primarily Potentilla supina, after the water level fell. Fragments of higher meadows and pastures had fewer species and were dominated by hydrophytes such as Deschampsia caespitosa after the flood.--Copyright 1976, Biological Abstracts, Inc.
W76-09079

HYDROTHERMIC REGIME AND PRODUCTIVITY OF FORESTS OF NATURAL ORIGIN, (IN RUSSIAN),
R. I. Florov.
Lesovedenie. 3, p 21-28, 1975.

Descriptors: Forest management, Nutrients, Production, Metabolism, Soil moisture, Vegetation, Leaves, Cycles, Fir trees, Spruce trees, Pine trees.
Identifiers: Hydrothermic regimes(Forests).

Nutrient regimes of natural forests, potential production and metabolism are functions of hydrothermic conditions. This is common for natural forests which periodically return nutrients to the soil. Quantitative relationships of stand production with the hydrothermic regime were established by 2 methods: a semi-empirical method using curves describing the annual course of soil moisture and the duration of the vegetative period; and the method of dissipation in the leaf system. (Data from pine, spruce and fir forests are discussed.)--Copyright 1976, Biological Abstracts, Inc.
W76-09080

VEGETATIONAL STRATA IN PERHUMID AND PERARID REGIONS OF THE TROPICAL ANDES, (IN GERMAN)
H. Ellenberg.
Phytocoenologia. 2(3/4), p 368-387, 1975.

Descriptors: *Primary productivity, Forests, Grassland, *South America, *Vegetation, Tropics, *Humidity, Arid climates, Leaves, Semi-arid lands.
Identifiers: Andes, Argentina, Chile, Colombia.

The Andean Mountains and the adjacent lowlands, from southern Colombia to northern Chile and Argentina, offer an unique opportunity to study the variation of vegetation with the altitude as well as with the degree of humidity of climate within the tropics. This variation is represented schematically, using the number of arid months as the horizontal and the altitudinal belts as the vertical axis. Primary productivity is highest in the humid, not in the perhumid lowlands. More realistic graphs may give an idea of the structure of the zonal plant formation in a perhumid, in a semihumid to semiarid and in an arid climate. Climatic diagrams of the daily movement of air temperature and relative humidity were developed which show the more or less wet and dry hours. Where possible, climatic diagrams with monthly average temperature and rainfall (according to Walter) are added. The abundance of vascular and cryptogamic epiphytes depend mainly on the degree of humidity at midday in the growing season, may this be caused by fog drift or frequency of rain fall. Drip tips on the leaves are lacking in the wettest forest climate (i.e., in the upper montanous belt) but are quite frequent where the average temperature is above 15 C, the whole growing season is humid, and the dry season is not longer than 4 mo. Under these conditions, most leaves normally have no or only a thin and individual bud protection, and their tip is already differentiated when the lamina begins to enlarge quickly, thus causing a curved transition to the tip. Most natural forest and woodland types have been partially or nearly totally replaced by grassland which has been regularly burned and grazed since the Spanish conquest or even longer.--Copyright 1976, Biological Abstracts, Inc.
W76-09083

PROTECTION OF ROMANIAN UNDERGROUND WATER FAUNA, (IN ROMANIAN),
Academia R. S. R., Cluj. Institutul de Speologie.
L. Botosaneanu.
Ocrotirea Nat. 16(1), p 43-46, 1972.

Descriptors: Europe, Groundwater, Karst, Caves, Springs, Underground streams, *Fish.
Identifiers: *Dendrocoelum-Afine, *Dendrocoelum-Atriostrictum, *Dendrocoelum-Banaticum, *Niphargus-Spp., *Romania.

Karstic waters are little affected by technological activities. The number of caves used for tourist purposes is still small. Human activities are not known to have an impact on aquatic cave fauna. The habitats involved include springs in hill, plateau, and plain areas, and streams. These are the habitats of depigmented and blind species of the family Dendrocoelidae and genus Niphargus which are in danger of vanishing. This is the case of Dendrocoelum atriostrictum, D. banaticum, D. (Polycladodes) afine, etc. These species occurred in various springs which are involved in industrial developments, municipal uses, etc.--Copyright 1976, Biological Abstracts, Inc.
W76-09085

INTERRELATION BETWEEN WEIGHT AND LINEAR INDICES IN BLACK SEA OYSTERS (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
T. F. Krakatitsa, and A. G. Paflai.
Izv Akad Nauk SSSR Ser Biol. 3, p 428-438, 1975.

Descriptors: *Oysters, Weight, *Shellfish farming, Biomass, Measurement, Estimating, *Commercial shellfish, *Statistics, Length.
Identifiers: Ostrea-Edulis-Var.-Taurica, *Black Sea oysters.

The interrelations of linear and weight indices in Black Sea oysters (Ostrea edulis var. taurica) were statistically analyzed using several years' experimental data and expedition materials. General mass, valve mass and the body mass depend on the height which is sufficiently clearly reflected by the equation of the power parabola W = aHb. The linear and quadratic dependencies due to the simplicity of calculations and the fair coincidence between actual and calculated weights were used for estimating oyster weight according to the linear measure. No similar investigations were carried out so far regarding Black Sea oysters. The establishment of the 1st experimental commercial oyster farm makes this of practical value for estimating biomass yield.--Copyright 1976, Biological Abstracts, Inc.
W76-09087

ON THE HISTOLOGICAL STRUCTURE AND FUNCTION OF DIGESTIVE ORGANS OF THE FED AND STARVED LARVAE OF THE YELLOWTAIL, SERIOLA QUINQUERADIATA, (IN JAPANESE),
Kochi Univ. (Japan). Inst. of Fisheries.
Umeda, Susumu, Ochiai, and Akira.
Jpn J Ichthyol. 21(4), p 213-219, 1975.

Descriptors: Larvae, *Fish diets, *Rotifers, *Fish food organisms, Fish hatcheries.
Identifiers: Seriola-Quinqueradiata, *Yellowtail larvae.

The early critical period of S. quinqueradiata larvae was studied. larvae were reared in laboratory tanks for 10 days after hatching, with or without food. In starved larvae the digestive organs were normal in histological structure and digestive function on the 4th day, but degenerated strikingly on the 6th-9th day after hatching. Larvae of the fed group receiving rotifers (3 5 individuals/ml seawater) as food from the 4th day were classified into starved, semistarved and normally feeding types. Starved type larvae possessed the same histological features as the larvae of starved group. The semistarved type had a histologically normal digestive tract, but rotifers were not seen in the intestinal lumen. Starved larvae were 70% and the semistarved type were 0% at day 6, 46% and 27% at day 7, 5% and 39% at day 9, respectively. The unfavorable feeding condition in the early period (4th-6th day after hatching) appears to be the main cause of mortality of yellowtail larvae reared in laboratory tanks.--Copyright 1976, Biological Abstracts, Inc.
W76-09088

PERIODICITY IN THE BIOMETRIC VARIATIONS OF LOXECHINUS ALBUS MOLINA, (IN SPANISH),
Universidad de Norte, Antofagasta (Chile). Sede Anatogagasta.
M. Gutierrez, Juan, V. Otsu, and Ines.
Rev Biol Mar. 15(2), p 179-199, 1975.

Descriptors: Commercial fish, Cycles.
Identifiers: Biometric variation, Chile, *Loxechinus-Albus, *Sea urchin.

L. albus Mol. is the edible sea urchin of the Chilean coast. The biometric variations in different periods of the year (1965, 1966, 1971) are analyzed. The samples studied were obtained in 'Caleta de Hornos' (22 54' 50''S and 70 18'20''W). Sea urchins (1828) were studied, which meant a monthly average of 141 specimens. The results of biometric determinations are given.--Copyright 1976, Biological Abstracts, Inc.
W76-09089

PHYSIOLOGICAL EVALUATION OF THE NUTRITIONAL VALUE OF ARTIFICIAL FISH FEEDS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khoziaistva, Rybnoe (USSR).
M. A. Shcherbina.
Vopr Ikhtiol. 15(2), p 338-345, 1975.

Descriptors: *Fish diets, *Fish food organisms, Nutrients, Protein, Energy, *Fish physiology, Evaluation.

A comprehensive method for determining the nutritional value of artificial fish feeds is proposed based on a determination of the most important components of the feed (dry matter, crude protein and energy) with respect to 6 indices: chemical composition of feed, digestibility of nutrients, expenditures of gross and digestible nutrients per unit weight gain, effectiveness of utilization of nutrients for weight gain by the fish, rate of increase of body weight and content of nutrients per unit weight gain. Equations for determining the indices are presented.--Copyright 1976, Biological Abstracts, Inc.
W76-09090

BIOCHEMICAL CHARACTERISTICS OF SPIRULINA PLATENSIS (GOM.) GEITL.: I. WATER-SOLUBLE GROUP B VITAMINS, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
N. D. Tupyk, and S. I. Los'.
Ukr Bot Zh. 32(1), p 39-41, 1975.

Descriptors: Vitamins, *Vitamin B, *Algae, Cultures, Solubility, Biochemistry.
Identifiers: *Spirulina-Platensis.

The effect of the culture age on the content of group B vitamins was studied in pure cultures of S. platensis under laboratory conditions. Vitamin content was maximal in intensively growing cultures. Definite differences were shown in the content of group B vitamins in algae of different species. S. platensis is a rich source of vitamins.--Copyright 1976, Biological Abstracts, Inc.
W76-09091

EFFECT OF FOOD CONCENTRATION ON EFFICIENCY OF ITS ASSIMILATION BY PLANKTONIC CRUSTACEANS WITH DIFFERENT FEEDING MECHANISMS, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
G. A. Pechen-Finenko.
Gidrobiol Zh. 9(5), p 97-104, 1973.

Descriptors: *Crustaceans, *Fish food organisms, Absorption, *Fish diets, Plankton, Metabolism.

Differences in crustacean feeding mechanisms give grounds to assume that this factor determines the main regularities in the assimilation of food by animals. To check this hypothesis, the literature was analyzed and data on the dependence of assimilation efficiency on food concentration and quantity of food consumed were related with feeding characteristics. Data on the assimilability and assimilation efficiency as a function of the food concentration and quantity of food consumed for filter-feeding crustaceans and seizing crustaceans show that under natural conditions both can regulate sufficiently well the process of consumption and assimilation of food, and that superfluous feeding cannot be considered characteristic for animals under natural conditions.--Copyright 1976, Biological Abstracts, Inc.
W76-09092

EFFECT OF HARDENING ON THE STATE OF WATER IN SEEDLINGS OF WINTER CULTURES, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
I. M. Vasil'eva, N. N. Ishmukhametova, N. A. Galiev, and V. I. Khisamutdinova.
Fiziol Rast (Mosc). 22(2), p 376-380, 1975.

Descriptors: *Wheat, *Rye, Leaves, *Frost, Energy, Ions, *Cytological studies, Freezing, Cultures.
Identifiers: Frost resistance(Plants).

Low-frequency electrical resistance was measured in the leaves of seedlings (wheat, rye) of winter cultures during hardening, as well as the effect of temperature on this parameter. Low-frequency resistance is higher in frost-resistant plants in which it increases with hardening and depends on temperature to a lesser degree. The higher the frost-resistance of the seedlings, the lower activation energy of the ion mobility before hardening. This energy increases with a decrease of temperature during hardening of the plants, the more so the higher is the frost resistance. Changes in the energy of activation of the ion mobility as a result of hardening are related to an increase of viscosity of the intercellular liquid caused by liberation of natural protective substances. This produces amorphous ice in the cell walls during freezing.--Copyright 1976, Biological Abstracts, Inc.
W76-09095

EFFECT OF AIR HUMIDITY ON STOMATAL AND MESOPHYLL CONDUCTIVITY OF BEAN LEAVES AT TWO SOIL MOISTURE LEVELS, (IN RUSSIAN)
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
K. A. Moldau, and A. Y. Syber.
Fiziol Rast. 21(4), p 800-806, 1974.

Descriptors: Leaves, Humidity, *Beans, *Stomata, *Soil moisture, Carbon dioxide, Conductivity, Transpiration, Soil-water-plant relationships.
Identifiers: *Mesophyll conductivity, Phaseolus-Vulgaris, *Air humidity.

The stomatal and mesophyll conductances and the CO2 relative humidity compensation point of intact bean Phaseolus vulgaris leaves were measured at low (10-30% relative humidity (RH) and high (85-97% RH) air humidity at 2 soil moisture levels (70 and 50% of total capacity). The stomatal conductance decreased with air humidity at both soil moisture levels with the elative decrease in the stomatal conductance being higher at a higher soil moisture level. As the transpiration rate into drier air remained higher, the stomatal response to air humidity was possibly explained without involving the mechanism of the peristomatal transpiration. On the basis of experimental evidence and mathematical analysis of water transport throughout the soil-plant atmosphere system, it was shown that the stomatal response to air humidity and soil water potential depends on the shape of the stomatal conductance-leaf water potential relationship and on the resistance to water movement in the liquid phase. The mesophyll conductance and the C2 compensation point did not depend on soil moisture and air humidity within the range of changes in the stomatal conductance from 0.9-0.06 cm/s for CO2.--Copyright 1976, Biological Abstracts, Inc.
W76-09097

MEADOW VEGETATION AND FORAGE RESOURCES OF THE URAL RIVER FLOODPLAIN, (IN RUSSIAN)
For primary bibliographic entry see Field 4A.
W76-09098

PLANT ASSOCIATIONS OF LAKE MIELIWO AND THE ADJACENT PEAT BOGS IN THE BRODNICA DISTRICT, (IN POLISH),
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology; and Nicolas Copernicus Univ. of Torun (Poland). Zaklad Botaniki Ogolnej.
For primary bibliographic entry see Field 2H.
W76-09099

FIRST OBSERVATIONS ON THE FOREST OF CAMEROON ON SANDY COASTAL CORDONS, (IN FRENCH)
Museum National d'Histoire Naturelle, Paris (France). Laboratoire de Phanerogamie.
R. Letouzey.
Adansonia. 14(4), p 529-542, 1975.

Descriptors: Africa, Bogs, Soils, *Vegetation, Forests, Coasts, Sands, Mangrove swamps.
Identifiers: *Cameroon, *Coastal cordons, *Rhizophora-Racemosa, *Mangroves.

On the Atlantic coastline of Cameroon, it is possible to distinguish 5 principle sectors: near Nigeria, a vast bogland colonized by the mangrove Rhizophora racemosa; SE of the 1st sector an area reaching from an active volcano emitting molten basalt lava to the ocean; to the SE, a zone with warping subsoil, also colonized by R. racemosa; at the estuary of the Wouri, an unusual flat sandy zone interrupted by estuaries of the important Sanaga and Nyong Rivers; and, near Kribi, a coastline formed by crystalline and gneissic soil. Plant species are listed for the several zones, for periodically inundated forests, boggy areas, young forests on recent cordons and old forests on ancient sandy cordons.--Copyright 1975, Biological Abstracts, Inc.
W76-09100

EFFECT OF THE WATER REGIME ON THE HEAT-RESISTANCE OF LEAF CELLS OF HEAT-HARDENED TRADESCANTIA FLUMINENSIS VELL. PLANTS, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
I. G. Zavadskaya, and G. G. Shukhtina.
Bot Zh (Leningrad). 59(7), p 1055-1058, 1974.

Descriptors: *Plant grouping, Drought, *Leaves, *Moisture content, Water loss, *Drought resistance, Cytological studies, Soils, Plant physiology.
Identifiers: Protoplasma, *Tradescentia-Fluminensis.

Two groups of T. fluminensis were subjected to soil drought until water deficit in the leaves reached 35%, after which plants of 1 group (group 2) were heat-hardened in a thermostatically-controlled chamber for 3 h at 38C, along with a 3rd group which had not been subjected to drought. All plants were placed under room temperature, and water content and heat-resistance, determined by cessation of protoplasmic movement after 5 min of heating, of the leaves were measured. Water content in the 3rd group and in a control group remained the same throughout the experiment (18 days) but in group 1 and 2 it slowly

decreased to 64% less than in the controls by the 18th day. Heat-resistance in the controls and group 1 was the same, which indicated that in this species water deficit did not affect primary heat-resistance. Hardening induced increased resistance in both the 2nd and 3rd groups, but it decreased in the 3rd group to control level in 7 days, while remaining high in group 2 until the end of the experiment. Watering the group 2 plants produced the same decrease as in group 3 thus proving that water deficit in the cells stabilizes heat-resistance in heat-hardened plants.--Copyright 1976, Biological Abstracts, Inc.
W76-09102

MERCURY UPTAKE IN ROOTED HIGHER AQUATIC PLANTS; LABORATORY STUDIES,
For primary bibliographic entry see Field 5C.
W76-09111

PHASE IV: BIOLOGY,
Gulf Coast Research Lab., Ocean Springs. Miss. Fisheries Section.
For primary bibliographic entry see Field 2L.
W76-09242

2J. Erosion and Sedimentation

SOIL AND WATER CONSERVATION WITH WESTERN IOWA TILLAGE SYSTEMS,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
For primary bibliographic entry see Field 4D.
W76-08805

COCCOLITH SEDIMENTATION BY FECAL PELLETS: LABORATORY EXPERIMENTS AND FIELD OBSERVATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08954

SEDIMENT LOADING, ITS EFFECT ON A SOUTHERN ARIZONA LAKE AND THE EMERGING SPRING ZOOPLANKTON COMMUNITY,
Arizona Univ., Tucson.
K. S. Hanks.
Journal of the Arizona Academy of Science, Vol. 11, No. 1, p 3-6, February, 1976. 4 fig, 1 tab, 6 ref.

Descriptors: *Sediment load, *Lake sediments, *Thermocline, *Zooplankton, *Rainfall-runoff relationships, Rotifers, Aquatic microorganisms, Turbidity, Dissolved oxygen, Impact(Rainfall), Water temperature, Arizona, Lakes.
Identifiers: Secchi disk transparency, Filter feeding, Pena Blanca Lake(Ariz).

A study of the Pena Blanca Lake area of Southern Arizona revealed that rainfall and its sediment loading can forestall thermocline development for many weeks and reduce zooplankton numbers. During late February and early March, 1973 heavy rainfall in the lake's watershed caused a sudden influx of silt-laden water into the reservoir. Secchi disk transparency readings dropped first, from 134 cm on February 17 to 25 cm on March 3; total zooplankton numbers fell from 906,000/cu m to 30,000/cu m between March 3 and March 17. The overall water column temperature decreased from 9.8 C in February to 7.8 C in March. This combination of factors probably accounts for delayed thermocline development (which was still weak in April, one month after stratification normally occurs). The ability of Polyarthra trigla to increase its numbers after March 17 seems to be a function of decreasing turbidity. Sediment loading is especially devastating to communities such as zooplankton which depend on filter feeding. (Jahns-Arizona)
W76-09073

VEGETATION AND LANDSLIDES, (IN FRENCH),
Toulouse-3 Univ. (France). Lab. of Botany and Biogeography.
For primary bibliographic entry see Field 4C.
W76-09101

THE AVAILABILITY OF 137-CS TO FISHES FROM INGESTED CLAYS,
For primary bibliographic entry see Field 5C.
W76-09118

THE FORMATION AND DETECTION OF METAL DISPERSION HALOS IN ORGANIC LAKE SEDIMENTS,
Geological Survey of Canada, Ottawa(Ontario).
M. H. Timperley, and R. J. Allan.
Journal of Geochemical Exploration, Vol. 3, No. 2, p. 167-190, May 1974, 9 fig, 2 tab, 62 ref.

Descriptors: *Heavy metals, *Trace elements, Geochemistry, Geologic investigations, *Lake sediments, *Pollutant identification, Lakes, *Canada.
Identifiers: *Gyttja, *Prospecting mediums, Geochemical exploration.

The appplication of organic rich lake sediment, gyttja, to exploration geochemistry is discussed. Gyttja was collected from 42 lake sites in the Red Lake-Uchi Lake volcanic-sedimentary sequence. The chemical composition and nature of the gyttja samples, analysis of the trace metal content and its relation to the geology of the sample's environment, the analytical method involved in this technique, and the interpretation of data are described. (Hoyle-Vanderbilt)
W76-09129

SEDIMENT TRANSPORT, TURBIDITY, CHANNEL CONFIGURATION, AND POSSIBLE EFFECTS OF IMPOUNDMENT OF THE MAD RIVER, HUMBOLDT COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. M. Brown, III.
Available from the National Technical Information Service, Springfield, Va., 22161, as ADAO 23721, $4.50 printed copy, $2.25 microfiche. Water-Resources Investigations 26-75, December 1975. 63 p, 24 fig, 3 tab, 28 ref.

Descriptors: *Pre-impoundment, *Baseline studies, *Sediment transport, *Turbidity, *Environmental effects, *California, Model studies, Forecasting, Streamflow, Reservoirs, Sediments, Sediment discharge, Sediment distribution, Sediment load, Flood control, Regulated flow, Channel morphology.
Identifiers: *Mad River(Calif), Humboldt County(Calif).

The effects of a proposed U.S. Army, Corps of Engineers impoundment on the Mad River, Humboldt County, Calif., projected on the basis of a regulated flow model for the river, include the following: (1) The proposed impoundment would trap about 60 percent of the potential beach-forming sediments transported by the river under unregulated conditions. (2) Release flows from the impoundment would have the capacity to transport the expected inflow of sediment particles less than 2 mm in diameter for the reach of river downstream from the impoundment site. (3) Release flows from the proposed impoundment would have the capacity to transport about 130,000 ton/yr (120,000 t/yr) of bed material particles less than 3 in (76 mm) in diameter. The release flows would be expected to degrade the Mad River channel for a maximum of about 15 mi (24 km) downstream from the impoundment. Degradation of the Mad River channel would ultimately reduce the number and scale of preimpoundment lateral adjustments of the channel for the 15-mi (24-km) reach. Downstream from the initial 15-mi (24-km) reach, artificial adjustments of the channel and flood plain would be expected to override most release-flow effects of channel adjustments. (4) Turbidity of impoundment release flows could approximate preimpoundment turbidity for an average year. (Woodard-USGS)
W76-09136

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, MISSISSIPPI.
For primary bibliographic entry see Field 2L.
W76-09238

PHASE III: SEDIMENTOLOGY,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 2L.
W76-09241

THE EFFECT OF POLYACRYLAMIDE ON THE SETTLING OF THAMES MUD,
Atomic Energy Research Establishment, Harwell (England).
P. Biddle, T. V. Healy, and H. A. C. McKay.
Available from the National Technical Information Service, Springfield, Va 22161 as ARERE R7907, $4.00 in paper copy, $2.25 in microfiche. Report AERE-R7907, January 1975. 34 p, 22 fig, 2 tab, 10 ref.

Descriptors: *Settling velocity, *Mud, *Sea water, Laboratory tests, Dewatering, Suspended solids, Sedimentation, Rivers, Channeling, Sedimentology.
Identifiers: *Thames River(England), *Polyacrylamide.

Laboratory studies have been made of the settling of Thames mud in 20% sea water, with and without added PAM (polyacrylamide). Besides small-scale tests in 100 ml measuring cylinders, experiments were also made in columns several feet long. It was found that initial settling rates were greatly increased by addition of PAM, provided the mud suspension was only mildly agitated before settling; otherwise the PAM had no effect. Dewatering of a consolidating mud, and the bearing strength of a given degree of dewatering, were also increased by PAM. A striking feature in many of the experiments reported was channelled flow in both upward and downward directions during settling. (Sims-ISWS)
W76-09243

FINITE ELEMENT MODEL FOR COHESIVE SEDIMENT TRANSPORT,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-09264

A LIGHT WEIGHT CORER FOR SAMPLING SOFT SUBAQUEOUS DEPOSITS,
University Coll., Dublin (Ireland). Dept. of Zoology.
D. A. Murray.
Limnology and Oceanography, Vol. 21, No. 2, p 341-344, March 1976. 1 fig, 3 ref.

Descriptors: *Cores, *Sediments, *Sampling, Equipment, Bottom sediments, Lake sediments, Bottom sampling, Sedimentology, Limnology.
Identifiers: *Sediment corers.

A light-weight piston corer to obtain sedimentary cores up to 2.0 m long from soft subaqueous deposits was described. This corer, which may be used in any depth of water, uses cord rubber as the driving force to propel a core tube into the sediments. (Sims ISWS)
W76-09266

PREDICTION OF METEOROLOGICAL FACTORS RELATED TO BEACH EROSION AT NEW JERSEY AND LONG ISLAND, N.Y.,
National Weather Service, Garden City, N.Y. Eastern Region.
For primary bibliographic entry see Field 2L.
W76-09270

THE SEDIMENTS OF HIGH MOUNTAIN LAKE: STRUCTURE: NATURE AND POPULATIONS, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Hydrobiologie.
N. Giani, and C. Lucas.
Ann Limnol. 10(3), p 223-244, 1974.

Descriptors: *Lake sediments, Lakes, Sampling, Europe, Aquatic animals, Distribution patterns.
Identifiers: *France(Lake Port-Bielh), *Mountain lakeS, Pyrenees Mts.

The vertical variations of physical and faunistic components in cores of sediment samples from the profundal zone of Lake Port-Bielh (Central Pyrenees (France)) were analyzed. These sediments are particularly fine (100% less than 50 microns) and muddy. Their structure is formed by constant suspension and decantation as well as through the activity of benthic organisms. The nature of the sediment does not reflect the chemical composition of the surrounding basin, but is the product of an important movement of ions in solution. The maximal population density is found in the superficial layers but the vertical distribution varies among groups. The modalities of these distributions are described.--Copyright 1975, Biological Abstracts, Inc.
W76-09347

2K. Chemical Processes

THE TIME STABILITY OF DISSOLVED MERCURY IN WATER SAMPLES-I. LITERATURE REVIEW,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-08767

HYDROGEOLOGICAL CONDITIONS OF AL-HAMAD AREA, IRAQ,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
For primary bibliographic entry see Field 2F.
W76-09068

CHEMILUMINESCENT METHOD OF DETERMINING MANGANESE IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
B. I. Nabivanets, and N. A. Truba.
Gidrobiol Zh. 9(5); p 90-93, 1973.

Descriptors: *Manganese, *Analytical techniques, Natural waters, Methodology, *Photometry, Oxidation, Organic compounds, Pollutant identification.
Identifiers: *Chemiluminescent method.

The chemiluminescent method, based on the catalytic action of Mn in the oxidation reaction of luminol H2O2, was used for determination of Mn in natural waters. The total light emitted in the reaction was determined on the basis of the density of a photographic plate measured on a microphotometer. To determine the gross content of Mn in natural waters, preliminary oxidation of the organic compounds in them is necessary.--Copyright 1976, Biological Abstracts, Inc.
W76-09077

EXPEDIENT TECHNIQUE OF PERMANENT OBSERVATIONS -- AN INDISPENSABLE TOOL ON STUDYING THE LIMNOLOGY OF RIVERS,
For primary bibliographic entry see Field 7B.
W76-09106

THE FORMATION AND DETECTION OF METAL DISPERSION HALOS IN ORGANIC LAKE SEDIMENTS,
Geological Survey of Canada, Ottawa(Ontario).
For primary bibliographic entry see Field 2J.
W76-09129

GROUND-WATER DATA FOR SUNFLOWER COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09140

GROUND-WATER DATA FOR CARROLL COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09141

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN CHAMBERS, LIBERTY, AND MONTGOMERY COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-09144

WATER RESOURCES OF WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-09149

METHODS AND INSTRUMENTS FOR MONITORING SURFACE WATER AND WASTE WATER QUALITY (VERFAHREN UND GERAETE ZUR UEBERWACHUNG DER OBERFLAECHEN- UND ABWASSERQUALITAET).
For primary bibliographic entry see Field 5A.
W76-09192

ANALYTICAL CHEMISTRY IN WATER POLLUTION CONTROL,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5A.
W76-09221

PHOSPHATE DETERMINATIONS IN WATERS USING AN ANION EXCHANGE RESIN,
Missouri Agricultural Experimental Station, Columbia.
For primary bibliographic entry see Field 5A.
W76-09370

CHEMICAL ANALYSES OF CAMPBELL ISLAND FRESH WATER,
Auckland Univ. (New Zealand). Marine Research Lab.
F. J. Taylor.
N Z J Mar Freshwater Res. 8(2); p 389-402, 1974.

Descriptors: *Chemical analysis, Sampling, *Freshwater, Ions, Calcium, Potassium, Magnesium, Salts, Sea water.
Identifiers: *New Zealand, *Campbell Island(NZ).

Ten samples of freshwater from Campbell Island (New Zealand) were analyzed for their main ionic constituents. All show a preponderance of sodium and chloride derived from sea water. K, Ca and Mg gave slightly higher concentrations than would be expected if derived solely from sea water. The excess K is derived from the underlying rocks and soil, and the excess Ca and Mg from the sea by fractionation into salt particles.--Copyright 1975, Biological Abstracts, Inc.
W76-09395

2L. Estuaries

MERCURY CONCENTRATIONS IN SPRING AND FALL ZOOPLANKTON OF THE ESTUARY OF THE AROSA RIVER, (IN SPANISH),
Instituto Espanol de Oceanografia, Madrid (Spain). Central Laboratories.
For primary bibliographic entry see Field 5C.
W76-08768

THE EFFECT OF FERTILIZATION ON THE SPECIES COMPOSITION OF SALT MARSH DIATOMS,
Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W76-08774

MERCURY CONTENT OF BIOTA IN COASTAL WATERS IN HAWAII,
Hawaii Univ., Honolulu. Pacific Biomedical Research Center.
For primary bibliographic entry see Field 5C.
W76-08776

HYPERHALINE ENVIRONMENTS OF THE COMPLEX OF BAGES-SIGEAN, THE LAGOON OF THE DOUL, (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
H. Boutiere.
Vie Milieu Ser B Oceanogr. 24(2), p.355-377, 1974. (Engl. summ.).

Descriptors: *Ponds, *Lagoons, Europe, *Hydrology, *Salinity, Inorganic compounds, *Halides, Temperature.
Identifiers: Bages-Sigean, Doul pond, *France.

In the lagoon system of Bages-Sigean, permanent hyperhaline waters are almost exclusive to the pond of the Doul near Peyriac-de-Mer (France). A general description of this pond is given; its hydrology is characterized by a high salinity (50-60%), high summer temperature (30 C) and the absence of stratification. The recent history of the pond is tentatively reconstructed from the remanent salinities of the mud. The nutritional elements come from the western threshold where the only communication with the lagoon of Sigean is located.--Copyright 1976, Biological Abstracts, Inc.
W76-08784

INSHORE EFFECT OF POLLUTION ON THE BIOTA OF THE BALTIC, SOUTHERN FINLAND,
For primary bibliographic entry see Field 5C.
W76-08791

ALGAL GROWTH POTENTIAL OF SIX NORWEGIAN WATERS RECEIVING PRIMARY, SECONDARY AND TERTIARY SEWAGE EFFLUENTS,
For primary bibliographic entry see Field 5C.
W76-08794

WIND-DRIVEN FLOW OF WATER INFLUENCED BY A CANOPY,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2H.
W76-08801

AREAL AND SEASONAL VARIATIONS IN THE CHEMISTRY OF SUSPENDED PARTICULATE MATTER IN A DEEP WATER FJORD,
Endinburgh Univ. (Scotland). Grant Inst. of Geology.
N. B. Price, and J. M. Skei.
Estuarine and Coastal Marine Science, Vol. 3, No. 3, p 349-369, 1975. 8 fig., 3 tab., 30 ref.

Descriptors: *Mineralogy, *Chemical property, *Suspended solids, *Fjords, Distribution, Aluminum, Silica, Calcium, Magnesium, Manganese, Potassium, Phosphorus, Sulfur, Titanium, Zinc, Lead, Sea water, Geochemistry, Estuaries, Bottom sediments.
Identifiers: *Hardangerfjorden(Norway), Marine waters.

To study variations in origin and behavior of elements associated with organic matter, areal and seasonal studies were made of silica, aluminum, titanium, calcium, magnesium, iron, manganese, potassium, phosphorus, sulfur, zinc, and lead in suspended particulate matter in water profiles of Hardangerfjorden, Norway. Attempts were made to partition these elements between terrigenous, skeletal, organic, and authogenic constituents. Elements denoting terrigenous matter, especially aluminum, were situated at or above the pycnocline during high river runoff periods. When runoff was minimal in spring and upper waters essentially isohaline, aluminosilicates were in the maximum biological productivity zone which had high particulate sulfur and phosphorus and may have been associated with plankton. Calcium and biogenous silica were high in upper waters. Measurements of organic matter decomposition during drying and storage showed that element losses were higher in upper waters than in deeper waters. Decreases in phosphorus, manganese, zinc, and lead between surface and underlying waters suggested that these elements could release rapidly in euphotic zone waters and only small amounts of these organically bound elements would survive fallout to the seabed. Particulate aluminum was uniformly distributed in deeper waters suggesting little or no recent esuspension of bottom sediment aluminosilicates had occurred. Manganese concentration increased below 400-450 meters and exceeded aluminum concentrations. (Buchanan-Davidson--Wisconsin)
W76-08829

TRAPPING OF HEAT IN SILL FJORDS,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
For primary bibliographic entry see Field 5C.
W76-08856

HEATING OF ESTUARINE AND COASTAL WATERS BY NUCLEAR POWER STATIONS IN FRANCE, (ECHAUFFEMENT DES EAUX PAR DES CENTRALES NUCLEAIRES EN ESTUAIRE ET BORD DE MER EN FRANCE),
Laboratoire National d'Hydraulique, Chatou (France).
For primary bibliographic entry see Field 5B.
W76-08859

SEASONAL FEATURE OF THERMAL ABATEMENT OF SHORELINE DISCHARGES AT NUCLEAR SITES,
Bhabha Atomic Research Centre, Bombay (India). Environmental Studies Section.
For primary bibliographic entry see Field 5G.
W76-08862

DEVELOPMENT AND APPLICATION OF CRITERIA FOR MARINE COOLING WATERS,
Environmental Research Lab., Narragansett, R. I.
For primary bibliographic entry see Field 5G.
W76-08885

A STUDY OF THE INFRALITTORAL POPULATION OF THE COAST OF ROUSSILLON: III. SPATIAL AND SEASONAL VARIATIONS, (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
J. M. Amouroux.
Vie Milieu Ser B Oceanogr. 24(2), p 321-354, Illus, 1974.

Descriptors: Europe, Seasonal, *Aquatic populations, Density, Spatial distribution.
Identifiers: *France, Infralittoral populations, Rousillon.

The densities of populations in relation to the depth, to the distance from the coast (France) and to the season are given, as well as the indices of diversity at different bathymetric levels. The total weight and the weight per group, in relation to the depth and to the season, were also recorded. The seasonal numerical variations of the most interesting or abundant species from these bottoms are described.--Copyright 1976, Biological Abstracts, Inc.
W76-08898

ENVIRONMENTAL CONDITIONS AND PRODUCTIVITY IN THE TERMINOS LAGOON, CAMPECHE, MEXICO, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
J. R. Carvajal.
Lagena. 31, p 35-38, 1973.

Descriptors: *Lagoons, *Mexico, Seasonal, Temperature, Humidity, Salinity, Shrimp, Oysters, *Aquatic life, *Productivity.
Identifiers: Campeche, Centropomus-undecimalis, Crassostrea-virginica, Diplantherawrightii, Penaeus-setiferus, Terminos Lagoon, Thalassia-testudinum, Snook.

The lagoon can be separated into 2 zones, one characterized by clear water and abundant, submerged monocotyledons including Thalassia testudinum and Diplanthera whightii, and the other a turbid zone almost devoid of underwater plant life. Data on seasonal variations in air temperature and humidity, salinity, depth and clearness of water are provided. Shrimp (Penaeus setiferus), oysters (Crassostrea virginica) and snook (Centropomus undecimalis) are most important to the fishing industry.--Copyright 1976, Biological Abstracts, Inc.
W76-08900

POTENTIAL EFFECTS OF OIL DRILLING AND DUMPING ACTIVITIES ON MARINE BIOTA,
North Carolina Univ. at Wilmington. Inst. of Marine Biomedical Research.
For primary bibliographic entry see Field 5C.
W76-08907

ENVIRONMENTAL IMPLICATIONS OF SEDIMENT BULK ANALYSIS TECHNIQUES FOR TRACE METALS IN OFFSHORE WELL-DRILLING OPERATIONS,
Gulf South Research Inst., New Orleans, La. Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W76-08908

EFFECTS OF DRILLING OPERATIONS ON THE MARINE ENVIRONMENT,
Exxon Co., Houston, Tex.
For primary bibliographic entry see Field 5G.
W76-08909

DISPOSAL OF DRILLING FLUIDS AND DRILLED-UP SOLIDS IN OFFSHORE DRILLING OPERATIONS,
Texas A and M Univ., College Station. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 5D.
W76-08915

NOTES ON THE IMPORTANCE OF DISSOLVED AND PARTICULATE ORGANIC MATTER IN MARINE FOOD CHAINS, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-08916

RESPONSIBILITIES OF OFFSHORE DRILLING REGULATIONS,
Geological Survey, Metairie, La.
For primary bibliographic entry see Field 5G.
W76-08918

REGULATION OF ONSHORE AND OFFSHORE OIL FIELD WASTE DISPOSAL,
Texas Railroad Commission, Austin, Tex.
For primary bibliographic entry see Field 5E.
W76-08919

RESEARCH ON THE MARINE FOOD CHAIN.
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08935

PHYSIOLOGICAL ECOLOGY OF GONYAULAX POLYEDRA, A RED WATER DINOFLAGELLATE OFF SOUTHERN CALIFORNIA,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08936

TWO BLOOMS OF GYMNODINIUM SPLENDENS (LEBOUR). A LARGE NAKED DINOFLAGELLATE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08937

PHOSPHATE UTILIZATION BY AN OCEANIC DIATOM IN PHOSPHORUS-LIMITED CHEMOSTAT CULTURE AND IN THE OLIGOTROPHIC WATERS OF THE CENTRAL NORTH PACIFIC,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08938

DYNAMICS OF PHOSPHORUS CYCLING IN THE EUPHOTIC WATERS OF THE CENTRAL NORTH PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08939

PHOTOSYNTHETIC MEASUREMENTS IN THE CENTRAL NORTH PACIFIC: THE DARK LOSS OF CARBON IN 24-HOUR INCUBATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08940

SILICIC ACID UPTAKE AND INCORPORATION BY NATURAL MARINE PHYTOPLANKTON POPULATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08941

PRIMARY PRODUCTION AND THE FACTORS CONTROLLING PHYTOPLANKTON GROWTH IN THE ANTARCTIC SEAS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08942

DISTRIBUTION, MORPHOMETRY, AND SEASONAL BIOLOGY OF THE PLANKTONIC COPEPODS, NEOCALANUS ROBUSTIOR AND N. GRACILIS, IN THE PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08951

COCCOLITH SEDIMENTATION BY FECAL PELLETS: LABORATORY EXPERIMENTS AND FIELD OBSERVATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08954

AMINO ACID UPTAKE AND RESPIRATION BY MARINE HETEROTROPHS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08955

IMPROVED METHODOLOGY FOR ATP DETERMINATION IN MARINE ENVIRONMENTS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08958

COPEPOD SLICK IN THE NORTHWEST PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08959

CRUISE SUMMARY, A. SOUTHERN CALIFORNIA BIGHT STUDIES (SCBS).
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08960

CRUISE SUMMARY, B. GULF OF CALIFORNIA PHOTOBIOLOGY CRUISE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08961

PUBLIC OPINION AND THE ENVIRONMENT: ECOLOGY, THE COASTAL ZONE, AND PUBLIC POLICY,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 6G.
W76-09035

INVESTIGATIONS ON THE PHYTOPLANKTON AND SOME ENVIRONMENTAL PARAMETERS OF THE SHATTAL-ARAB (IRAQ), (IN GERMAN)
Rostock Univ. (East Germany). Dept. of Biology.
V. Kell, and A. H. Saad.
Int Rev Gesamten Hydrobiol. 60(3), p 409-421, 1975.

Descriptors: *Phytoplankton, Environment, Asia, Cyanophyta, *Algae, *Diatoms, Temperature, Dissolved oxygen, Chlorides, Chlorophyta, *Marine algae, *Estuaries.
Identifiers: *Iraq(Shatt-Al-Arab), *Tigris-Euphrates estuaries.

Samples of phytoplankton were taken from the Euphrates and Tigris estuaries (Shatt al-Arab) in April 1974 and investigated with the inverted microscope. Among 226 spp. identified in the samples, 96 were of marine origin. The percentage of diatoms in the total numbers of cells from all stations was 68%. The planktonic green algae comprised 195; the blue-greens 13%. The number of marine species continuously increased in the longitudinal axis of the 139 km section considered. The phytoplankton were compared to the gradients of some environmental variabLe (temperature, transparency, dissolved 02, C1). Regular longitudinal or vertical differences of these parameters were not observed.--Copyright 1976, Biological Abstracts, Inc.
W76-09084

INTERACTIVE EFFECTS OF PREDATION PRESSURE AND INSECTICIDE (TEMEFOS) TOXICITY ON POPULATIONS OF THE MARSH FIDDLER CRAB UCA PUGNAX,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Entomology and Economic Zoology.
For primary bibliographic entry see Field 5C.
W76-09114

FIELD EVALUATION OF BENZOPYRENE HYDROXYLASE INDUCTION AS A MONITOR FOR MARINE PETROLEUM POLLUTION,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
For primary bibliographic entry see Field 5A.
W76-09116

RESPONSES OF ARCTIC MARINE CRUSTACEANS TO CRUDE OIL AND OIL-TAINTED FOOD,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
For primary bibliographic entry see Field 5C.
W76-09123

ACCLIMATION OF RAINBOW TROUT TO SEA WATER,
Dunstaffnage Marine Research Lab., Oban (Scotland).
P. J. Landless.
Aquaculture, Vol. 7, p 173-179, 1976. 3 fig. 15 ref.

Descriptors: *Aquaculture, *Salinity, *Sea water, *Fish farming, *Rainbow trout, *Mortality, *Juvenile fish, Aquatic productivity, Fish hatcheries, Fish management, Sport fish, Salmonids, Anadromous fish, Fish physiology, Methodology, Fry.
Identifiers: *Acclimation, *Osmotic stress.

The ability of rainbow trout to acclimate to sea water was evaluated in both a recirculation experiment which allowed gradual increase in salinity, and or direct transfer from fresh to sea water. Mortality occurred in fish when salinity was increased above 24.2 ppt, but not below, in the recirculating experiments. Similar results were observed in the sea cages. This allows the advantageous transfer of young rainbow trout to seawater of reduced salinity at a young age. Rainbow trout of 15 g held in sea cages at a salinity of 22 ppt had mortality levels of 1 to 8%. (Katz)
W76-09125

RESILIENCE OF A ROCKY INTERTIDAL FISH COMMUNITY IN A PHYSICALLY UNSTABLE ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 5C.
W76-09126

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1974 IN DADE COUNTY FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-09135

SEDIMENT TRANSPORT, TURBIDITY, CHANNEL CONFIGURATION, AND POSSIBLE EFFECTS OF IMPOUNDMENT OF THE MAD RIVER, HUMBOLDT COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-09136

MACROSCOPIC BENTHIC FAUNA OF THREE TIDAL CREEKS ADJOINING THE RHODE RIVER, MARYLAND,
Geological Survey, Edgewater, Md.
For primary bibliographic entry see Field 5B.
W76-09143

A NEW STRATIFIED PLANKTON SAMPLER FOR SHALLOW WATERS, (IN SPANISH),
La Plata Univ. (Argentina). Instituto del Museo.
For primary bibliographic entry see Field 7B.
W76-09193

IDENTIFICATION OF NITROGEN AS A GROWTH-LIMITING NUTRIENT IN WASTEWATERS AND COASTAL MARINE WATERS THROUGH CONTINUOUS CULTURE ALGAL ASSAYS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-09195

PHOTOGRAPHIC ANALYSIS OF WATER QUALITY CHANGES,
Georgia Univ., Athens.
For primary bibliographic entry see Field 5A.
W76-09199

POSSIBLE INFLUENCE OF ATMOSPHERIC TRANSPORT ON THE TOTAL MERCURY CONTENT OF SOUTHEASTERN ATLANTIC CONTINENTAL SHELF SURFACE WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W76-09224

THE REPLICATION OF BIOLOGICAL EVENTS IN ENCLOSED WATER COLUMNS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-09226

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, MISSISSIPPI.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-73 11269, $11.75 in paper copy, $2.25 in microfiche. Gulf Coast Research Laboratory, Ocean Springs, Mississippi, 1973. 435 p. Christmas, J.Y., editor.

Descriptors: *Mississippi, *Estuaries, *Coasts, Bays, Rivers, Tidal waters, Benthos, Vegetation, Nutrients, Salinity, Water quality, Sedimentation, Sediments, Sedimentology, Barrier islands, Beaches, Biology, Aquatic life, Zooplankton, Aquatic plants, Fish, Fisheries, Sampling, Hydrology, Oceanography.
Identifiers: *Mississippi Sound.

That portion of the Gulf of Mexico coast within the State of Mississippi was studied in considerable detail. The results of these studies were reported by papers for each of the four phases of the

study: (1) Area Description, (2) Hydrology, (3) Sedimentology, and (4) Biology. The biology phase included papers under these headings: (1) The Marshes of Mississippi, (2) The Distribution of Certain Submerged Plants in Mississippi and Adjacent Waters, (3) Estuarine Zooplankton, Mississippi, (4) Estuarine Invertebrates, Mississippi, and (5) Estuarine Vertebrates, Mississippi. (See W76-09239 thru W76-09242) (Sims-ISWS)
W76-09238

PHASE I: AREA DESCRIPTION,
Gulf Coast Research Lab., Ocean Springs, Miss. Fisheries Section.
J. Y. Christmas.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi; Mississippi Marine Conservation Commission, Gulf Coast Research Laboratory, Ocean Springs, Mississippi, p 1-71, 1973. 16 fig, 32 tab, 125 ref.

Descriptors: *Mississippi, *Coasts, *Estuaries, Bays, Tidal waters, Geology, Environment, Estuarine environment, Benthos, Economics, Land use, Fisheries, Commercial fishing, Sport fishing, Pollutants, Fishkill, Wetlands, Water pollution, Tourism, Vegetation, Surface waters, Climatology.
Identifiers: *Mississippi Sound.

Data for the Area Description Phase of the Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi were compiled and discussed. Extreme variations in many environmental factors were noted. Through most of its history, development of the Mississippi coastal area has depended on the harvesting of renewable resources from the forest and the sea, water transportation and the aesthetic attraction for visitors. In recent years intensive industrialization and large government installations have provided for phenomenal population and economic growth in a narrow strip along the coast. Realization of planned developments will create a single megalopolis extending across the state. Important segments of the coastal economy, especially the commercial fisheries and a large part of the tourist industry, and the continued wellbeing of the people depend on continued high production of renewable marine resources. The environment in most of the study area is still healthy. Domestic and industrial pollution have exceeded the assimilative capacity of some estuarine areas. Plans for abatement can provide for satisfactory recovery of most of these, at present, grossly polluted areas. It is unlikely that even fish and wildlife criteria, let alone recreation or shellfish, can be met in Mississippi estuaries if projected population and industrial developments occur without improved treatment technology. (See also W76-09238) (Sims-ISWS)
W76-09239

PHASE II: HYDROLOGY,
Gulf Coast Research Lab., Ocean Springs, Miss. Fisheries Section.
J. Y. Christmas, and C. K. Eleuterius.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi; Mississippi Marine Conservation Commission, Gulf Coast Research Laboratory, Ocean Springs, Mississippi, p 73-121, 1973. 26 fig, 5 tab, 15 ref, 1 append.

Descriptors: *Mississippi, *Estuaries, *Hydrology, *Water quality, Streamflow, Rivers, Bays, Sampling, On-site data collections, Salinity, Temperature, Nitrates, Phosphates, Nutrients, Dissolved oxygen, Hydrogen ion concentration, Oceanography.
Identifiers: *Mississippi Sound.

Salinity, temperature, pH and dissolved oxygen concentration were measured at 5-foot intervals through the water column at 51 stations in Mississippi inshore estuarine waters. Micronutrient concentrations were determined from surface and bottom water samples. Monthly stream flow was documented. Sampling was accomplished monthly or oftener. Salinity was closely correlated with stream flow, providing drastic seasonal and areal variations. Temperature followed a seasonal pattern with spring and fall reversal of offshore clines. Saltwater wedges were described. Average isohalines and isotherms for Mississippi Sound were constructed. General micronutrient levels in the study area were established. Concentrations were closely related to adjacent human population density. (See also W76-09238) (Sims-ISWS)
W76-09240

PHASE III: SEDIMENTOLOGY,
Gulf Coast Research Lab., Ocean Springs, Miss.
E. G. Otvos.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi; Mississippi Marine Conservation Commission, Gulf Coast Research Laboratory, Ocean Springs, Mississippi, p 123-137, 1973. 3 fig, 1 tab, 15 ref.

Descriptors: *Mississippi, *Estuaries, *Coasts, *Sedimentology, Sediments, Sedimentation, Erosion, Bays, Rivers, Sands, Clays, Gravels, Particle size, Barrier islands, Beaches.
Identifiers: *Mississippi Sound.

The source of sediments in Mississippi coastal waters lies in the Eastern Gulf Province. Clayey silty sediments from the rivers settle partially in the embayments, reach into Mississippi Sound and eventually the open Gulf of Mexico. Most of the barrier island sediments are supplied by the westward littoral drift which originates on the mainland east of Mobile Point. Orthoquartzitic sands in the study area include a suite of heavy minerals typical of the Eastern Gulf Province. Clay minerals are principally kaolinite with a steady westward increase in montmorillonite + illite/kaolinite ratios caused by the Mississippi River deposits at the western end of Mississippi Sound. Size distribution patterns showed that silt and clay muds dominate much of the central portion of Mississippi Sound, grading into fine and very fine sands in several areas. Mainland beach sands west of the Pascagoula River and along the barrier island chain are medium and coarse. Minor seasonal variations were noted and accounted for. Natural phenomena continually alter the distribution patterns of bottom sediments and the included fauna. Major abrupt changes occur when storms, particularly hurricanes, reach the coast. Channel dredging and other engineering operations dislocate considerable quantities of bottom sediment. Numerous spoil areas have been altered drastically. (See also W76-09238) (Sims-ISWS)
W76-09241

PHASE IV: BIOLOGY,
Gulf Coast Research Lab., Ocean Springs. Miss. Fisheries Section.
J. Y. Christmas, L. N. Eleuterius, W. W. Langley, H. M. Perry, and R. S. Waller.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi; Mississippi Marine Conservation Commission, Gulf Coast Research Laboratory, Ocean Springs, Mississippi, p 139-434, 1973. 58 fig, 115 tab, 444 ref, 1 append.

Descriptors: *Mississippi, *Biology, *Estuaries, *Marshes, Coasts, Barrier islands, Wetlands, Plant populations, Aquatic plants, Zooplankton, Aquatic life, Invertebrates, Fish, Sampling, On-site investigations, Estuarine environment.
Identifiers: Vertebrates.

The results of the biology phase of the Cooperative Gulf of Mexico Estuarine Inventory and Study have been presented in studies of the emergent and submerged flora, the zooplankton, the vertebrate fauna, the invertebrate fauna and commercial fisheries found in the study area. Over 300 plant species, at least 100 zooplankters, 251 fishes, several other vertebrates and 180 invertebrate species were recognized. Data on the areal and seasonal distribution, associated environmental factors, life history, growth, migrations and relative abundance of many plants and animals have been presented. Species composition of commercial fishery landings were compiled from statistical data. Historical fisheries data showing the number of fisherman, craft and gear employed in Mississippi commercial fisheries were tabulated for selected years from 1930 through 1965. Relatively small areas of the Mississippi estuarine area have been seriously damaged by pollution. Continued and expanded fisheries production and utilization of unexploited resources were possible if environmental deterioration was stopped and existing conditions in some areas improved. (See also W76-09238) (Sims-ISWS)
W76-09242

FINITE ELEMENT MODEL FOR COHESIVE SEDIMENT TRANSPORT,
California Univ., Davis. Dept. of Civil Engineering.
R. Ariathurai, and R. B. Krone.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11987, p 323-338, March 1976. 7 fig, 1 tab, 17 ref, 2 append.

Descriptors: *Sediment transport, *Cohesive soils, *Estuaries, *Finite element analysis, *Diffusion, Salinity, Clays, Flocculation, Model studies, Numerical analysis, Settling velocity, *Mathematical models.
Identifiers: *Cohesive sediment transport, Aggregation, Galerkin method.

A mathematical model that simulates erosion, transport and deposition of cohesive sediments in estuaries was developed. Due to the relatively low flow velocities prevalent in most rivers where they enter estuaries, a large portion of the total sediment load is usually composed of suspended silt and clay. The mode of cohesive sediment transport and the factors affecting the resistance of a cohesive bed to erosion by flowing water were explained. The equations governing the cohesive sediment transport were solved by the finite element method using the Galerkin formulation. The domain was subdivided into a series of triangular elements in which a quadratic approximation was made for the suspended sediment concentration. Continuing aggregation was accounted for by specifying appropriate settling velocities in each element for each time step. A table of salinities at which each of the three main clay types becomes cohesive has been included. This is useful in predicting potential aggregation as suspended sediments move from fresh to saline waters. (Singh-ISWS)
W76-09264

AN AUTOMATIC RELEASE INSTRUMENT WITH UNDERWATER BUOY FOR MARKING OF FIELD EQUIPMENT,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
For primary bibliographic entry see Field 7B.
W76-09268

PREDICTION OF METEOROLOGICAL FACTORS RELATED TO BEACH EROSION AT NEW JERSEY AND LONG ISLAND, N.Y.,
National Weather Service, Garden City, N.Y. Eastern Region.
S. E. Wasserman, and D. B. Gilhousen.
Journal of Applied Meteorology, Vol. 15, No. 4, p 313-318, April 1976. 3 fig, 1 tab, 5 ref.

Descriptors: *Beach erosion, *Meteorology, *New Jersey, *New York, *Atlantic Ocean, Winds, Wind velocity, Erosion, Beaches, Ocean waves, Atmospheric pressure, Meteorological data, Storms, Shores, Oceanography.
Identifiers: *Long Island(NY).

Prediction of meteorological factors related to storm-caused beach erosion were discussed. Composite sea level pressure maps were presented for beach erosion events that occurred on the New Jersey and Long Island, New York, coasts. Significant meteorological conditions related to beach erosion are: (1) an angle between the predominant wind direction on the eroding beach and the orientation of the smoothed coastline of between 0 and 20 deg for Long Island, and between 20 and 40 deg for New Jersey; (2) a setup period of at least 18 h during which coastal winds do not vary more than 20 deg from the observed predominant wind direction; (3) at some time during the setup period the wind direction upstream for a distance at least 550 km does not vary more than 20 deg from the coastal wind direction; and (4) the upwind surface pressure gradient at some time during the setup period attains a value of at least 4 mb/200 km. (Sims - ISWS)
W76-09270

PHYTOPLANKTON DISTRIBUTION IN THE VICINITY OF THE PERU CURRENT NEAR 8 DEGREES S. LATITUDE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5B.
W76-09283

MINERAL RESOURCE MANAGEMENT OF THE OUTER CONTINENTAL SHELF.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6G.
W76-09306

ECOLOGICAL EFFECTS OF OFFSHORE CONSTRUCTION,
Marine Science Inst., Bayou La Batre, Ala.
For primary bibliographic entry see Field 6G.
W76-09307

REPORT ON THE HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE SPOIL DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5E.
W76-09309

FEATURES OF VARIOUS OFFSHORE STRUCTURES,
Raymond Technical Facilities, Inc., New York.
For primary bibliographic entry see Field 8A.
W76-09311

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 11-12, 1975, SAVANNAH, GEORGIA.
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
For primary bibliographic entry see Field 5G.
W76-09329

THE OCS FORGOTTEN LAND: TERRITORIAL SEA, NEARSHORE, AND ESTUARY,
Florida Dept. of Administration, Tallahassee. Div. of State Planning.
For primary bibliographic entry see Field 5G.
W76-09330

OFFSHORE PETROLEUM DRILLING AND PRODUCTION,
Exxon Co., New Orleans, La. Southeastern Div.
For primary bibliographic entry see Field 5G.
W76-09332

SIXTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 6-8, 1974, HOUSTON, TEXAS. PREPRINTS, VOLUME II,
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09333

BEACH-OFFSHORE DREDGING: SOME ENVIRONMENTAL CONSEQUENCES,
London Univ. (England).
For primary bibliographic entry see Field 5G.
W76-09335

ENVIRONMENTAL STUDIES FOR MAJOR OFFSHORE DEVELOPMENTS,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09336

APPLICATION OF GROUND-WATER FLOW THEORY TO A SUBSURFACE OIL SPILL,
Geological Survey, Menlo Park, Calif. Engineering Geology Branch.
T. L. Holzer.
Ground Water, Vol. 14, No. 3, p 138-145, May-June, 1976. 7 fig, 9 ref.

Descriptors: *Water pollution sources, Oil, *Subsurface flow, *Subsurface drainage, *Groundwater, Oil-water interfaces, Oil reservoirs, Water table, Tile drains, Resistivity.
Identifiers: *Hantush's theory, *Oil storage tanks, *Subsurface oil spill, Flow system analysis, Field investigation.

Application of Hantush's (1968) theory for the movement of a fresh-water lens in an unconsolidated saline aquifer to the movement of an oil lens in fresh water made it possible to identify the probable source area of an oil spill of unknown origin. The theory predicted that too much time had elapsed from the first detection of oil at the surface to the collection of subsurface information to make it feasible to speculate on the precise nature of the spill event. Quantitative analysis of the flow system helped in the selection of the appropriate collection system, because a lengthy cleanup period was indicated by the analysis. An attempt to delineate the subsurface extent of the oil spill with an electrical resistivity survey was only slightly successful. (Heiss-NWWA)
W76-09350

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME II.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09371

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME III.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09374

MASS TRANSPORT AND DISPERSION OFF A TIDAL INLET,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W76-09381

THE OFFSHORE ECOLOGY INVESTIGATION,
Gulf Universities Research Consortium, Gulfport, Miss.
For primary bibliographic entry see Field 5G.
W76-09382

NEW YORK ALTERNATIVE DUMPSITE ASSESSMENT - RECONNAISSANCE STUDY OF SURFICIAL SEDIMENTS,
National Oceanic and Atmospheric Administration, New York. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5G.
W76-09383

GEOTECHNICAL ASPECTS OF ROCK BORROW FOR LARGE BREAKWATERS,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09386

EFFECT OF OFFSHORE STRUCTURES ON SHORELINE EVOLUTION, ATLANTIC GENERATING STATION,
Army Engineers Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5G.
W76-09388

PHOTOOXIDATION AS A FACTOR IN THE ENVIRONMENTAL DISPERSAL OF CURDE OIL,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). Exploration and Production Research Div.
For primary bibliographic entry see Field 5B.
W76-09389

WILSON INLET: A SEASONALLY CLOSED WESTERN AUSTRALIAN SOUTH COAST ESTUARY,
Western Australia Dept. of Fisheries and Fauna, Perth.
R. C. J. Lenanton.
West Aust Dep Fish Fauna Rep. 14, p 1-32, 1974.

Descriptors: *Estuaries, *Australia, Coasts, Fish, Seasonal, Estuarine environment.
Identifiers: *Wilson Inlet(Australia).

Considerable conflict has existed for many years between professional fishing, recreational usage and development in the west and south coast estuaries of Western Australia. One of the areas where intense conflict exists is Wilson Inlet. A preliminary description of the Wilson Inlet environment is presented, the history of netting closures in the Inlet recorded and the history of the sand bar openings and their effect on the estuarine environment discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-09390

COMPARISON OF TWO METHODS FOR DETERMINATION OF PRIMARY PRODUCTIVITY ON COASTAL WATERS OF THE GULF OF MEXICO, (IN SPANISH),
Universidad Nacional Autonoma de Mexico City. Instituto de Biologia.
For primary bibliographic entry see Field 5A.
W76-09391

DEGRADATION OF BUNKER C OIL UNDER DIFFERENT COASTAL ENVIRONMENTS OF CHEDABUCTO BAY, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia)
For primary bibliographic entry see Field 5B.
W76-09394

CHEMICAL ANALYSES OF CAMPBELL ISLAND FRESH WATER,
Auckland Univ. (New Zealand). Marine Research Lab.
For primary bibliographic entry see Field 2K.
W76-09395

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DIRECT CONTACT MULTI-STAGE FLASH DESALINATION,
Department of the Interior, Washington, D. C. Office of the Secretary.
A. L. Kohl, T. T. Shimazaki, and W. B. Suratt.
U.S. Patent No. 3,948,734, 6 p, 4 fig, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 311, April 6, 1976.

Descriptors: *Patents, *Desalination, *Water purification, *Waste water treatment, *Desalination processes, *Desalination apparatus, Condensation, Separation techniques, Potable water, Flash distillation.

The invention provides a relatively cool and pure liquid, which is used to directly condense vapors flashed off an impure liquid in stages in which pure liquid and condensate flows from stage to stage by gravity and contacts vapor in each stage in a crossflow 'rain' type spray zone. The direct contact condensation stages are grouped in a module containing 2 to 10 condensation chambers and condensate flows through each module by gravity and then is pumped to the top of the next module. This arrangements keeps both the module height and number of pumps within reasonable limits. The functions of brine flashing and steam condensation are separated. The condensation chambers in each module are located vertically above the brine flashing chambers, and at progressively lower elevations in the direction of condensate flow to permit gravity flow of condensate between chambers. The water vapor flows upward through a vapor duct to the corresponding condensation chamber where it flows through in crossflow relationship to a 'rain' of cooler falling water streams or droplets and is thereby condensed, raising the temperature of the total condensate stream. The flashing water is at its boiling point and substantially pure steam is evolved upon exposure to a chamber of reduced pressure and is subsequently condensed. (Sinha - OEIS)
W76-09052

PROCESS FOR ELECTROLYSIS OF BRINE,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y. (Assignee).
For primary bibliographic entry see Field 5D.
W76-09053

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3E.
W76-09065

REVERSE OSMOSIS SEPARATION OF POLAR ORGANIC COMPOUNDS IN AQUEOUS SOLUTION,
Illinois Univ. At Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-09165

WATER SUPPLY AND SEWAGE TREATMENT IN ARID AREAS,
For primary bibliographic entry see Field 5D.
W76-09166

REVERSE OSMOSIS TODAY,
For primary bibliographic entry see Field 5D.
W76-09169

3B. Water Yield Improvement

THE AVAILABILITY OF GROUND WATER FOR IRRIGATION IN THE RICE LAKE-EAU CLAIRE AREA, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 4B.
W76-09348

WATER FOR THE IVORY COAST.
For primary bibliographic entry see Field 8C.
W76-09355

3C. Use Of Water Of Impaired Quality

LEACHING LOSSES OF AMMONIUM AND NITRATE IN THE RECLAMATION OF SAND SPOILS IN CORNWALL,
Liverpool Univ. (England). Dept. of Botany.
W. S. Dancer.
Journal of Environmental Quality, Vol. 4, No. 4, p 499-504, October-December 1975. 4 fig, 3 tab, 15 ref.

Descriptors: *Leaching, *Ammonium compounds, *Ammonium salts, Fertilization, *Nitrates, *Land relamation, Nitrogen, Plant growth, Sands.
Identifiers: *Sand spoils.

Reclamation studies on sand spoils in Cornwall have shown a difficulty in maintaining adequate levels of nitrogen for plant growth. Information is presented to show that the movement of N03(-) and NH4(+) is highly correlated with rainfall (r=0.89 and 0.92, respectively). Nitrate leaching is more serious than NH4(+) leaching and calculations show that more than 98% of the N03(-) fertilizer applied to bare sand spoil will be leached beyond the surface 20 cm with an average month of summer rainfall (9.7 cm). Maximum inorganic-N fertilizer recoveries of 40 kg/ha are predicted for grass swards established on spoils flattened by earth-moving equipment, while recoveries less 20 kg N/ha are likely on steeply sloping sand heaps. (SKogerbor-Colorado State)
W76-08760

SOLUBLE SALTS AND NITRATE DISTRIBUTION IN IRRIGATED LETTUCE BEDS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
K. B. Hummadi, D. D. Fangmeir, and T. C. Tucker.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 4, p 686-689, July-August 1975. 6 ref, 2 tab, 9 ref.

Descriptors: *Irrigation, *Irrigation effects, *Salinity, *Saline soils, *Lettuce, *Nitrates, Sprinkler irrigation, Furrow irrigation, Irrigation practices, Salts, Salt tolerance, Distribution.

The salt and nitrate content was measured in lettuce beds irrigated by sprinkler, furrow and combined methods. Salt and nitrate content was determined by depth in the center, near both sides of the bed and in the furrow between beds. Furrow irrigation continually increased the salt content of the surface 2.5 cm of soil in the bed particularly in the center of the bed. Sprinkler irrigation slightly decreased the salt content during the season. Below 7.5 cm the irrigation method had little effect. (Skogerboe-Colorado State)
W76-08763

SALT TOLERANCE AND SUITABILITY O VARIOUS GRASSES FOR SALINE ROADSIDES
Colorado State Univ., Fort Collins. Turfgrass Extension.
T. D. Hughes, J. D. Butler, and G. D. Sanks.
Journal of Environmental Quality, Vol. 4, No. 1, 65-68, January-March 1975. 1 fig, 6 tab, 12 ref.

Descriptors: *Salinity, *Crop response, *Salin soils, *Grasses, *Salt tolerance.
Identifiers: Saline roadsides.

Forage yields of five grass species were studied i soil under greenhouse conditions with NaCl add tions of 0; 5,000; 10,000; and 20,000 ppm. Forag yield of P. distans was reduced 23% by addition 20,000 ppm NaCl, compared to a minimum reduc tion of 40% for the other grass species. Miner analysis of leaf tissue by emission spectroscop showed that Na concentrations increased as NaC addition to the soil increased. However, there wa no relationship between salt tolerance of the var ous grasses and amounts of Na in leaf tissue. I creased NaCl addition to the soil resulted decreased leaf Ca and Mg, but no relationship e isted between leaf K and NaCl additio (Skogerboe-Colorado State)
W76-08764

ECOLOGICAL AND PHYSIOLOGICAL IMPL CATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Pla Sciences.
For primary bibliographic entry see Field 5D.
W76-08840

EFFECTS OF LIME, PHOSPHATE AND SOI CONDITIONER ON GROWTH AND FRUI QUALITY OF NETTED MELON, (I JAPANESE),
Tsuishin Jr. Coll. of Agriculture, Aichi (Japan).
T. Takano, and Y. Saso.
Sci Rep Fac Agric Meijo Univ. 8, p 1-10, 1972.

Descriptors: Fruit crops, *Melons, *Plant growt *Soil amendments, Fertilizers, *Lim *Phosphate, *Root development, Soil-water-pla relationships.

Differences in stem length between treatmen were observed on about the 15th day after tran planting. This was the effect of lime, phospha and soil conditioner on stem elongation. Th growth of plants in plots treated with soil cond tioner was delayed during the early stage growth due to lower soil moisture. The main effe of lime and soil conditioner was shown by goo root development, large and thick leaves, swe fruit and higher specific gravity of fruit. No di ference of fruit weight and fruit shape was o served between treatments. Fruits on plan treated with soil conditioner had longer storag life. Treatment with soil conditioner increase pore space in soils, improving water permeabilit Soils after harvest had lower pH and low exchangeable Ca, except for the plots treated wi lime. Cations in soils treated with soil condition were leached by watering. The supply of lime an soil conditioner, separately and combined im proved fruit quality.–Copyright 1974, Biologic Abstracts, Inc.
W76-08989

PLANT COLLECTION FOR SALTLAN REVEGETATION AND SOIL CONSERVATION
Western Australia Dept. of Agriculture, Sou Perth. Soils Div.
For primary bibliographic entry see Field 2I.
W76-09071

GROWTH, WATER CONSUMPTION, AN SALT UPTAKE OF TOMATO PLANTS IN HIG HUMIDITY- HIGH CARBON DIOXIDE GREE HOUSE ENVIRONMENTS,
Arizona Univ., Tucson.

A. A. Swalls, and J. W. O'Leary.
Journal of the Arizona Academy of Science, Vol. 11, No. 1, p 23-26, February, 1976. 4 tab, 23 ref.

Descriptors: *Plant growth regulators, *Humidity, *Moisture uptake, *Environmental control, *Carbon dioxide, *Greenhouses, Salt tolerance, Transpiration control, Water utilization, Air environment, Plant growth, Productivity, Environmental effects, Evapotranspiration.

When tomato plants were cultivated in greenhouses under high humidity and high CO2 conditions, water consumption and salt concentrations were reduced and growth rates increased. Plants were grown in a conventional fan-pad open greenhouse and three closed-environment greenhouses maintained at 85-100% relative humidity. In the latter three greenhouses, CO2 concentrations were 300, 900, and 1500 ppm respectively. Water uptake declined due to increased humidity and CO2 levels; higher water-use efficiency was indicated by a significant decrease in transpiration ratio. Total salt concentration in the leaves declined only at higher CO2 levels; magnesium content was reduced by high humidity alone. Growth was significantly greater under these conditions than in lower CO2 environments at either high or low humidity. High humidity-induced declines in dry weight were more than offset by the increase in CO2; the stem and petiole accounted for most of the increased weight. (Jahns-Arizona)
W76-09075

SEWAGE EFFLUENT INFILTRATES FROZEN FOREST SOIL,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 5B.
W76-09288

3D. Conservation In Domestic and Municipal Use

IMPLICATIONS OF ZONING AS AN URBAN WATER MANAGEMENT MEASURE,
Georgia Univ., Athens. Dept. of Real Estate.
For primary bibliographic entry see Field 6F.
W76-08755

URBAN RUNOFF MODELLING,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Div.
For primary bibliographic entry see Field 4A.
W76-09033

DECISION PERSPECTIVES ON URBAN STORM WATER POLLUTION,
GKY and Associates, Alexandria, Va.
For primary bibliographic entry see Field 5G.
W76-09207

THE EFFECT OF ROAD DEICING SALTS ON SODIUM CONCENTRATION IN AN URBAN WATER COURSE,
York Univ., Downsview (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-09218

QUANTITATIVE ASSESSMENT OF CHANGES IN URBAN RUNOFF,
Texas Univ. Health Science Center, Houston. School of Public Health.
For primary bibliographic entry see Field 4C.
W76-09267

3E. Conservation In Industry

KINETICS AND MECHANISMS OF THE OXIDATIVE DEGRADATION OF NITRILOTRIACETIC ACID (NTA) IN AQUEOUS SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-08843

INDUSTRIAL DEVELOPMENT THROUGH WATER-RESOURCES PLANNING,
Department of Commerce, Washington, D. C.
K. L. Kollar, and R. Brewer.
Journal American Water Works Association, Vol. 67, No. 12, p 686-690, December 1975. 2 tab.

Descriptors: *River basins, *Water resources, *Planning, *Projections, *Industrial water, *Water conservation, *Water demand, *Reused water, Reclaimed water, Planning, Computer models, Water pollution control, Recycling, Chesapeake Bay.

Long range water resources planning is hampered by the lack of basic data to base judgements regarding allocating resources and competing waste requirement. Discussed is a model developed by the Department of Commerce that forecasts industrial water demands for river basins. It is keyed to economic projections developed for national and regional planning. The data base is large: the 12,000 largest water using manufacturing plants in the nation which account for 98% of such water use. The model projects withdrawal demands by industry by changing technology, variations in water pollution control requirements, and changes in recycling rates. Population growth and economic activity are in accordance with Series C projections prepared by the U.S. Water Resources Council and best available pollution control technology is assumed by 1985. Applied to Chesapeake Bay, forecasts were made for water use through the year 2020. This is broken down into items such as gross water use, intake, recycling rate, discharge, etc. Cooling water is a major use in many manufacturing processes and since it is relatively pollutant-free it may be recycled. In contrast, water used in a manufacturing process is less likely to be recyclable since it is in contact with pollutants. In the future it is expected that recycling rates will be much higher than now. This will allow considerable industrial expansion in an area such as Chesapeake Bay without significantly increasing water withdrawal. Recycling is influenced by availability and cost of water, quality, plant processes, materials recovery, consumptive losses, regulations, cost avoidance, and age of plant. (Smith-North Carolina)
W76-09034

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
L. Duckstein.
In: International Conference on Global Water Law Systems, September 1-9, 1975, Valencia, Spain, 58 p. 64 ref, 2 append.

Descriptors: *Water management(Applied), *Desalination, *Waste water treatment, *Water allocation(Policy), *Water law, Administration, Flood control, Irrigation, Water quality, Urbanization, Technology, Research and development, Electric power production, Water rights, Decision making, Systems analysis.

Both traditional and new technologies are needed to solve the fundamental problems of flood control, irrigation, effects of urbanization, and water quality. The problem of allocating ater between competing sources, especially energy production and agriculture, is acute in certain regions, such as near coal reserves in the western U. S. As a result of new technologies, water requirements may increase or decrease with various degrees of certainty. Desalination, which may be used as a supplementary fresh water source in conjunction with natural supplies, and several wastewater treatment schemes which may be used to increase insufficient water supply are given special consideration. In addition, systems analysis techniques themselves should be considered as new technologies. Legal systems are briefly reviewed from the viewpoint of their role in the overall water resources system and in the decision-making process. (Robinett-Arizona)
W76-09065

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN SELECTED COAL-ENERGY AREAS OF UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-09148

NORTHERN GREAT PLAINS RESOURCE PROGRAM. SURFACE RESOURCE WORK GROUP--REGIONAL PROFILE.
Northern Great Plains Resource Program, Denver, Colo.
For primary bibliographic entry see Field 4C.
W76-09228

WATER RESOURCES POLICY ISSUES - 1975.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-09230

WATER REQUIREMENTS FOR ENERGY,
L. E. Wilkinson.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p. 9-21. 2 fig., 4 tab.

Descriptors: *Electric power production, *Pacific Coast region, *Water demand, Electric power demand, Rocky Mountain region, Water utilization, Coal, Nuclear power plants, Thermal powerplants, Oil shales, Oil wells, Water costs, Water supply, Planning, Natural gas, Water requirements.
Identifiers: Coal gasification plants, Coal liquifaction plants, Coal slurry pipelines, Geothermal power plants.

The burgeoning demand for energy in the Western states and the consequent pressure on their limited water resources are discussed in relation to various energy sources. Water uses for strip mine revegetation, coal slurry pipelines, coal liquefaction, coal gasification, oil shale recovery, synthetic fuels, drilling and recovery of crude oil and natural gas, geothermal energy conversion, and steam electric plants are outlined and summarized to show the pounds of water required to produce one million BTUs: A steam-electric-nuclear source 200 to 2000; steam-electric-coal 200 to 1350; coal gasification 800 to 1350; oil shale 100 to 240; and coal slurry pipelines zero to 100. The water supply in the river basins is computed for the Upper Colorado, Lower Colorado, Great Basin, Northwest, and California, in millions of acre-feet, as 9.9, 1.8, 2.6, 49 and 20, respectively. The demand on the respective basins is 4.3, 4.4, 3.4, 17, and 31; while the percent in use is 43, 250, 130, 34, and 155. (The numbers exceeding 100% are accounted for by imported water). Suggested technical alternatives are: Water conservation, technological development on dry cooling systems; cloud seeding in winter; coastal siting of steam-electric plants; and more nuclear power plants. Evaporative cooling tower installations

LIBRARY U. OF A. MARANA-CAMPUS

should be discontinued and interbasin transfers are unreliable sources. (See also W76-09230) (Auen-Wisconsin).
W76-09231

HYDROLOGICAL PROBLEMS ASSOCIATED WITH DEVELOPING GEOTHERMAL ENERGY SYSTEMS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-09260

ECONOMICS AND ENERGY: REDUCING MILL ENERGY CONSUMPTION AND EFFLUENT VOLUME,
Ekono Inc., Bellevue, Wash.
For primary bibliographic entry see Field 5G.
W76-09299

STUDIES ON OXYGEN-ALKALI TREATMENT OF LIGNEOUS MATERIALS. PART V. RECYCLE AND REUSE OF WASTE LIQUOR IN O-PA-P BLEACHING SEQUENCE (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood Chemistry Lab.
T. Nishida, K. Sakai, and T. Kondo.
Japan Tappi, Vol. 29, No. 12, p 641-649, December, 1975. 6 fig, 9 ref, 8 tab. English summary.

Descriptors: *Water conservation, *Bleaching wastes, *Oxygen, *Recirculated water, Pollution abatement, Water pollution control, Wastes, Industrial wastes, Recycling, Water pollution sources, Pulp wastes, Color, Hydrogen ion concentration, Industrial water, *Water reuse.
Identifiers: Sodium hydroxide, Birch trees(Betula), Kraft pulp, Hydrogen peroxide, Washing(Pulp).

Birch kraft pulp was bleached by a three-stage sequence using oxygen-alkali, peracetic acid, and hydrogen peroxide (O-PA-P), followed by countercurrent washing. Pulp brightness could be maintained at 90 without any effluent during at least 10 recycles of the spent bleach liquor, provided the pH values of the oxygen and peroxide bleach liquors were kept constant by NaOH additions. The freshwater consumption was estimated at about 5 cu m/ton of pulp, but this required 1.5% of additional NaOH in the oxygen stage (based on oven-dry pulp). The NaOH addition could be omitted by increasing the freshwater volume to 10 cu m/ton of pulp, but this increased the evaporator load. Compared to a conventional O-D-E-D sequence, countercurrent washing reduced the total effluent color to 1/9 or 1/10 and the total effluent COD to 1/8 or 1/9 after 10 recycles. (Brown-IPC)
W76-09337

PAPETERIES DE L'AA -- SUSPENDED SOLIDS REDUCED BY 98%, ORGANIC MATERIALS BY 74% (PAPETERIES DE 1'AA -- MES REDUITES DE 98%, ET MO DE 74%),
For primary bibliographic entry see Field 5D.
W76-09341

CLOSING THE WHITE WATER SYSTEM OF PAPER MACHINES -- EFFECTIVE PROTECTION OF THE ENVIRONMENT (FECHAMENTO DO SISTEMA DE AGUA BRANCA DAS MAQUINAS DE PAPEL -- UMA POTECAO LUCRATIVA DO MEIO AMBIENTE),
C. Johansson.
O Papel, Vol. 36, p 103-109, November, 1975. 4 fig, 9 tab.

Descriptors: *Closed conduit flow, *Water conservation, *Recirculated water, Water pollution control, Recycling, water reuse, Water consumption (except consumptive use), Foreign countries, Costs, Effluents, Pollution abatement, Europe.
Identifiers: *Paper machines, *White water(Paper machines), Kraft mills, Tissue mills, *Sweden, Fiber recovery.

Following an introduction to data on average specific water consumption and specific dry solids losses during the manufacture of various types of paper with open white water systems, experience with closed white water systems at a Swedish integrated kraft mill and at a Swedish tissue paper mill is described. In these cases, effluent flow was reduced by up to 84%. Cost figures show that savings relating to fiber recovery and reduced pollution load can render such a closing of the white water system very profitable. (Speckhard-IPC)
W76-09342

3F. Conservation In Agriculture

NO-TILL SEEDING OF IRRIGATED SORGHUM DOUBLE CROPPED AFTER WHEAT,
Southwestern Great Plains Research Center, Bushland, Tex.
R. R. Allen, J. T. Musick, F. O. Wook, and D. A. Dusek.
Transactions of the ASAC (American Society of Agriculture Engineers) Vol 13 No. 6, p 1109-1113, November-December 1975. 7 fig, 3 tab, 8 ref.

Descriptors: *Sorghum, Till, Seed treatment, Irrigation, Wheat, Crop response, Agriculture, Crop production, Great Plains, Cultivation.
Identifiers: *Non-tillage practices, Southern High Plains.

Irrigated grain sorghum was successfully no-till seeded into wheat residue immediately following wheat harvest in the Southern High Plains. Also Grain sorghum was grown with clean tillage and seeding for comparison. No-till seedlings generally emerged faster, grew taller, and matured up to 5 days earlier than controls. Grain yield for a 5-yr study averaged 5,690 kg/ha for no-till and 5,070 kg/ha for clean-till, a 12 percent increase. No-till required only one-fifth as much time between crops to prepare and plant a seedbed. No-till reduced fuel requirements, including harvest, by 55 percent. (Skogerboe-Colorado State)
W76-08756

WATER REGIME IN GROWING POINTS OF WHEAT SHOOTS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 2I.
W76-08757

EFFECT OF LATE SOWING ON MORPHOGENETIC DEVELOPMENT OF PANICLE IN RICE (ORYZA SATIVA L.),
Calcutta Univ. (India). Dept. of Agriculture.
R. M. Datta, A. K. Paul, and N. Mondal.
Indian J Agric Sci. 42(9), p 795-799, 1972.

Descriptors: *Rice, Crops, Cereal crops, Fieldcrops, *Planting management, *Seasonal, *Plant growth.
Identifiers: *Late sowing.

Floral initiation, panicle development and heading were studied in the summer and winter varieties of O. Sativa, sown late in the monsoon. In sumer rice, the tissue from floral initiation was differentiated earlier, spikelets and glumes developed quickly, meiosis took place rapidly and heading was completed 8 days earlier. In winter all the stages were noticed earlier in summer rice, indicating its relative insensitivity to important environmental factors like day length, temperature and humidity which make it a short duration crop. No unusual behavior, at least in floral initiation and panicle development was noticed. Winter rice revealed its characteristic short-day response to floral initiation and subsequent morphogenetic development despite sowing in winter. Floral morphogenetic initiation was noted first in summer rice and last in spring rice, although spring rice was more suited to the environmental conditions in late winter and spring. The morphogenetic development, particularly during the stages from floral initiation to heading, is governed by humidity in spring rice. Humidity may act as a limiting factor even under optimum conditions of temperature and light. In spite of floral initiation and panicle development, pollen sterility was found in winter and summer rices more than in spring rice. This sterility is probably physiological. Spring rice, being winter-adapted, showed the minimum grain sterility.--Copyright 1974, Biological Abstracts, Inc.
W76-08758

A SIMULATION MODEL OF BIOPHYSIOCHEMICAL TRANSFORMATIONS OF NITROGEN IN TILE-DRAINED CORN BELT SOIL,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 5B.
W76-08761

NATURAL (15)N ABUNDANCE IN SOIL, LEAVES, AND GRAIN AS INFLUENCED BY LONG TERM ADDITIONS OF FERTILIZER N AT SEVERAL RATES,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
V. W. Meints, L. V. Boone, and L. T. Kurtz.
Journal of Environmental Quality, Vol. 4 No. 4, p 486-490, October-December 1975. 4 fig, 1 tab, 2 ref.

Descriptors: *Fertilization, *Fertilizers, *Nitrogen, *Corn(Field), *Soybeans, Crop response, Soils, Leaves, Grains(Crops).

Soil, leaf, and grain natural (15)N abundance was measured in corn and soybean plots which had received various rates of fertilizer N for 20 years. Soil (15)N abundance did not significantly reflect the amount of fertilizer N applied and should not be used to estimate fertilizer N additions. Corn leaf and grain (15)N abundance reflected additions of fertilizer N only at low rates of fertilizer N applied. Soybean leaf (15)N abundance reflected a decrease in symbiotic N fixation with additional increments of fertilizer N applied. (Skogerboe-Colorado State)
W76-08765

POTENTIALLY BENEFICIAL USES OF SULFURIC ACID IN SOUTHWESTERN AGRICULTURE,
Arizona Univ. Tucson. Dept. of Soils, Water and Engineering.
S. Miyamoto, J. Ryan, and J. L. Stroehlein.
Journal of Environmental Quality, Vol. 4, No. 4, p 431-437, October-December 1975. 63 ref.

Descriptors: *Acids, Waste disposal, Land reclamation, Sodium, Agriculture, *Southwest U.S., Industrial production, Beneficial use, Soil amendment, Soil treatment.
Identifiers: *Sulfuric acid, Water amendment.

Production of sulfuric acid is projected to exceed market demand in the southwestern USA if current air pollution control regulations are fully implemented by means of acid plants. Considerable quantities of surplus acid can be used beneficially for reclaiming sodium-affected calcareous soils, increasing the availability of phosphorus and certain micronutrients, treating alkaline and ammoniated irrigation water, controlling certain weeds and soil-borne pathogens, improving range grass establishment and growth, and for several other purposes. Principles involved in these uses are reasonably well established, but studies are required to determine effective use especially

the area of field application. (Skogerboe-Colorado State)
W76-08766

POWER FACTORS AND ELECTRICAL DEMANDS OF CENTER-PIVOT IRRIGATION MACHINES,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
L. E. Stetson, and S. O. Nelson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 4, p 673-676, July-August, 1975. 4 fig, 2 tab, 3 ref.

Descriptors: *Irrigation effects, *Electric power demand, *Electric power costs, Irrigation practices, Irrigation, Irrigation system.
Identifiers: *Center pivot irrigation.

Some operating characteristics of electrically driven, center-pivot irrigation machines were measured in the field. Peak power demands over fractional-minute periods were about twice the average demand. Power factors for the machines ranged between 0.3 and 0.5, and at least 1 kVA per connected hp was necessary to meet average electrical demands. Higher average power was required for faster rates of travel, but peak power demand was independent of travel rate. Power required for movement of machines around the pivot was the same whether or not they were carrying irrigation water. Voltage drops in drive-motor circuits did not exceed the tolerance limits for the 460-V motors and controllers. (Skogerboe-Colorado State)
W76-08770

SOIL AND WATER CONSERVATION WITH WESTERN IOWA TILLAGE SYSTEMS,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
For primary bibliographic entry see Field 4D.
W76-08805

AGRICULTURAL WATER DEMANDS IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. S. Sowell, R. E. Sneed, and L. H. Chen.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-253 771, $9.25 in paper copy, $2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Rpt. No. 114, May 1976. 262 p, 43 fig, 64 tab, 11 ref, 3 append. OWRT B-068-NC(2), 14-31-0001-4113.

Descriptors: *Agriculture, *Water demand, *Water utilization, *North Carolina, *Irrigation water, *Water requirements, Irrigation, Irrigation practices, Computer models, Linear programming, Irrigation efficiency, Model studies, Optimization.
Identifiers: *Agricultural water demand, Water use model, Irrigation policy, *Tar-Neuse River Basin(NC).

The objectives were: (1) to determine total water requirements for a given level of agricultural activity in an area; (2) to determine for a given level of water available in a specified area, the optimum level of agricultural activity; and (3) to determine economically feasible irrigation water requirements for each crop grown in an area. A linear programming optimization model was developed to rapidly analyze large numbers of irrigation-soil type-crop combinations. Water requirements for twenty-six counties in the Tar-Neuse River Basin were evaluated for 1971 rainfall conditions. Total water requirements, peak water requirements and the time of the peak requirement, and dollar value of the production were determined for four levels of irrigation. In addition, similar information was developed for three of the counties over a ten-year period, based on rainfall data from 1961 to 1970. This report covers Phase III of the study. (See also W74-01112) (Stewart - North Carolina State)
W76-08841

IMPACT OF CHANGES IN IRRIGATION WATER MANAGEMENT IN EASTERN IDAHO,
Idaho Univ., Moscow. Dept. of Civil Engineering.
C. E. Brockway, and B. A. Claiborn.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 965, $4.50 in paper copy, $2.25 in microfiche. Idaha Water Resource Research Institute, Moscow, Completion Report June 1975. 50 p, 4 fig, 16 tab, 46 ref. OWRT A-040-IDA(1), 14-34-0001-5012.

Descriptors: Irrigation districts, *Irrigation efficiency, Sprinkler irrigation, Surface irrigation, Irrigation practices, Distribution systems, *Canal seepage, *Idaho, *Water management(Applied), Irrigation water, *Water utilization, Diversion, Return flow, Seepage, Consumptive use.
Identifiers: Snake River Basin(Idaho), Upper Snake River Region(Idaho).

Irrigation water use data on six irrigation districts in the Upper Snake River Basin of Idaho were obtained for the 1974 season. Data on river diversions, return flows, crop consumptive use, and seepage losses were obtained and water budget analysis performed to determine present farm, conveyance system and project efficiencies. Present farm irrigation efficiencies varied from 11 to 62 percent and project irrigation efficiencies varied from 10 to 42 percent. Low farm irrigation efficiencies were attributed to long field runs on high intake rate soils. Canal seepage losses contribute a significant part of the system loss; however, lining of main canal systems would not significantly increase project efficiencies. Reasonably attainable project efficiencies were determined by evaluating the effects of reducing canal seepage losses, incremental reductions in river diversions, reasonable increases in farm irrigation efficiencies, and a complete hypothetical conversion to sprinkler irrigation. Reasonably attainable project efficiencies of 35 to 51 percent are estimated assuming a farm irrigation efficiency of 60 percent which is achievable with sprinkler irrigation or well managed surface systems. On the six districts evaluated, which irrigate 252,000 acres, a potential water savings of over 800,000 acre feet per year could be achieved making water available for irrigation of an additional 274,000 acres or for other beneficial uses.
W76-08925

ZINC NUTRITION OF RICE IN RELATION TO IRON AND MANGANESE UPTAKE UNDER DIFFERENT WATER REGIMES,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India).
M. S. Gangwar, and J. S. Mann.
Indian J Agric Sci. 42(11); p 1032-1035, 1972.

Descriptors: *Rice, *Zinc, Iron, Manganese, *Water requirements, *Soil-water-plant relationships, Plant diseases, Flooding, Irrigation, Plant growth, *Absorption.
Identifiers: India, Oryza-Sativa, Khaira.

A greenhouse study was conducted on a silty clay-loam soil to investigate the influence of soil moisture regimes and Zc application on the Fe and Mg uptake by 'IR 8' rice (oryza sativa L.) and its growth pattern. When compared with irrigation to field capacity, flooding produced more dry matter at all stages of growth. Generally, Zn application increased the dry matter significantly under flooding condition and marginally under irrigation to field capacity. Flooding remarkably increased the Fe and Mg content, and to a lesser extent Zn content, of the different plant parts. Zc application markedly decreased the Fe and Mg concentration in plants under both water regimes. 'Khaira' disease of rice in the tarai (subhumid and submontane belt at the foot of the Himalayas) region may be due to Fe- and Mg-induced Zc deficiency.--Copyright 1974, Biological Abstracts, Inc.
W76-08974

INTERCEPTION OF RAINFALL AT DIFFERENT GROWTH STAGES BY THE CANOPY OF TOBACCO PLANTS, (IN JAPANESE).
Okayama Tobacco Experiment Station (Japan).
H. Kitanosono.
Proc Crop Sci Soc Jap. 41(1); p p 38-43, 1972.

Descriptors: *Rainfall, *Tobacco, *Plant growth, *Raindrops, *Interception, Canopy, Stem-flow, Throughfall, Cover crops, Analytical techniques.
Identifiers: *Bright yellow.

Bright Yellow was used in this experiment. The rainfall intercepted by the tobacco canopy is redistributed as throughfall, stalk-flow, evaporation and absorption. The shaded area by the canopy was measured quantitatively by the use of photographs and a planimeter. The number and size of raindrops were measured by photographic paper spread with developer. There was a high degree of positive correlation between the raindrop diameter and the size of the trace of photographic paper. The number of raindrops/sec counted on the shaded area was 282 at moulding time, 527 at topping time. The dissolution of raindrops due to the collision with the leaf surface differed by the position on the leaf inclination angle of leaf, condition of surface and collision angle between drops and leaf. Photographs showed that when a drop of water (diameter 4.1 mm) fell from the height of 11 m and hit the surface of the leaf, it was divided into many microdroplets with the diameter of the largest droplet about 2.0 mm. Interception increased directly with the growth of vegetative cover and the distribution of ground rainfall was influenced by the character of vegetative growth. The amount of water held by the leaf after rainfall was about 50 g/plant at the budding stage and this water was absorbed by the leaf or evaporated into the atmosphere after about 50 min. The amount of stem-flow was smaller than that reaching the ground directly through canopy gaps or from leaf drip. About 1/3 of the water held by leaf flowed down from the tip and about 2/3 flowed down the basal part of the leaf. Excessive rainfall was deleterious to leaf quality of flue-cured tobacco.--Copyright 1974, Biological Abstracts, Inc.
W76-08986

EFFECT OF SOIL-MOISTURE REGIMES AND N AND P FERTILIZATION ON BERSEEM GROWN FOR FODDER,
Indian Agricultural Research Inst., New Delhi. Div. of Agronomy.
S. P. Singh, and R. R. Singh.
Indian J Agric Sci. 42(9); p 819-822, 1972.

Descriptors: *Soil-water-plant relationships, *Soil moisture, *Fertilizers, Irrigation, Sands, Loam, Nitrogen, Phosphorus, Potassium, *Plant growth.
Identifiers: *Berseem, *Fodder, Trifolium-Alexandrinum, India.

A field experiment on berseem (Trifolium alexandrinum Juslen.) with 3 levels of soil moisture regimes (irrigations at 75, 50 and 25% available soil moisture), N (0, 20 and 40 kg/haas urea) and P (0, 40 and 80 kg P2O5/ha as single superphosphate) each, was conducted in Agra, India, during the winter seasons of 1966-67 and 1967-68. The soil was a sandy-loam, deficient in N and P and rich in K. The maximum yields of green and dry fodder were obtained under wet soil moisture regimes. The responses to N and P applications were linear for the yield of green as well as dry fodder. Application of 40 kg N along with 80 kg P2O5/ha gave the highest yield of green fodder.--Copyright 1974, Biological Abstracts, Inc.
W76-08987

LIBRARY U. OF I. URBANA-CHAMP.

PRESSURE AND FLOW REGULATION DEVICE,
Rain Bird Sprinkler Mfg. Corp., Glendora, Calif. (Assignee).
C. J. Flynn.
U. S. Patent No. 3,948,285, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 167, April 6, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation systems, *Irrigation efficiency, Flow, Flow control, Pressure, Water delivery, Water distribution(Applied).

A device is described in which each sprinkler in the system has an independently pressure-regulated supply, and has its own pressure-actuated check valve to prevent undesirable low-pressure flow. A check valve with a resiliently mounted diaphragm snaps the valve open positively when a predetermined minimum supply pressure is reached, and, constructed integrally with the check valve so as to form a single interrelated device is a pressure regulating disk cooperating with the check valve diaphragm to provide a constant pressure source of water to the associated sprinkler. The diaphragm of the check valve is exposed to the water supply pressure on one side and to atmospheric pressure in a vented chamber on its other side. The invention represents a significant advance over previous devices because it provides the dual functions of a pressure regulator and a check valve in a single device. (Sinha-OEIS)
W76-09049

METHOD AND DEVICE FOR ATTACHING SHUT-OFF CONTROL VALVE TO DISTRIBUTING WATER PIPE SUCH AS SERVICE PIPE WITHOUT STOPPING PASSAGE OF WATER THERETHROUGH,
Yano Giken Co., Ltd. Osaka (Japan). (Assignee).
M. Yano.
U. S. Patent No. 3,948,282, 4 p, 11 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 166, April 6, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation operation and maintenance, Irrigation efficiency, *Irrigation systems, Irrigation practices, Pipes, Water delivery, Flow control.

When a portion of a distributing water pipe has become cracked or otherwise damaged, the invention provides for the installation of a water control valve adjacent to or the installation of water control valves on both sides of the cracked area of the pipe without stopping passage of water. A T-pipe is attached to the damaged water distribution pipe. A first valve assembly is then mounted on the T-pipe assembly. A hole boring assembly is mounted on the free end of the first valve assembly in watertight relation and a hole then bored in to the water distribution pipe. The hole is closed by the first valve member after which the boring assembly is withdrawn. A second valve assembly having an external housing is mounted to the free end of the first valve assembly by means of the external housing and the valve seat of the second valve housing then inserted through the opening and the water distribution pipe locked in place to shut off the flow of water through either distribution pipe. The external housing is thereafter removed. (Sinha-OEIS)
W76-09050

COST OF PRODUCING CROPS IN THE IRRIGATED SOUTHWEST, PART V: UTAH,
Arizona Univ., Tucson.
N. G. Wright, L. H. Davis, T. M. Stubblefield, and D. A. Swope.
Arizona Agricultural Experiment Station, Technical Bulletin 223. 1976. 25 p, 1 fig, 25 tab, 25 append.

Descriptors: *Cost analysis, Water resources development, *Crop production, *Cultivated lands, *Irrigated land, *Planning, Economic feasibility, Cost comparisons, Water utilization, Land development, Agriculture, Irrigation programs, *Utah, Marketing, *Southwest U. S.
Identifiers: Synthetic budgeting method.

This study is part of a project designed to supply information necessary to maximize the agricultural base in southwestern states and to aid realistic planning of profitable agri-businesses using irrigated land. Some southwestern states are now under irrigated cultivation and use; additional acreages could be irrigated wherever such utilization would have economic advantages over alternative uses for the land and water. For this study, the state (Utah) was divided into six regions which are essentially homogeneous as to production costs; these regions were evaluated in terms of water resources, crop marketing procedures and production costs for the major irrigated crops. More than 750,000 irrigated acres were used for crop production in 1970 and 1971. Sources for irrigation water include diverted stream and other surface water used for flooding the fields and pumped groundwater; sprinkler systems, dirt ditches, and flood irrigation are popular delivery techniques. Several irrigation districts in one region have constructed holding dams to store spring runoff water to extend the supply over the entire growing season. Costs were computed using a synthetic budgeting method and in such a manner as to be comparable with similar costs in other states. (Jahns-Arizona)
W76-09063

COMPARATIVE EVALUATION OF YEARLY CLIMATIC FACTORS WITH THE FIVE YEARS AVERAGES FOR FUDHALIYA AGRO-METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W76-09066

COMPARATIVE EVALUATION OF CLIMATIC FACTORS AND CONDITIONS AT FUDHALIYA AGRO-METEOROLOGICAL STATION AND BAGHDAD AIRPORT METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W76-09067

EFFECT OF HARDENING ON THE STATE OF WATER IN SEEDLINGS OF WINTER CULTURES, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
For primary bibliographic entry see Field 2I.
W76-09095

EFFECT OF AIR HUMIDITY ON STOMATAL AND MESOPHYLL CONDUCTIVITY OF BEAN LEAVES AT TWO SOIL MOISTURE LEVELS, (IN RUSSIAN)
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
For primary bibliographic entry see Field 2I.
W76-09097

WATER CONSERVATION AND IRRIGATED AGRICULTURE,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
W. E. Schmisseur.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p 73-80. 4 fig, 7 ref.

Descriptors: *Water conservation, *Agriculture, *Irrigation efficiency, Adoption of practices, Pricing, Pacific Coast region, Oregon.

The irrigation district's policies and farm practices to conserve water use are defined to include increasing water delivery to crops from existing supplies by reducing water transportation losses; maintain the level of water delivery to crop site but increase utilization efficiency; reduce the variability of crop yield associated with a given water supply by diminishing climatic effects and disease control; and reduce the year-to-year variability of the district's water supplies. The determinant for water conservation at the farm level involves economic issues in resource allocation. The policies, practices, and factors affecting water conservation and its effects on the irrigation district and its farmer clientele are district water pricing, water supply and/or supply restrictions. While a variable water charge is designed to ration water, in practice, such pricing policies are mostly ineffective because the unit price of water is set too low. An effective water pricing policy can promote water conservation at the farm level by inducing substitute technology. Exogenous impacts on water conservation at the farm level are more water efficient crop varieties, improved irrigation methods, economic conditions, public and political pressures, and labor price. Effective approaches to efficient water use in agriculture are water pricing or rationing because they can effect change at a more controlled rate. (See also W76-09230) (Auen-Wisconsin)
W76-09236

WATER AND FOOD PRODUCTION DEMANDS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 6D.
W76-09237

WIND EROSION: THE PROTECTIVE ROLE OF SIMULATED STANDING STUBBLE,
Agricultural Research Service, Manhattan, Kans. North Central Region.
For primary bibliographic entry see Field 4D.
W76-09247

EROSION FOR CORN TILLAGE SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
J. C. Siemens, and W. R. Oschwald.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 69-72, January-February 1976. 3 fig, 6 tab, 14 ref.

Descriptors: *Erosion control, *Cultivation, *Farm management, Crops, Corn(Field), Rainfall, Simulated rainfall, Sediments, Nutrients, Runoff, Soil erosion, Soil conservation, Agricultural runoff, Agricultural engineering, Agriculture.

The erosion control effectiveness of six tillage-planting systems after planting in corn residue was measured. The tillage systems utilized different types and amounts of tillage in order to produce soil surfaces that varied in residue quantity and soil looseness in the tilled layer. A rainfall simulator for application of simulated rain to plots was described. Conservation tillage systems following corn such as chop-plant, disk-chisel, coulter-chisel, and chisel can significantly reduce soil loss from that of fall plow. After planting, these tillage systems have a greater impact on soil loss than on surface runoff. The loss of N and P in surface runoff may not differ significantly between tillage treatments, given the fertilizer application practices followed by most Corn Belt crop producers. Conservation tillage systems can, however, significantly influence the loss of total N and P as a result of the influence on sediment removal. Total N and P loss may have little short-term influence, but accumulated losses over time will eventually influence the need for N and P fertilizers. (Sims-ISWS)
W76-09248

URFACE RESIDUE, WATER APPLICATION, ND SOIL TEXTURE EFFECTS ON WATER CCUMULATION,
gricultural Research Service, Bushland, Tex.; nd Southwestern Great Plains Research Center, ushland, Tex.
or primary bibliographic entry see Field 2G.
/76-09258

HE AVAILABILITY OF GROUND WATER OR IRRIGATION IN THE RICE LAKE-EAU LAIRE AREA, WISCONSIN,
eological Survey, Madison, Wis. Water esources Div.
or primary bibliographic entry see Field 4B.
/76-09348

UMPS.
or primary bibliographic entry see Field 8C.
/76-09351

S YOUR PUMP A CANDIDATE FOR INEFFI-IENCY.,
Schleicher.
rigation Age, Vol. 10, No. 8, p 12-14, May-June, 976.

escriptors: *Farm equipment, *Irrigation en-neering, *Pumps, Performance, Water costs, ump testing, Distribution systems, Sprinkler ir-gation, Irrigation efficiency, Water wells, Water uality, Iron bacteria.
lentifiers: Sand pumping wells, Belt-driven umps.

ising energy costs have resulted in irrigators pay-g closer attention to the operating efficiencies of eir pumping systems. This means that irrigators ill probably be willing to invest more capital ini-ally to purchase more efficient pumping systems, at in the long run will save them money by educing their power bills. A new pump system hould obtain 65% wire to water efficiency from n electric powered system. If a natural gas owered pump is used, 15% overall plant efficien-y would be acceptable. The average lifetime of a ump is 20 to 25 years. If the pump is worked hard s life can be reduced. An expert should be called eriodically to test the system's efficiency. If the fficiency is at 35 to 40% then the pump should be econditioned or replaced. It is very important to atch the pump to the irrigation system. Declining ater tables will not only reduce pump system ef-ciency but may also result in damage to a pump if rging or cavitation occurs. Sand pumping and oor water quality can result in damage and more equent maintenance of the pump. (Gass-WWA)
/76-09352

GRONOMIC AND CATTLE STUDIES WITH UNICIPAL LIQUID DIGESTED SLUDGE,
gricultural Research Center, Jay, Fla.
or primary bibliographic entry see Field 5E.
/76-09367

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

MPLICATIONS OF ZONING AS AN URBAN ATER MANAGEMENT MEASURE,
eorgia Univ., Athens. Dept. of Real Estate.
or primary bibliographic entry see Field 6F.
/76-08755

STRUCTURAL PERFORMANCE OF BURIED PLASTIC DRAIN TUBING,
Utah State Univ. Logan. Engineering Experiment Station.
For primary bibliographic entry see Field 8G.
W76-08771

TROUT POPULATION RESPONSES TO STREAMFLOW FLUCTUATION AND HABITAT MANAGEMENT IN BIG ROCHE-A-CRI CREEK, WISCONSIN,
R. J. White.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2469-2477, 1975 8 fig., 6 ref.

Descriptors: *Brook trout, Sport fish, Stream fisheries, *Rainbow trout, *Brown trout, Channels, *Natural flow, Streams, Runoff, *Natural streams, *Banks, *Shoreline cover, Streamflow, Wisconsin, Low flow, Water level fluctuations.
Identifiers: *Big Roche-a-cri Creek(Wisc), Overhead cover, Hiding cover, Size classes, Stream banks.

In a field study of Big Roche-a-cri Creek, a trout stream in Wisconsin, it was determined that in a given stream reach (1) the more water, the more trout, (2) year-to-year change in stream flow regime may often govern trout abundance, (3) narrowing the stream and providing overhead hiding cover can help to ameliorate unfavorable effects of a low flow, (4) greatest benefits of such management accrue to the larger size classes of trout. (Katz)
W76-08789

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME I, INDIAN BEND WASH REPORT.
Army Engineer District, Los Angeles, Calif.
Prepared for Maricopa County, Arizona, June 1964. 21 p, 1 fig, 19 plates, 1 tab, 3 append, 18 ref.

Descriptors: Floods, *Sheet flows, *Floodways, *Flood plains, Flood flow, *Flood forecasting, *Flood frequency, Channels, Flash flood, Storms, Historic floods, Flood data, Peak discharge, Non-structural alternatives, Control structures, Channel improvement, Flood protection, *Arizona.
Identifiers: *Maricopa County(AZ), Indian Bend Wash(AZ), Paradise Valley(AZ), Standard Project Flood, 100-year flood, 25-year flood.

The portion of Indian Bend Wash (a tributary of the Salt River) covered in this report extends 8.5 miles from Indian Bend Road northwesterly to Greenway Road, that portion of the drainage area upstream from the Arizona Canal which can divert flood flows of up to 2,000 cubic feet per second in a westerly direction, has a drainage area of 152 square miles. The flood plain is up to 4,000 feet wide and is subject to overland or sheet flows. Growth from Phoenix, Paradise Valley, and Scottsdale is prompting more residential development and some light industrial development. Future development plans include building an express highway paralleling Indian Bend Wash for the full length of the study reach. The natural floodway is shallow, not well defined, and unimproved except for a levee from Mahon Road to Indian Bend Road. Nine floods have occurred since 1921 resulting from general winter and summer storms and thunderstorms. Flood area maps delineate flood limits for Standard Project Flood, 100-year flood, and 25-year flood. The 100-year flood will have a peak discharge of 40,000 cubic feet per second at the gage .5 mile upstream from the Arizona Canal. The SPF will have a peak discharge of 72,000 cfs and average velocities of 5 ft/sec. Guidelines for reducing future flood damage include flood control works, flood plain management, and floodway zoning. A channel improvement project is under consideration. (See also W76-08807, W76-08808 and W76-08809) (Henley - North Carolina)
W76-08806

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME II, CAVE CREEK REPORT,
Army Engineer District, Los Angeles, Calif.
Prepared for Maricopa County, November 1964. 24 p. 2 fig, 15 plates, 10 ref, 3 append.

Descriptors: *Floodways, *Flood plains, Floods, Flood flow, *Flood forecasting, *Flood profiles, *Non-structural alternatives, Channels, Historic floods, Flood frequency, Storms, Reservoirs, Control structures, Flood plain zoning, *Arizona.
Identifiers: Maricopa County(AZ), Cave Creek(AZ), Rowler Wash(AZ), Mexican Wash(AZ), Carefree(AZ), Phoenix(AZ), Salt River(AZ), Standard Project Flood, 100-year flood, 50-year flood, 25-year flood.

The study area extends upstream along Cave Creek (a tributary of Salt River) for 9.5 miles to Rowler Wash, then upstream along Rowler Wash and its tributary, Mexican Wash for 3.25 miles, draining 138 square miles in northeast Maricopa County. Flood plain width ranges from 1,800 feet in the lower reach to 350 feet near the confluence of Cave Creek and Rowler Wash. Though the area is presently undeveloped, residential development pressures are increasing in the wide flood plain. Floods result from general prolonged winter and summer storms and thunderstorms. Along Rowler Wash near the town of Cave Creek, overflows have caused damage. Based on data from similar areas a Standard Project Flood would have an estimated peak discharge of 62,000 cubic feet per second at Cave Creek Reservoir. This exceeds the highest flood peak discharge on record in 1954 at Whitlow Ranch damsite (in the similar drainage area of Queen Creek) by 2,000 cfs. The 100-year flood would discharge 37,000 cfs, the 50-year flood 28,000 cfs, and the 25-year flood 20,000 cfs. Floodway encroachment limits for development and flood profiles are given. The area has no flood plain zoning. (See also W76-08806) (Henley - North Carolina)
W76-08807

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME IV, WICKENBURG REPORT.
Army Engineer District, Los Angeles, Calif.
Prepared for Maricopa County, Arizona, December 1965. 44 p, 12 fig, 20 plates, 13 ref, 3 append.

Descriptors: *Flood plains, Floods, Flood flow, *Flood profiles, *Floodways, *Arizona, Channels, Historic floods, Flood forecasting, Flood data, Flood frequency, Non-structural alternatives, Control structures, Storms, Erosion.
Identifiers: *Maricopa County(AZ), Wickenburg(AZ), Powder House Wash(AZ), Sols Wash(AZ), Sunset Wash(AZ), Casandro Wash(AZ), Flying E Wash(AZ), Hassayampa River(AZ), Standard Project Flood, 100-year flood, Floodway encroachment lines.

Powder House, Sunset, Casandro, Flying 'E', and Sols Wash, tributaries of the Hassayampa River, drain 160.3 square miles in northeast Maricopa County. Although stream flows occur only during storms, the stream channels of these washes are poorly defined and accommodate only minor flows. Floods result from general prolonged winter storms in December through March, and summer storms and thunderstorms in July through September. Seven floods have caused damage since 1944. Wickenburg (1960 population 2,500) is a rapidly growing resort center. Extensive residential development and accompanying commercial development are encroaching on the flood plains of Sunset, Sols, Casandro and Powder House Washes. Property owners have built parallel levees in Sunset and Powder House Washes which act as floodways. However, these are inadequate and floodwaters overflow onto adjacent lands. The maximum flood flow of these five washes occurs in Sols Wash where a 100-year

LIBRARY U. OF A. UNIVERSITY CAMPUS

flood will have a peak discharge of 24,000 cubic feet per second and a Standard Project Flood will have a peak discharge of 45,000 cfs. The SPF would probably result from severe thunderstorms, with a duration of several hours, and would peak soon after the beginning of rainfall. This study delineates: (1) the overflow area of the SPF as the upper limits of flood plains; (2) the areas inundated by the 100-year flood; and (3) floodway encroachment limits for development. Guidelines for reducing flood damage include flood control works, flood plain regulations, subdivision regulations, and zoning. (See also W76-08806) (Henley-North Carolina)
W76-08808

FLOOD PLAIN INFORMATION: MARICOPA COUNTY ARIZONA, VOLUME V, NEW RIVER REPORT.
Army Engineer District, Los Angeles, Calif.
Prepared for Maricopa County, April 1967. 33 p, 9 fig, 18 plates.

Descriptors: Floods, *Flood forecasting, *Flood plains, *Flood stages, *Flood damage, Flood flow, *Non-structural alternatives, *Flood frequency, Floodways, Storms, Historic floods, Peak discharge, Frail lands, Rivers, Channels, Levee, Arizona.
Identifiers: *Maricopa County(AZ), Peoria(AZ), New River(AZ), 100--year flood, 50-year flood, Phoenix (AZ), Aqua Fria River(AZ), Skunk Creek(AZ), Standard Project Flood.

The 27 mile reach of New River, a tributary of Agua Fria River, in this report is the flood plain extending upstream from Greenway Road (near the confluence with Skunk Creek) to the narrows about 5 miles upstream from Black Canyon Highway Bridge near the town the town of New Hope. The width of the flood plain varies from 2,000 to 6,000 feet, with most of the natural channel being shallow and not well defined. Development in the flood plain is almost exclusively agricultural but present rates of population growth in the Peoria area will bring residential development pressure to the flood plain in the near future. Three types of storms occur in the New River basin. General winter storms usually in December through March last for several days with widespread rainfall. General summer storms in June through September bring heavy precipitation for 24 hours over large areas followed by light showers for as long as 3 days. Local thunderstorms cause heavy rains for short periods in small areas. Since 1921, floods have occurred on this reach of New River ten times with some damage to agricultural areas. The worst flood occurred in August, 1943 with peak discharge reaching 38,000 cubic feet per second at the highway bridge at Peoria. A Standard Project flood would have an estimated peak discharge of 55,000 cfs at Greenway Road. Maricopa County has proposed flood plain zoning ordinances but these have not yet been adopted. Some levees have been constructed by private interests. The lower levels of the reach are most susceptible to flooding because of inadequate channel capacities. (See also W76-08806) (Henley - North Carolina)
W76-08809

FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for San Joaquin County, January 1974. 56 p, 23 fig, 37 plates, 10 tab.

Descriptors: Floods, Flooding, *Streamflow forecasting, *Flood profiles, *Peak discharge, *Flood peak, *Flood plains, Dams, Regional flood, Cloudbursts, Historic floods, Flood data, Flood frequency, Flow duration, Flood damage, Erosion, Deposition(Sediments), Obstructions to flow, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Levee, Diversion structures, Channel improvement, *California.
Identifiers: *Stockton(CA), Bear Creek(CA), Calaveras River(CA), Mosher Creek(CA), Stockton Diverting Canal(CA), San Joaquin River(CA), Paddy Creek(CA), Hogan Dam(CA), New Hogan Dam(CA), Mormon Slough(CA).

Properties in this study area are 93% agricultural, 3% residential, .5 to 1% commercial and 4% vehicle rights-of-way. Uses besides agriculture are increasingly slowly. Both principal streams, the Calaveras River with a drainage of 597 square miles, and Bear Creek with a drainage of 28 sq mi, are tributary to the San Joaquin River. Floods occur November to April resulting in high peak flows of moderate duration. Ninteen floods have been recorded by streamflow gages from 1907 to 1973. A flood in 1955 caused damages of $700,000 and had a peak flow of 14,200 cubic ft/sec and a 1958 flood caused losses totalling $1,400,000 with a peak discharge of 12,100 cfs. Hogan Dam (1936) and New Hogan Dam (1964) have lessened the impact of floods. In an Intermediate Regional Flood peak flows ranging up to 13,600 cfs and water velocities of up to 9 ft/sec are predicted. The height of rise would be up to 2.4 feet in 3 to 10 hours, depending on the creek. Time above flood stage would be from 18 to 26 hours. A Standard Project Flood would have a peak discharge of 22,700 cfs. The height of rise ranges up to 5.25 feet in 3 to 20 hours depending on the stream. Flood-stage would last from 9 to 46 hours. Many bridges and culverts would be obstructive to flood flow in either major flood. Flood control improvements include levees, channel improvement and a diversion facility which provide 50-60 year flood protection to the City of Stockton. San Joaquin County does not have a full zoning ordinance, though riparian areas are zoned for agricultural uses and structures are required to be set back from levees. The County is elegible for flood insurance. (Smith-North Carolina)
W76-08810

SPECIAL FLOOD HAZARD INFORMATION: MILL CREEK-GEKELER SLOUGH, LA GRANDE, OREGON.
Army Engineer District, Walla Walla, Wash.
Prepared for City of La Grande, Oregon, June, 1973. 8 p, 2 fig, 2 plates.

Descriptors: *Flood plains, *Flood damage, *Planning, *Obstruction to flow, *Floods, Land use, Flood data, Drainage area, Drainage patterns, Alluvial fans, *Oregon, Erosion.
Identifiers: Mill Creek(Oregon), Gekeler Slough(Oregon), Deal Creek(Oregon), *La Grande(Oregon), Taylor Creek(Oregon), Flood plain management, Flood hazard, Intermediate Regional Flood, Standard Project Flood, Sidehill runoff.

Stream and sidehill runoff flood hazards on Mill Creek and Gakeler Slough within the city of La Grande, Oregon, are outlined. Residential properties along these streams have been moderately damaged by past floods. The flood plain west of 10th Street contains the Mill Creek alluvial outwash fan with no well-defined drainage pattern. The area east of 10th Street is not an alluvial fan but also has a poorly defined drainage pattern, consisting of Taylor Creek, Deal Creek, and city area drainage. Deal Creek drainage has been altered by channelization, buried pipes, houses, streets, and the railroad so that its drainage pattern is unclear. Floods from the drainage areas should have short durations of less than 2 days, and should peak in less than a day. High velocity flow could occur any place within the indicated flood plain and could be highly erosive. The steep slopes of Mill Creek in the canyon areas (up to 825 feet per mile) can contribute material ranging from small gravels to large cobbles that effectively plug the stream channel, culverts, and buried conduit. The only known flood in this area occurred in January, 1965. The Intermediate Regional Flood peak discharge of the western and eastern parts are 790 cfs and 1400 cfs respectively. The Standard Project Flood peak discharge is 2100 cfs for the western area and 300 for the eastern area. (Diefendorf-North Carolina)
W76-08811

FLOOD PLAIN INFORMATION: RUSH CREEK-PETALUMA RIVER TO U. S. HIGHWAY 101, MARIN COUNTY, CALIFORNIA.
Jordon/Mathis and Associates, San Francisco, Calif.; and Army Engineer District, San Francisco, Calif.
Prepared for Marin County Flood Control and Water Conservation District, June 1975. 19 p, 10 fig, 10 plates, 1 tab.

Descriptors: *Floods, *Flooding, *Flood profiles, *Flood plains, *California, Overland flow, Overflow, Regional flood, Streamflow forecasting, Winds, Tides, Flood frequency, Peak discharge, Flood plain zoning, Levee.
Identifiers: Rush Creek(CA), Petaluma(CA), Novato(CA), Basalt Creek(CA), Intermediate Regional Flood, Five hundred Year Flood, San Pablo Bay(CA), Petaluma River(CA), Black John Slough(CA).

Development is concentrated mostly in the Upper Rush Creek Basin along Highway 101 and in the City of Novato with 60-70% of the area tributary to Rush Creek consisting of sparsely populated rolling hills covered with brush and trees. Ten to 12 percent of the drainage area is a flood plain and becomes a retention zone during heavy storms. A levee along Basalt Creek, extending to Black John Slough, was built to stop retained water from flowing back into protected areas. Tides in San Pablo Bay are transmitted to the Petaluma River and have an impact on flow characteristics of Black John Slough. Flood season is December to March, though there are floods in November. No streamgage data exists but important floods occurred in 1955, 1956, 1958, 1959 and 1973. High winds, high tides and failing levees have added to the impact of some floods. In an Intermediate Regional Flood peak discharges of 770 cubic feet per second and water velocities of 6 ft/sec are expected. In the case of a 500 year flood a peak discharge of 900 cfs is predicted with slightly higher water velocities. Damage to houses and public facilities could be severe in some areas. Some sections are also subject to flooding from direct rainfall though they would not be flooded by stream water. Hydraulic studies were based on the assumption that all culverts, gates and other conveyance structures were working well, but there is little evidence that this is true all of the time because of silting and mechanical problems. The Corps of Engineers has constructed no flood control structures in the Rush Creek Drainage Basin. Marin County does have Flood Plain Zoning Regulations which establishes Primary and Secondary Floodway Districts. (Smith-North Carolina)
W76-08812

FLOOD PLAIN INFORMATION: KINGS RIVER, SANGER, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for Fresno County, June, 1972. 40 p, 14 fig, 17 plates, 8 tab.

Descriptors: Flood flow, *Historic floods, *Flood plains, *Flood profiles, Reservoirs, Flood forecasting, *Flood frequency, *Floodways, Streamflow forecasting, Storms, Flood data, Peak discharge, Flow duration, Erosion, Deposition, Levee, Reservoir, Channel improvement, Snow melt, *California.
Identifiers: Sanger(Calif), Fresno County(Calif), *Kings River(Calif), *Mill Creek(Calif), Piedra(Calif), Pine Flat Lake(Calif), Hughes Creek(Calif), Standard Project Flood, Intermediate Regional Flood.

Flood hazards along the Kings River from Pine Flat Lake downstream to the vicinity of Sanger, California (3 miles) and along the lower 4 miles of

Mill Creek, a tributary stream entering the Kings River about 2 miles downstream from Pine Flat Lake, are discussed. Prolonged heavy rainfall between November and April creates high peak flows of moderate duration. More severe flooding occurs when ground is frozen and infiltration is minimal, during saturated ground conditions or with the addition of snow melt in late spring and early summer. Pine Flat Lake Project, completed in 1954 by the Corps of Engineers, has prevented damage in the area estimated at $88,330,000. Since its completion, there have been two floods resulting from rainfall and two snowmelt floods. The worst occurred in January, 1969, with peak discharge on Kings River at the gage at Piedra, reaching 16,000 cubic feet per second. Damage to orchards, vineyards, farmlands, and residences around Centerville was estimated at $700,000. Under existing conditions flooding may result from uncontrolled flows of Mill and Hughes Creeks and from large controlled outflows from Pine Flat Lake during major snowmelt floods. An Intermediate Regional Flood would have a peak discharge of 21,000 cfs at Piedra Road Bridge, channel velocities of 4-7 ft/sec and overbank flows of 1-4 ft/sec. A Special Project Flood would have a peak discharge of 26,000 cfs at the same location. Four bridges, vegetation, and boxes and crates stored in the flood plain can be expected to obstruct flood flows. (Henley-North Carolina)
W76-08813

FLOOD PLAIN INFORMATION: DRY CREEK AND TRIBUTARIES, ROSEVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for the City of Roseville, May, 1973. 40 p, 21 fig, 19 plates, 8 tab.

Descriptors: Floods, Flood flow, *Flood forecasting, *Flood profiles, *Flood stage, *Erosion, *Flood plains, Flooding, Storms, Historic floods, Flood data, Flood frequency, Flood peak, Bank erosion, Flood plain zoning, Warning systems, Channel improvement, *California.
Identifiers: *Roseville(Calif), Placer County(Calif), Dry Creek(Calif), Standard Project Flood, Intermediate Regional Flood, Antelope Creek(Calif), Cirby Creek(Calif), Linda Creek(Calif).

Lands in the study area along Dry, Antelope, Cirby, North Cirby, and Linda Creeks (drainage area equal 80 sq mi) are urbanized to various degrees ranging from scattered residential development to well established business districts. Vegetation, 12 bridges, 8 culverts, and 3 foot bridges could be expected to obstruct flood flows. Floods occur as the result of prolonged heavy rainfall between October and May. Total runoff volume is large with duration above flood stage on Dry Creek lasting as much as 12 hours during an Intermediate Regional Flood (IRF). Roseville has recently improved Dry Creek channel and has put in effect an Interim Flood Plain Zoning Ordinance. Sixteen floods have occurred in the last 40 years, the worst in October, 1962. Peak discharge reached 4,400 cubic feet per second on Dry Creek with considerable bank erosion, damage to water lines and residences. An IRF can be expected to have a peak discharge of 9,200 cfs with channel velocities of 5-7 ft/sec and overbank velocities of 1-3 ft/sec. A Standard Project Flood would have a peak discharge of 15,400 cfs, with slightly higher velocities than an IRF. Both floods would inundate agricultural lands, residential areas, parks, streets, commercial developments and public utilities. (Henley-North Carolina)
W76-08814

FLOOD PLAIN INFORMATION: GUADALUPE RIVER, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Santa Clara County Flood Control and Water District, January, 1972. 22 p, 3 fig, 18 plates, 6 tab.

Descriptors: Floods, Flooding, *Flood forecasting, *Flood profiles, *Floodways, *Flood plains, *Subsidence, Overflow, Flood flow, Streamflow forecasting, Maximum probable flood, Historic floods, Peak discharge, Flood peak, Flood damage, Obstruction to flow, Control structures, Levee, Reservoirs, Water storage, Percolation, *California.
Identifiers: *Guadalupe River(Calif), Calero Reservoir(Calif), San Jose(Calif), Almaden Reservoir(Calif), Alviso(Calif), Guadalupe Reservoir(Calif), Intermediate Regional Flood, Standard Project Flood, San Francisco Bay(Calif), Percolation basins.

Since World War II Santa Clara County has grown very rapidly and much former agricultural land has been taken over by residential and light industrial developments. Growth in this area, which includes cities of San Jose, Sunnyvale, Alviso, and part of the City of Santa Clara, is likely to continue at a rapid rate. The river system of which the Guadalupe is a part drains about 160 square miles. Calero, Almaden and Guadalupe contribute to the regulation of peak flows with 27,000 acre-feet additional storage provided on Los Gatos Creek. Main flood season extends from October through April when flooding may be caused by intense rainstorms over or adjacent to the Guadalupe Basin. Streamflow data has been available from gaging stations since 1930. The largest flood occurred in 1958 when the stream gage height of 16.55 ft, and a peak discharge of 9,150 cfs were recorded. Damages totaling $1,348,000 were reported. In the event of an Intermediate Regional Flood (IRF) it is anticipated that a peak discharge of 17,000 cfs may be reached with water velocities from about one ft/sec near to San Francisco Bay to about 12 ft/sec in the upper reaches. A Standard Project Flood (SPF) could produce a peak discharge of 34,000 cfs. Most of the 42 bridges and culverts are obstructive to the IRF and even more obstructive to the SPF. In some areas land subsidence has been as much as 14 ft, averaging 8 or 9 ft over the area subject to flooding, which has greatly increased flood hazards. Levees constructed and maintained by local interests on the Guadalupe and its tributaries provide some flood protection, as do the reservoirs and percolation basins within the system. (Smith-North Carolina)
W76-08815

FLOOD PLAIN INFORMATION: UMATILLA RIVER TRIBUTARIES, MCKAY, TUTUILLA AND WILDHORSE CREEKS, PENDLETON, OREGON AND VICINITY.
Army Engineer District, Walla Walla, Wash.
Prepared for Umatilla County, Oregon, March 1971. 43 p, 13 fig, 22 plates, 4 tab.

Descriptors: Floods, Flooding, *Flood profiles, *Historic floods, *Flood stages, Flow duration, *Flood frequency, *Runoff, Flow characteristics, Flood plains, Channels, Snowmelt, Non-structural alternatives, Levee, Reservoirs, *Oregon.
Identifiers: McKay Creek(OR), Tutuilla Creek(OR), Wildhorse Creek(OR), Umatilla River(OR), *Pendleton(OR), McKay Dam and Reservoir, Intermediate Regional Flood, Standard Project Flood.

The McKay, Tutuilla and Wildhorse Creeks are tributaries of the Umatilla River all of which originate in the Blue Mountains. The drainage areas for each is: McKay Creek, 190 sq mi; Tutuilla Creek, 59 sq mi; Wildhorse Creek, 205 sq mi. Development of McKay Creek's flood plain includes residential, commercial and agricultural areas as well as roads. For Tutuilla and Wildhorse Creeks, development of flood plains consists of limited residential and agricultural development. Obstructions to flows include vegetation, bridges, buildings close to the channel, and poor channel alignment. Flood damage prevention measures vary widely among the three creeks. McKay Dam and Reservoir, built in 1926, gives adequate protection from peak flows. Prevention measures on Tutuilla Creek are limited to widening the channel, increasing the capacity of the stream. Snowmelt due to the rapid warming caused by chinooks, and rainfall running off frozen ground are the principle causes of flooding. The Intermediate Regional Flood and the Standard Project Flood for each creek is: McKay Creek, 4,000 and 15,300 cubic feet per second; Tutuilla Creek, 3,400 and 6,700 cfs; Wildhorse Creek, 9,600 and 16,000 cfs. For an IRF channel and overbank velocities are 10 and 3, 13 and 4, 16 and 5 ft/sec for McKay, Tutuilla and Wildhorse Creeks respectively; and for an SPF, 14 and 5, 16 and 6, 17 and 5 ft/sec respectively for these same streams. (Gentry-North Carolina)
W76-08816

FLOOD PLAIN INFORMATION: COW CREEK, PALO CEDRO, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for Shasta County, June 1971. 36 p, 17 fig, 16 plates, 6 tab.

Descriptors: Floods, Flood flow, *Streamflow forecasting, *Flood profiles, *Flood data, *Flow duration, *Flood plains, Storms, Historic floods, Flood frequency, Flood stages, Flow characteristics, Flood damage, Bank erosion, Warning systems, Dams, Snowmelt, Obstructions to flow, *California.
Identifiers: Shasta County(CA), Cow Creek(CA), *Palo Cedro(CA), Millville(CA), Bella Vista(CA), Little Cow Creek(CA), Dry Creek(CA), Oak Run Creek(CA), Standard Project Flood, Intermediate Regional Flood.

The portion of Cow Creek and its tributaries, Dry Creek, Oak Run Creek and Little Cow Creek, covered in this report have a total drainage area of 428 square miles. The watershed is located in the northern end of Sacramento Valley in Shasta County, CA. Development in the flood plain is limited to mostly agricultural uses, but there is some residential and commercial development which is susceptible to flooding. Vegetation and 6 bridges obstruct large flood flows. The flood season is from November to May when rains are heaviest and most prolonged. Flooding is most severe when the ground is saturated or frozen or when snowmelt occurs. Eight floods have occurred since 1937, but information on them is sparce. Streamgage data indicates that the largest flood occurred in 1951 when a peak discharge of 42,500 cubic feet per second was recorded on Cow Creek. Floods in the past have washed out bridges, powerhouses and buildings in Shasta County, and with some loss of life. An Intermediate Regional Flood would have a peak discharge of 63,000 cfs on Cow Creek, along with water velocities of 11-15 ft/sec in the channel and 2-5 ft/sec in overbank areas. This flood would rise to peak in 8 hours and last 16 hours above critical stage. A Standard Project Flood would have a peak discharge of 93,000 cfs and water velocities slightly higher than the IRF. The floodwould rise to peak in 17 hours and last 28 hours. One dam in the area reduces flood peaks. A flood warning system exists in the area. (Henley - North Carolina)
W76-08817

FLOOD PLAIN INFORMATION: DARDENNE AND BELLEAU CREEKS, ST. CHARLES COUNTY, MISSOURI.
Army Engineer District, St. Louis, Mo.
Prepared for the County of St. Charles, April 1972. 22 p, 10 fig, 15 plates, 4 tab.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Missouri, Flooding, Flood flow, Streamflow forecasting, Flood forecasting, Peak discharge, Flood peak, Flow duration, Flow characteristics, Levee, Channel improvement.
Identifiers: *Dardenne Creek(MO), *Belleau Creek(MO), St. Charles County(MO), St Peters(MO), Standard Project Flood, Intermediate Regional Flood.

LIBRARY U. OF A. ARKANSAS-Water Res. Res. Ctr.

In the floodplains of both the streams of this study area are many residential and commercial structures, particularly in the village of St. Peters(MO) which is situated just outside of the Mississippi River flood plain. Belleau Creek, which drains 10.5 square miles, is a tributary of Dardenne Creek which has a drainage area of 102 sq mi and flows into the Mississippi River. Floods can occur at any time of the year and can rise very quickly after intense rainfall that accompanies severe storm fronts. No stream gage records exist for this area. Accounts of past floods have been taken from newspapers. Damaging floods have occurred as far back as 1882, the most recent in 1970. Large sections have been flooded in past events and damage has been compounded sometimes by the breaching of levees. In an Intermediate Regional Flood (IRF) peak discharges of 4500 cfs and 22,000 cfs are expected on Belleau and Dardenne Creeks, respectively, along with water velocities in the main channel from 1 to 7 ft/sec and 1 to 3 ft/sec in overbank areas. On Belleau Creek the IRF would rise to peak in 3 hours and last 12 hours above critical stage and on Dardenne Creek would rise to peak in 9 hours and last 25 hours. A Standard Project Flood would have peak discharges of 7600 and 41,700 cfs on Belleau and Dardenne Creeks, respectively. Water velocities would be slightly higher than during the IRF. The flood would reach peak in 7 to 13 hours on Belleau and Dardenne Creeks, respectively, and would last 19 hours and 37 hours on the two creeks. Most of the 21 bridges and culverts in the area are obstructive to flow in large floods. The only flood protection efforts have been levees and channel improvements. (Smith-North Carolina)
W76-08818

FLOOD PLAIN INFORMATION: ST. CHARLES COUNTY, MISSOURI, PART 2, PERUQUE CREEK.
Russell and Axon, St. Louis, Mo.; and Army Engineer District, St. Louis, Mo.
Prepared for the County of St. Charles, Missouri, July 1973. 27 p, 10 fig, 16 plates, 4 tab.

Descriptors: *Floods, *Flood forecasting, *Flood profiles, *Flood plains, *Missouri, Flooding, Regional flood, Streamflow forecasting, Historic floods, Peak discharge, Flood peak, Flow duration, Obstructions to flow, Levee, Lakes.
Identifiers: St. Charles County(MO), *Peruque Creek(MO), Lake St. Louis(MO), Standard Project Flood, Intermediate Regional Flood.

St. Charles County is rapidly urbanizing, having increased its population 75%, from 53,000 to 93,000 during the 1960's, and lost 55,000 acres of farmland and 6492 acres of cropland to urban needs. There are only a few farm buildings, and roads in the floodplain, but future large floods might cause severe damages if construction is permitted in the flood prone areas. Peruque Creek, a tributary of the Mississippi River, drains 72 square miles above the Mississippi flood plain. Flooding along this creek is not seasonal, and can occur at any time of the year. There are no stream gages in this area, but local residents believe that a 1946 flood was the largest in recent years. Newspaper accounts indicate that past floods have caused little damage though some structures and highways have been inundated. In an Intermediate Regional Flood (IRF) a peak discharge of 24,400 cfs is expected along with water velocities from 3 to 11 feet per second in the channel and 1 to 3 ft/sec in overbank areas is expected. This flood would rise to peak in 5 hours and remain above floodstage 18 hours. Thirteen of 20 bridges in the study area would be obstructive to flow. In a Standard Project Flood a peak discharge of 46,300 cfs is predicted and water velocities slightly higher than the IRF. The flood will reach peak in 29 hours and last 43 hours. All but two bridges would be obstructive to flood flow. Little in the way of flood protection has been undertaken to date. Lake St. Louis, near the center of this area, cannot be considered to possess flood storage capacity due to spillway design. A proposed Lake Wentzville is being considered for flood control. (Smith - North Carolina)
W76-08819

FLOOD PLAIN INFORMATION: MIDDLE RIVER ROUGE, NORTHVILLE, MICHIGAN.
United States Lake Survey, Detroit, Mich.
44 p, 12 fig, 8 plates, 13 tab. Prepared for Water Resources Commission, Michigan Department of Natural Resources and Southeast Michigan Council of Governments and the City of Northville, 1971.

Descriptors: Floods, Flooding, *Flood forecasting, *Flood profiles, Flow duration, *Flood plains, *Land use, *Michigan, Flooding, Regional flood, Streamflow forecasting, Maximum probable flood, Historic floods, Flood data, Peak discharge, Erosion, Rivers, Non-structural alternatives, Planning, Dams.
Identifiers: *Middle River Rouge(MI), Northville(MI), Phoenix Lake Dam(MI), Standard Project Flood, Intermediate Regional Flood.

Within the study reaches, portions of industrial, recreational and other open space, and residential development have experienced past flooding. Many structures are only slightly above stages expected in an Intermediate Regional Flood (IRF). The Middle Rouge has a drainage of 110 square miles of predominantly flat land, 56.5 sq mi of which is above the downstream study limit and includes the town of Northville and a portion of Phoenix Lake. In winter and spring floods result from general heavy rains, though floods may also occur during summer from local intense thunderstorms. Stream gages, in place since 1947, indicate a general trend toward larger flows. The largest flood, in 1947, reached disastrous proportions according to accounts. The slightly lower 1968 flood produced a peak discharge of 2440 cubic feet per second. In an IRF it is estimated that a peak discharge of 2350 cfs would occur at the local Phoenix Lake Dam along with water velocities of up to 8 feet per second in the main channel and 1.4 ft/sec in the flood plain. This flood would rise to peak in about 19 hours and last 56 hours above bankfull. During a Standard Project Flood a peak discharge of 5950 cfs is expected and water velocities of 10.9 ft/sec in the channel and 2.15 ft/sec in overbank areas. This flood would reach peak in 21 hours and last 89 hours. During this flood all bridges except 3 would be inundated and cause a heavy loss of head. The Wayne County Road Commission has been acquiring flood plain lands for many years in order to restrict flood plain development and development of open space. (Smith-North Carolina)
W76-08820

FLOOD PLAIN INFORMATION: SAPPA CREEK, OBERLIN, KANSAS.
Army Engineer District, Kansas City, Kans.
Prepared for the City of Oberlin, Kansas, November, 1973. 26 p, 14 fig, 9 plates, 3 tab.

Descriptors: Floods, Flooding, *Flood control, *Flood plains, *Flood damage, *Flood profiles, Flood protection, Levees, *Kansas.
Identifiers: *Sappa Creek(Kansas), Oberlin(Kansas).

Located in Northern Kansas, Sappa Creek has a drainage area of 1063 sq mi and consists of 3 separate streams flowing together near Oberlin. The creek then flows northeasterly to its confluence with the Republican River. A well-defined surface drainage pattern has been created by an old stream meander and sidehill drainage. Study area flood plain width ranges from 1/2 to 1 mile. The channel slopes approximately 6 ft/mi. Most of Oberlin's business district, and a sewage treatment plant which is protected by a levee, lie in the flood plain. A lake built flood control is practically silted in and offers no protection. Stream gaging records show that flood season begins with spring rains and continues through early summer. Flows are characterized by high stages, high velocities and medium length duration. A storm on either of the two main branches of the Creek or over the entire area could cause flooding at Oberlin. Bridges and the city itself present the greatest obstruction to flow with brush and debris obstructing the channel and bridge openings. No planned flood damage prevention program exists. The greatest known flood occurred on July 16, 1944 with a peak discharge of 10,600 cfs. An Intermediate Regional Flood and Standard Project Flood (SPF) woul have discharges of 21,000 cfs and 41,000 cfs respectively. An SPF would peak in about 45 hours, rising at a maximum rate of 1 ft/hr with Sappa Creek out of banks about 6 1/2 days. Under these flood conditions the flood plain area would be inundated, causing widespread damage in Oberlin. (Salzman - North Carolina)
W76-08821

FLOOD PLAIN INFORMATION: ARKANSAS RIVER, DERBY-MULVANE, KANSAS.
Army Engineer District, Tulsa, Oklahoma.
Prepared for the Kansas Water Resources Board, June 1975. 25 p, 6 fig, 9 plates, 4 tab.

Descriptors: Flooding, Flood flows, *Flood profiles, *Historic floods, *Flood stages, *Runoff, *Flood forecasting, Flood data, Flood frequency, Flow duration, Peak discharge, Flood peak, Flow characteristics, Flood plain, Channels, *Kansas.
Identifiers: Mulvane(KS), Derby(KS), *Arkansas River(Kan), Sumner County(KS), Sedgewick County(KS), Intermediate Regional Flood, Standard Project Flood.

The study area is 9.6 miles of the Arkansas River, from about three miles below the city of Mulvane (population 3,185) to the city of Derby (population 7,947). Although the Arkansas River drains 33,700 square miles above the Derby gage, only 3,566 sq mi of contributing drainage area between Derby and Great Bend, Kansas, are effective in producing flood peaks at the upper end of the study limit, 3,638 sq mi at the lower end. The flood plain in the study area is about 3.5 miles wide, and flat. Heavy rainstorms are generally responsible for flood peaks, occurring during the months of April through October. There have been 10 major floods since 1944, the largest of record being that of October 1973 with a peak flow of 45,800 cubic feet per second. Development along the river has been recent, and is predominantly agricultural, with recent residential development including individual homesites, housing developments and mobile home communities. Four bridges and vegetation can obstruct flood flows. The Intermediate Regional Flood and the Standard Project Flood will have peak discharges of 76,000 and 138,000 cfs respectively. Channel and overbank velocities during the IRF will be 3.7 and 1.9 ft/sec respectively, for the SPF 4.5 and 2.5 ft/sec respectively. (Gentry-North Carolina)
W76-08822

THE IN VITRO SENSITIVITY OF SOME SPECIES OF CHLOROPHYCEAE TO A SELECTED RANGE OF HERBICIDES,
Saskatchewan Univ., Regina. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08824

EFFECTS OF INITIAL FLOODING ON FOREST VEGETATION AT TWO OKLAHOMA LAKES,
Oklahoma State Dept. of Agriculture, Oklahoma City.
M. D. Harris.
Journal of Soil and Water Conservation, Vol. 7, No. 7, p. 294-295, 1975. 3 tab.

Descriptors: *Trees, *Flooding, *Reservoirs, Impounded waters, *Oklahoma, Varieties, Hardwood, Submergence, Shrubs, Stress, Vegetation, Recreation, Mortality, Maple trees, Oak trees,

Cottonwoods, Hickory trees, Ash trees, Sycamore trees, Willow trees, Pecans, Birch trees, Lakes.
Identifiers: Reservoir flood pool, Hackberry, Elm, Buttonbush, Mulberry, Baldcypress, Water-tolerant trees, Kingstone Reservoir(Okla), Oologah Reservoir(Okla).

Post-flood surveys were made of hardwood trees in flood pools of Keystone and Oologah impoundments, Oklahoma. Inundation lasted 7-100 days, with the first 10 ft lasting 67-73 days. Flood damage was most severe in the first 10 feet above normal pool level. Above this, mortality of smaller trees and shrubs was greatest though most larger trees survived. Most completely submerged trees were killed. Trees with some crown above water or which were only submerged for a few days showed stress in July--small, malformed, yellowing leaves on main branches only. Increment borings revealed discolored cambium layers and sour smells. About 80% of the trees that showed stress and were less than 10 inches in diameter at breast height and 25 feet tall died. Larger, taller showed no visible stress except for reduced later summer growth rates. Mortality was highest among oak-hickory types and increased as size decreased. Mortality was less with hackberry, pecan, elm, green ash, sycamore, cottonwood, and willows. When properly planted and maintained, green ash, sycamore, cottonwood (cottonless), buttonbush, willow, mulberry (fruitless), silver maple, bald-cypress, and river birch grow rapidly and are soon tall and large enough in diameter to withstand flooding. (Buchanan-Davidson--Wisconsin)
W76-08831

A CRITICAL STUDY OF FLOOD PROTECTION PLANNING IN THE SUSQUEHANNA RIVER BASIN: 1936-1972,
Cornell Univ., Ithaca, N. Y.
For primary bibliographic entry see Field 6F.
W76-08846

USER CHARGES FOR INLAND WATERWAYS: A REVIEW OF ISSUES IN POLICY AND ECONOMIC IMPACT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
L. A. Shabman.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 765, $5.50 in paper copy, $2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 91, May 1976. 106 p, 8 fig, 22 tab. OWRT B-061-VA (1)

Descriptors: *Inland waterways, *Use rates, Water rates, Navigation, Evaluation, *Cost analysis, Cost sharing, Water policy, *Economic impact, Benefits, Taxes.
Identifiers: *User charges.

Numerous studies have discussed the various issues associated with the adoption of user charges for inland waterways. This study is a synthesisof these discussions, and a preliminary analysis, using secondary data sources, of the economic impact of alternative user charge policies. The main conclusions are: (1) the benefits of a free waterway policy are shifted forward to shippers and their customers; (2) a fuel tax would have limited effects on traffic movements while a segment toll would result in closing of some parts of the waterway system. Under the most severe cost conditions, only 3 percent of the total traffic would move from the system.
W76-08847

FIELD EVALUATION OF A PREDICTIVE MODEL FOR THERMAL STRATIFICATION IN LAKES AND RESERVOIRS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W76-08920

MODELS FOR EVALUATION OF FRESHWATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 950, $5.00 in paper copy, $2.25 in microfiche. Publication No. 32, Massachusetts Water Resources Research Center, Amherst, January 1976. 91 p, 8 fig, 18 tab, 60 ref. J. S. Larson, editor. OWRT B-023-MASS(14), 14-31-0001-3596.

Descriptors: *Wetlands, Economics, Wildlife, Aesthetics, Flood control, Evaluation, Northeast U. S., *Model studies, *Massachusetts, Planning, Regulation.
Identifiers: Groundwater models, Economic models.

Four sub-models for relative and economic evaluation of freshwater wetlands are presented within a single, three-phase eliminative model. Wildlife and visual-cultural models are based on physical characteristics. Each characteristic is given values by rank and coefficient. A relative numerical score is calculated for the total wetland characteristics and used to compare it with a broad range of northeastern wetlands. A groundwater model places wetlands in classes of probable groundwater yield based on surficial geologic deposits under the wetland. An economic submodel suggests values for wildlife, visual-cultural aspects, groundwater and flood control. The submodels are presented within the framework of an overall three-phase eliminative model. Phase I identifies wetlands which should be protected at all costs. Phase II applies the wildlife, visual-cultural and groundwater sub-models to those wetlands which do not meet the criteria for outstanding wetlands. Phase III develops the economic values of the wetlands evaluated in Phase II. The models are intended to be used by local, regional and state resource planners and wetland regulation agencies.
W76-08921

METHODS OF ESTIMATING RESIDENTIAL LAND USE FOR WATER RESOURCES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Economics.
For primary bibliographic entry see Field 4C.
W76-08924

WATER CONTROL SOLVES TOUGH SEWER PROBLEM,
For primary bibliographic entry see Field 8B.
W76-08967

URBAN RUNOFF MODELLING,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Div.
J. Marsalek.
Civic, Vol. 27, No. 3, p 32-36. March 1975, 3 fig, 2 tab, 3 ref.

Descriptors: *Model studies, *Computer models, *Runoff, *Urban runoff, Hydraulic models, Storm runoff, Water quality, Urban drainage.
Identifiers: *Hydrocomp model.

Because of new concepts in urban drainage design, such as runoff control at source, detention, retention and storm water quality considerations, new predictive methods are needed for urban runoff. A model is needed which transforms an input rainfall into a runoff hydrograph for a particular urban area. Features of existing models are summarized. Most include the following components: catchment hydrology (precipitation, infiltration, detention, retention, and surface runoff); sewer hydraulics; and water quality aspects. A table shows whether or not 22 existing models take 16 factors in these three areas into account. There is a wide variation among models, from 1 aspect taken into account by the unit hydrograph to 14 or 16 aspects accounted for by the model called Hydrocomp. In comparison to the traditional 'rational' method of predicting runoff, the computer models are far more accurate. Calibration can improve a model for use in a particular area. With such a model an engineer can design a drainage system in an area including various runoff control schemes and estimating resulting pollution in receiving waters. A wide variety of user needs can be satisfied by available models and for many, computer programs are available. It is recommended that municipalities start collection of precipitation runoff data for future design of urban drainage. (Smith-North Carolina)
W76-09033

THE PHRAGMITETEA AND MOLINIETALIA ASSOCIATIONS IN THE THAYA, MARCH AND DANUBE RIVER BASINS OF AUSTRIA, (IN GERMAN),
E. Balatova-Tulacova, and E. Huebl.
Phytocoenologia. 1(3); p 263-305, 1974.

Descriptors: *River basins, Europe, *Meadows, Humidity, Moisture, Soil analysis, Temperature, Precipitation(Atmospheric).
Identifiers: *Austria, Danube River basin, *Molinietalia, *Phragmitetea, Thaya(River Basin).

A phytosociological and ecological description of moist and wet meadows along the rivers Thaya, March and Danube in the northeastern part of Austria is given. Mean annual temperatures in the region range from 9-10C average precipitation from 559-612 mm. Most of the associations discussed are subject to the dynamics of the rivers, i.e., their floristic compositions are influenced mostly by the height and duration of inundations. Beginning with Glycerietum maximae. The associations of periodically flooded meadows can be arranged in an ecological series of decreasing humidity. From the associations encountered, those belonging to Phragmitetalia and Magnocaricetalia are found throughout central Europe, while most of the Molinietalia associations are members of the Cnidion venosi alliance characteristic for continental Europe. The species of Cnidion venosi need alternating inundations and dry soil conditions during the year. Among the driest associations in the ecological series are Silaetum pratensis and especially Serratulo-Festucetum commutatae, both members of the Molinion coeruleae alliance. Soil samples from the associations studied were analyzed to a depth of 35 cm.--Copyright 1976, Biological Abstracts, Inc.
W76-09076

HYDROTHERMIC REGIME AND PRODUCTIVITY OF FORESTS OF NATURAL ORIGIN, (IN RUSSIAN),
For primary bibliographic entry see Field 2I.
W76-09080

EFFECT OF THE MOZHAYSK RESERVOIR ON SOIL OF THE BANK AREA OF THE SURROUNDING TERRITORY, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
For primary bibliographic entry see Field 2G.
W76-09081

MEADOW VEGETATION AND FORAGE RESOURCES OF THE URAL RIVER FLOODPLAIN, (IN RUSSIAN)
E. A. Ageleuv.
Izv Akad Nauk Kaz SSR Ser Biol 13(1), p 8-16, 1975.

Descriptors: *Vegetation, Meadows, Flood plains, *Forage, Rivers.
Identifiers: Steppe, *USSR(Ural River flood plain).

LIBRARY U. OF A. UNDERWATER [illegible]

Investigations of the floodplain meadows of the Ural River were carried out in 1962-1971. The Ural floodplain is divided into 6 geobotanical regions: upper steppe, middle steppe, interplatform middle steppe, near-Caspian steppe, near-Caspian desert Ural and delta floodplain. A classification of the Ural floodplain meadows is presented. In all, 153 associations were noted, which are combined into 36 formations belonging to 3 classes: steppe, true and marshy. The forage characteristics of the meadows are described. There is a need to develop a system of measures aimed at the improvement and rational use of the floodplains in connection with the construction of the Volga-Ural canal and diversion of part of the runoff of Siberian rivers to western Kazakhstan (USSR).--Copyright 1975, Biological Abstracts, Inc.
W76-09098

HYDROLOGIC UNIT MAP--1974, STATE OF MINNESOTA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09131

STATISTICS OF DATA TRANSFER,
Geological Survey, Reston, Va.
N. C. Matalas, E. Todini, and J. R. Wallis.
In: Hydrological Network Design and Information Transfer; Proceedings of international seminar, held at Newcastle upon Tyne, U K, August 19-23, 1974: World Meteorological Organization Operational Hydrology Report No 8 (WMO No 433), p 103-109, 1976. 2 tab, 7 ref.

Descriptors: *Streamflow forecasting, *Regression analysis, *Statistical methods, Analytical techniques, Data collections, Equations, Sites, Estimating.
Identifiers: *Data transfer, Information transfer.

In water resources investigations, extensive use is made of statistical parameters, such as the mean and variance that characterize streamflow. Given two sites, one with a longer length of record than the other, but where the records are to some extent concurrent, information may be transferable from the long-term to the short-term site. An analytical technique of information transfer is outlined, and the use of the technique as a network design tool is illustrated. Discussion is limited to estimating the mean. (Woodard-USGS)
W76-09133

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1974 IN DADE COUNTY FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-09135

SEDIMENT TRANSPORT, TURBIDITY, CHANNEL CONFIGURATION, AND POSSIBLE EFFECTS OF IMPOUNDMENT OF THE MAD RIVER, HUMBOLDT COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-09136

A TECHNIQUE FOR ESTIMATING THE TIME OF TRAVEL OF WATER IN INDIANA STREAMS,
Geological Survey, Indianapolis, Ind.
S. E. Eikenberry, and L. G. Davis.
Available from National Technical Information Service, Springfield, Va 22161, as PB-251 934 as printed copy, $4.00, microfiche $2.25. Water-Resources Investigations 76-9, March 1976. 39 p, 19 fig, 3 tab, 13 ref.

Descriptors: *Path of pollutants, *Streams, *Indiana, *Travel time, *Forecasting, Analytical techniques, Streamflow, Solutes, *Flow rates, Channel morphology, Flow characteristics, Equations.

Estimates of the traveltime of waterborne particles in streams is important for pollution studies and in the event of spills of contaminants. This report provides data for the 16 Indiana streams on which time-of-travel information has been obtained and a means for estimating the velocity of any naturally flowing stream in Indiana with a drainage area of 80 square miles (210 square kilometres) or more. Measured velocity rates compiled from the time-of-travel data are related to 25, 50, 100, and 200 percent of the average discharge of streams. Velocities at these discharges are significantly related to their respective watershed characteristics (average discharge and slope). Generalized relations of the velocities as functions of the streams' watershed characteristics are developed as multivariate regression equations using the data from each of the measured streams. Examples of uses and applications of the measured data and the predictive equations are given. (Woodard-USGS)
W76-09138

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 7C.
W76-09145

LOW-FLOW CHARACTERISTICS AND MEAN ANNUAL DISCHARGE OF NORTH BRANCH MANITOWOC RIVER AT POTTER, WISCONSIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 7C.
W76-09147

WATER RESOURCES OF WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
C. A. Pascale.
Available from Florida Dept. of Natural Resources, Tallahassee, for $1.39. Florida Bureau of Geology, Tallahassee, Report of Investigations No 76, 1974. 65 p, 28 fig, 8 tab, 15 ref, append.

Descriptors: *Groundwater resources, *Surface waters, *Water quality, *Water supply, *Florida, Hydrologic data, Aquifer characteristics, Hydrogeology, Streamflow, Water utilization, Water wells, Water level fluctuations.
Identifiers: Walton County(Fla).

Walton County is an area of about 1,140 sq mi in northwestern Florida. Total water use in 1970 averaged about 13.2 mgd of which 12.7 mgd was from the Floridan aquifer. Water used for irrigation averaged 10 mgd and exceeded all other uses. The Floridan aquifer underlies all of Walton County and is the primary source of water supply. It is an important hydrogeologic unit because of its capacity to store water and to maintain streamflow. The transmissivity of the Floridan aquifer is highly variable and ranges from 4,000 gpd/ft along the gulf coast to 180,000 gpd/ft in southeastern Walton County. Dissolved solids of water from wells range from 70 to 3,500 mg/litre; chlorides vary to a maximum of about 2,000 mg/litre. Groundwater pumpage for irrigation in 1970 in southeastern Walton County caused water levels there to decline more than 80 feet. Total discharge of streams originating in Walton County averages about 1.0 bgd; minimum discharge during dry spells is about 300 mgd. Although most streams yield copious amounts of good quality water, none are used for water supply. (Woodard-USGS)
W76-09149

WATER DIVERSION AND THE MORATORIUM,
Washington Univ., Seattle. School of Law.
R. W. Johnson.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p. 39-62. 35 ref., 3 append.

Descriptors: *Interstate, *Inter-basin transfers, *Legal aspects, *Water policy, Water rights, Southwest U.S., Rocky Mountain region, Pacific Northwest U.S., Legislation, State governments, Federal government, Judicial decisions, Interstate compacts, Colorado River basin, Columbia River.

While the question of Congressional legislation on interstate basin transfers of water has been deferred in 1968 for ten years, partially to allow the National Water Commission to study the nation's water requirements, the needs for large quantities of water to develop oil shale and coal deposits in the Rocky Mountain area, to resolve increasing salinity in the Colorado River basin, and to rescue large agricultural and urban communities in the Southwest, especially in Arizona and Texas, focus on federal legislation and a break with past policies and new approaches to the evaluation of proposals for major interbasin transfers. Discussed are Supreme Court decisions as they relate to congressional power to legislate interstate transfers, the states' rights of veto, the Senate's reaction to proposed Columbia River diversion to the Southwest, equitable treatment for areas of water origin, the environmentalists' impact on such transfers, and transfers from Canada to the United States. It is suggested that if a major advantage to the nation would accrue with only a minor cost to the Pacific Northwest, or other areas of origin, then such transfers should go forward, with appropriate compensation to the area of origin for its losses. The National Water Commission's recommendations would permit an objective and realistic evaluation of this issue. (See also W76-09230) (Auen-Wisconsin).
W76-09234

PROTECTION OF FREE-FLOWING RIVERS,
Oregon State Univ., Corvallis. Dept. of Geography.
For primary bibliographic entry see Field 6E.
W76-09235

AN EVALUATION OF ERTS DATA FOR OCEANOGRAPHIC USES THROUGH GREAT LAKE STUDIES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2H.
W76-09244

EVALUATION OF A MONTHLY WATER YIELD MODEL,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W76-09246

A THEORY OF FLOW RESISTANCE FOR VEGETATED CHANNELS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
G. T. Thompson, and J. A. Roberson.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 2, p 288-293, March-April 1976. 5 fig, 12 ref.

Descriptors: *Model studies, *Channel flow, *Flow resistance, Mathematical models, Drag, Vegetation, Roughness(Hydraulic), Flow, Viscosity, Fluid mechanics, Fluid friction, Hydraulics.
Identifiers: Vegetated open channels.

A theory was developed to predict the flow resistance in vegetated open channels. The solution technique was based on an analytical metho

originally proposed by Roberson for smooth conduits roughened with discrete submerged roughness elements. Flow conditions may either partially or fully submerge the cylinders. Included in the analysis is a method to predict the effect of flexible vegetation on flow resistance. The model also predicts resistance effects of a smooth boundary or one roughened by dense concentrations of small elements such as soil particle aggregates. An initial comparison of flume measurements of resistance for small diameter cylinders was given. The analytical model provides, in addition to resistance factor, other flow parameters involved in analytical solutions of vegetated open channel flow. (Sims - ISWS)
W76-09252

UNIT HYDROGRAPHS - A COMPARATIVE STUDY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W76-09254

DRAINAGE SYSTEM EFFECTS ON PHYSICAL PROPERTIES OF A LAKEBED CLAY SOIL,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-09259

QUANTITATIVE ASSESSMENT OF CHANGES IN URBAN RUNOFF,
Texas Univ. Health Science Center, Houston. School of Public Health.
For primary bibliographic entry see Field 4C.
W76-09267

4B. Groundwater Management

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN WELL DRILLING OPERATIONS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W76-08889

TECHNIQUES OF SHALLOW WELL DRILLING,
Layne Atlantic Co., Norfolk, Va. Water Resources Div.
For primary bibliographic entry see Field 8B.
W76-08891

GROUND WATER PROBLEMS ASSOCIATED WITH WELL-DRILLING ADDITIVES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-08902

MOBILITY OF WELL-DRILLING ADDITIVES IN THE GROUND WATER SYSTEM,
National Water Well Association, Worthington, Ohio. Research Facility.
For primary bibliographic entry see Field 5B.
W76-08904

MOVEMENT OF CHEMICAL CONTAMINANTS IN GROUND WATER,
Dames and Moore, Park Ridge, Ill.
For primary bibliographic entry see Field 5B.
W76-08905

OBJECTIVES OF WELL-DRILLING REGULATIONS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W76-08917

MODELS FOR EVALUATION OF FRESHWATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 4A.
W76-08921

HYDROGEOLOGICAL CONDITIONS OF AL-HAMAD AREA, IRAQ,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
For primary bibliographic entry see Field 2F.
W76-09068

A PRELIMINARY WATER AND ENERGY BUDGET ANALYSIS OF MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
A. J. Brazel.
Journal of the Arizona Academy of Science, Vol. 11, No. 1, p. 9-15, February, 1976. 6 fig, 3 tab, 5 ref, 1 append.

Descriptors: *Hydrologic budget, *Energy budget, *Artesian wells, *Microclimatology, *Heat balance, Inflow, Discharge(Water), Water loss, Subsurface investigations, Water temperature, Air temperature, Vapor pressure, *Arizona.
Identifiers: *Montezuma Well(Ariz), Montezuma Castle National Monument(Ariz), Verde Basin(Ariz), Beaver Creek(Ariz).

A study was made of the energy and water budget and surrounding microclimate of Montezuma Well, a thermal artesian well in the Verde Basin of Central Arizona. For a 30-hour period in early November, the mean air temperature was 10 C (0.3 C cooler than the mean daily temperature at nearby Montezuma Castle National Monument). The largest heat flux was that associated with inflow and outflow (over 2,000 lys/day), although the net difference was only 187 lys/day. Very little water loss is via the irrigation ditch draining into Beaver Creek. Air in the well depression remains cooler during the day and slightly warmer at night than the surrounding desert, the well rim being the warmest site. Vapor pressure deficits during the day were much greater over the desert and rim sites than the well site. Such variations are partly a function of the well's vapor flux. Temperatures must vary greatly within the well environment, mostly due to slope and exposure characteristics of the cliff walls, and apparently correspond to plant cover variations. The well's late fall energy budget seems to be a balance between net radiation and evaporation, and between net energy gain from inflow-outflow and loss of sensible heat to the atmosphere by conduction and convection. (Jahns-Arizona)
W76-09072

PROTECTION OF ROMANIAN UNDERGROUND WATER FAUNA, (IN ROMANIAN),
Academia R. S. R., Cluj. Institutul de Spelologie.
For primary bibliographic entry see Field 2I.
W76-09085

GROUND-WATER LEVELS AND CHEMICAL QUALITY OF GROUND WATER IN LINCOLN, MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 7C.
W76-09132

HYDROLOGIC ENVIRONMENTAL EFFECTS OF SPRAYED SEWAGE EFFLUENT, TALLAHASSEE, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-09134

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1974 IN DADE COUNTY FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-09135

THE EFFECTS OF GROUND-WATER DEVELOPMENT ON THE WATER SUPPLY IN THE POST HEADQUARTERS AREA, WHITE SANDS MISSILE RANGE, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W76-09137

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--CALIFORNIA REGION,
Geological Survey, Reston, Va.
H. E. Thomas, and D. A. Phoenix.
Available from Supt. of Documents, GPO, Wash., D.C., 20402, price $2.30. Professional Paper 813-E, 1976. 51 p, 14 fig, 1 plate, 12 tab, 135 ref.

Descriptors: *Groundwater resources, *Surface waters, *Water quality, *Available water, *California, Reviews, Evaluation, Water supply, Water demand, Water utilization, Hydrogeology, Land subsidence, Water pollution sources.
Identifiers: California Region.

Most people in the California Region live in a semiarid or arid climate, with precipitation less than the potential evapotranspiration--environments of perennial water deficiency. However, water from winter rain and snow can be stored for use during the dry summer months, and water stored during a wet climatic period can be used in a succeeding dry period; moreover, perennial deficiency can be overcome by bringing water from areas of perennial surplus. Nearly all the groundwater reservoirs of the California Region are in alluvial sediments of valleys and plains that flank the mountain ranges. The largest, underlying the vast Central Valley, occupies 10 percent of the area of the region, has an estimated usable capacity exceeding 100 million acre-feet (125 cubic kilometres), and has an annual pumpage from wells of about 13 million acre-feet (16 cubic kilometres). For more than half a century the California Region has led all others in North America in pumping of groundwater as well as in the area, variety, yield, and export of crops irrigated by water from wells. (Woodard-USGS)
W76-09139

GROUND-WATER DATA FOR SUNFLOWER COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09140

GROUND-WATER DATA FOR CARROLL COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09141

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN CHAMBERS, LIBERTY, AND MONTGOMERY COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-09144

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN SELECTED COAL-ENERGY AREAS OF UTAH,
Geological Survey, Salt Lake City, Utah.
K. M. Waddell.

LIBRARY U. OF I. URBANA-CHAMP.

Open-file report, April 1976. 21 p, 5 fig, 2 tab, 12 ref.

Descriptors: *Environmental effects, *Coal mines, *Water resources, *Utah, Water pollution sources, Water quality, Surface waters, Groundwater, Sediments, Data collections, Water demand, Water wells.

Planned coal development in Utah in the next decade includes thermal-electric and coal gasification plants and slurry pipelines with estimated water requirements that may exceed 200,000 acre-ft (246.6 cubic hectometres) annually. The U.S. Geological Survey presently maintains a minimal monitoring program on streams and wells in the coalfield areas. The program consists of 116 stream-gaging stations, 18 at which chemical-quality data are obtained and 14 at which sediment data are obtained. The groundwater monitoring program consists of 170 wells for water-level monitoring and 16 wells at which samples are obtained for chemical analysis. Five areal water-resources studies are being made in the vicinity of Utah coalfields. The principal study where coal mining is most active is in the Wasatch Plateau-Book Cliffs area. This is a 2-year hydrologic reconnaissance designed to provide an assessment of the current hydrology, which will aid in the solution to some of the potential problems that may occur as a result of coal-energy development. (Woodard-USGS)
W76-09148

WATER RESOURCES OF WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-09149

HYDROLOGIC CONCEPTS OF ARTIFICIALLY RECHARGING THE FLORIDAN AQUIFER IN EASTERN ORANGE COUNTY, FLORIDA--A FEASIBILITY STUDY,
Geological Survey, Columbus, Ohio.
D. D. Knochenmus.
Available from Florida Dept. of Natural Resources, Tallahassee, for $1.17. Florida Bureau of Geology, Tallahassee, Report of Investigations No 72, 1975. 36 p, 14 fig, 2 tab, 17 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Underground storage, *Water management(Applied), *Florida, Methodology, Aquifer characteristics, Artesian aquifers, Confined water, Hydrologic systems, Water wells, Transpiration control, Hydrologic cycle, Water table, Water quality, *Feasibility studies.
Identifiers: *Floridan aquifer(Fla), Orange County(Fla).

In east Orange County, Fla., the hydrologic system cycles about 55 inches of rainfall per year of which 10 to 15 inches run off, 40 to 45 inches evapotranspire, and 0 to 2 inches recharge the Floridan (artesian) aquifer. The water level in the nonartesian aquifer is at, or near, land surface and as much as 30 feet above the potentiometric surface of the Floridan aquifer. Little downward leakage (recharge) takes place because the nonartesian aquifer is separated from the Floridan aquifer by a thick sequence of clayey sands. The supply of water for artificially recharging the Floridan aquifer with a network of optimally designed and spaced connector wells (wells that tap both the nonartesian and Floridan aquifer) would be derived from the capture of potential water losses--evapotranspiration and runoff. Water would drain from the nonartesian aquifer into the Floridan aquifer and lower the water table. Lowering of the water table would reduce evapotranspiration losses and provide storage capacity for rainfall that would otherwise run off. (Woodard-USGS)
W76-09150

DETERMINATION OF THE HYDRAULIC CONDUCTIVITY - DRAINABLE POROSITY RATIO FROM WATER TABLE MEASUREMENTS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W76-09249

HYDROLOGICAL PROBLEMS ASSOCIATED WITH DEVELOPING GEOTHERMAL ENERGY SYSTEMS,
Geological Survey, Denver, Colo.
R. H. Pearl.
Ground Water, Vol. 14, No. 3, p 128-137, May-June 1976. 3 fig, 52 ref.

Descriptors: *Geothermal studies, *Groundwater, *Hydrologic aspects, *Energy, Thermal properties, Thermal springs, Wells, Thermal water, Geology, Groundwater movement, Hydrogeology, Recharge, Porosity, Permeability, Water demand, Legal aspects.
Identifiers: *Geothermal energy, Geothermal systems.

Geothermal energy - the naturally occurring heat of the earth's crust - has been used since earliest time by man for a variety of purposes. In recent times, wells have been drilled in close proximity to surface indicators of geothermal heat in an attempt to utilize this resource. The steam or hot water obtained from these wells has been used for agricultural and recreational purposes, to heat buildings, and to generate electricity. It has been estimated that by the year 2000 between 30,000 Mw and 395,000 Mw of electricity can be generated in the United States with naturally occurring steam. At present, and probably for years to come, the primary geothermal exploration efforts will be aimed at discovering and developing high-temperature hydrothermal systems to be used for generation of electricity. Typical problems that will be encountered in the exploration and development of such systems are: (1) defining the type of hydrothermal system under investigation; (2) groundwater flow direction, whether it is vertical or horizontal; (3) recharge rates and areas; (4) porosity and permeability determination; (5) water needs and consumptive usage; (6) disposal of waste fluids; and (7) legal and institutional considerations. A discussion of each problem area was presented. In order to solve many of these problems at the outset, it is believed that the geohydrologist should be an essential member of the exploration team. (Sims - ISWS)
W76-09260

SUBSURFACE BRINE DISPOSAL - BE REASONABLE,
Engineering Enterprises, Inc., Norman, Okla.
For primary bibliographic entry see Field 5B.
W76-09261

PRIVATE WELLS PROVE TO BE A BETTER BUY,
Ground Water Age, Vol. 10, No. 8, p 21-22, April, 1976.

Descriptors: *Water rates, *Pricing, *Cost comparison, Amortization, Water wells, Nebraska.
Identifiers: *Domestic wells, Rural water systems.

Rancher Kenneth Schroeder of Wakefield, Nebraska undertook a detailed two year water use study and proved that private wells can provide water more economically than central rural water systems. Schroeder saves approximately $500 annually by supplying his own water. This figure will vary depending on the abundance of good quality water. (Gass-NWWA)
W76-09343

INTACT MANURE PACK HALTS SEEPAGE,
For primary bibliographic entry see Field 5G.
W76-09344

COUNTERMEASURES TO CONTROL OIL SPILLS IN WESTERN CANADA,
EBA Engineering Consultants Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5G.
W76-09346

THE AVAILABILITY OF GROUND WATER FOR IRRIGATION IN THE RICE LAKE-EAU CLAIRE AREA, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
E. A. Bell, and S. M. Hindall.
Wisconsin University Extension, Madison, Geological and Natural History Survey, Information Circular Number 31, 1975. 65 p, 33 fig, 4 tab, 30 ref.

Descriptors: *Groundwater, *Irrigation water, *Glacial drift, *Sandstones, Irrigable land, Soil environment, Soil moisture, Aquifers, Permeability, Water wells, Irrigation wells, Groundwater recharge, Dissolved solids, Calcium compounds, Boron, *Wisconsin.
Identifiers: *Rice Lake-Eau Claire area(Wis), Red Cedar river valley(Wis), Lower Chippewa river valley(Wis), Menomonie area(Wis), Cameron area(Wis), Dunn County(Wis).

An abundance of ground water of excellent chemical quality for irrigating crops is available from glacial outwash sand and gravel and from the underlying sandstones in the Rice Lake-Eau Claire area. Thick deposits of glacial outwash sand and gravel in the valleys of the Red Cedar and lower Chippewa Rivers yield more than 1,000 GPM (63 litres per second) to many wells. Large tracts of irrigable soils, delineated in two subareas (Rice Lake and Cameron) in Barron County and one subarea (Menomonie) in Dunn County, lie within the outwash plains where ground water is available in large quantities. Yields are especially large in the Rice Lake and Cameron subareas where the sand and gravel is highly permeable and the thickness of saturated aquifer exceeds 250 feet (75 metres). Yields generally are less than 1,000 GPM (63 litres per second) in the Menomonie subarea where large amounts of clay locally reduce the permeability of the aquifer and the thickness of saturated aquifer is less than 200 feet (60 metres). Adequate water for irrigation is available also from sandstone underlying the glacial outwash plains. Because the two aquifers generally are connected hydraulically, wells penetrating the sandstone also withdraw water indirectly from the glacial drift. Most irrigation wells in Barron County withdraw water from glacial outwash; more than half the irrigation wells in Dunn County withdraw water from sandstone. In most years, recharge to the ground-water reservoir is 6 to 8 inches (150 to 200 millimetres), which is more than ample to sustain pumping for irrigation without lowering the water table significantly. (Heiss-NWWA)
W76-09348

WATER MONITORING - JIM BRIDGER PROJECT - SWEETWATER COUNTY, WYOMING,
Fox (F. M.) and Associates, Inc., Wheat Ridge, Colo.
For primary bibliographic entry see Field 5A.
W76-09349

APPLICATION OF GROUND-WATER FLOW THEORY TO A SUBSURFACE OIL SPILL,
Geological Survey, Menlo Park, Calif. Engineering Geology Branch.
For primary bibliographic entry see Field 2L.
W76-09350

THE ROLE OF GROUND WATER.
For primary bibliographic entry see Field 2F.
W76-09353

COST ESTIMATION.
Ground Water Age, Vol. 10, No. 5, p 23, 26, January, 1976. 1 fig.

Descriptors: *Cost analysis, *Estimated costs, *Operating costs, Annual costs, Water wells.
Identifiers: *Drilling cost estimation, Criteria for cost estimation.

Water well drillers should be able to approximate the drilling difference based on various types of formations in order to arrive at cost figures which will give him a profitable operation. Terrain and road conditions, drilling rig parts accessibility, labor, as well as fuel and lubrication costs are all important considerations to a drilling job budget sheet. An example is given based on a 2,000 hour per year operation. The 2,000 hours are divided into a determination of yearly rig cost ($10,000.00 per year) to yield a cost per hour figure of $5.00. Next an estimation of average footage drilled per hour must be made. In the example, a rate of 2 feet per hour is given. The footage figure is then divided into the cost per hour giving the cost per foot of the well drilled. Using the above figures, a driller can estimate charges for his services. (Heiss-NWWA)
W76-09354

WATER FOR THE IVORY COAST.
For primary bibliographic entry see Field 8C.
W76-09355

CATHODIC PROTECTION WELLS AND GROUND WATER POLLUTION,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W76-09357

MAKING THE WORLD SAFE FOR GROUND WATER,
For primary bibliographic entry see Field 5B.
W76-09360

FUNDAMENTAL GEOLOGIC PRINCIPLES,
For primary bibliographic entry see Field 7C.
W76-09362

4C. Effects On Water Of Man's Non-Water Activities

METHODS OF ESTIMATING RESIDENTIAL LAND USE FOR WATER RESOURCES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Economics.
P. A. Perry.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 056, $4.50 in paper copy, $2.25 in microfiche. Water Resources Research Institute, Rutgers University, New Brunswick, N.J., Partial Completion Report, May 1976. OWRT A-043-NJ(2).

Descriptors: *Land use, Water resources development, *Land development, *Urbanization, Planning, Institutions, Management, Water quality, Cities, Estimating, *New Jersey, *Water supply, Water quality standards, Regulation, Erosion, Runoff, *Safe yield, *Water pollution control.
Identifiers: Lake Hopatcong(NJ), Six Mile Run(NJ).

Land use principles and criteria related to water quality and water resources management are reviewed. Residential land use estimation techniques are presented. Existing and potential residential land uses are analyzed at two water resources in New Jersey. Lake Hopatcong is representative of an existing water resource that has undergone substantial development in the last ten years because of its proximity to population centers. Six Mile Run exemplifies a proposed new water resource that will be subjected to similar but probably even more intense development pressure within the next ten years. Safe yields of surface water supplies are illustrated for Morris County. Residential land use contributions to non-point sources of pollution are generalized. Indirect methods of maintaining water quality standards through land use regulations are outlined. Guidelines for minimization of erosion and runoff and estimates of impervious surface by land use are included. Planned unit (residential) developments are discussed.
W76-08924

THE NATURE AND CAUSES OF DESERTIZATION,
International Livestock Centre for Africa, Addis Ababa (Ethiopia).
H. Le Houerou.
Arid Lands Newsletter (University of Arizona), No. 3, p. 1-7, March, 1976. 1 tab., 88 ref.

Descriptors: *Deserts, *Desert plants, *Ecosystem, *Vegetation effects, *Arid climates, *Rainfall disposition, Arid lands, Ecological distribution, Resources development, Land management, Droughts, Grazing.
Identifiers: *Desertification, Climatic change, Desertization.

Differentiation is made between true climatic deserts (e.g. Tenere, Libyco-Egyptian and Arabic Sinai) and man-made deserts which occur in arid zones. Desertization is the extension of desert-like conditions to areas not climatologically appropriate, thereby reducing the ecumene. Expansion of deserts on their margins is due to continuous human encroachment on fragile and unstable ecosystems and faulty management of natural resources. Desertization varies in time with the recurrence of prolonged droughts but is curtailed during a series of abnormally rainy years. Spatial variation depend on the density of human and animal population, which in turn is linked to water availability; thus, areas with better water conditions experience the most acute desertization. Several authors have suggested that climatic fluctuations may result from increasing quantities of dust released into the atmosphere thousands of miles from the area of origination. Such dust clouds might reduce rain-producing clouds. Decreasing organic decay products, in the large drought-stricken areas of the Sahel and East Africa, may have reduced ice-forming biogenic nuclei, thus limiting precipitation and causing feedback self-catalyzing mechanism to desertization. Simulation model studies suggest that an increase in albedo due to diminished vegetative cover also may lessen rainfall and create a feedback mechanism, reinforcing desertization. (Jahns-Arizona)
W76-09069

THE SAHEL: TIME FOR A NEW APPROACH,
The OECD Observer, No. 79, Jan.-Feb., 1976. 7 p, 1 fig, 4 tab. (Some details selected from 'The Economic Impact of Drought and Inflation in the Sahel' by Dr. Elliot Berg, University of Michigan).

Descriptors: *Droughts, *Environmental effects, *Environmental control, *Economic impact, Water resources development, *Land development, Arid lands, Productivity, Water management, *Africa, Moisture deficit, Regional development, Planning.
Identifiers: *Sahel, Club des Amis du Sahel.

Long years of drought and underdevelopment have intensified the ecological and economic plight in five of six Sahel nations (Senegal being the exception). These countries depend heavily on rainfall for adequate agricultural production, animal pasturage and staple food output. The ecological balance is very fragile; even minor variations in rainfall involve magnified consequences. Obstacles to economic expansion include limited resources, trained personnel and organizational and management capacities, along with inadequate knowledge of the environment, especially its agricultural potential. Drought impacts have been great in topsoil destruction and permanent yielding of vegetation to sand, with a resultant ecosystem imbalance. Reversible impacts include reductions in agricultural productivity and herd sizes and the general economic decline. The newly formed 'Club des Amis du Sahel' aims to expand intra-Sahel cooperation toward greater human and natural resource development. Under-utilized river basins and areas being freed from the threat of disease are opening new land with more fertile soil and important ground and surface water resources. (Jahns-Arizona)
W76-09070

MODERN STATE OF THE VEGETATION IN THE DONBAS SMALL RIVER BASINS AND ITS ANTIEROSIVE AND WATER-PROTECTIVE ROLE, (IN UKRANIAN)
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
V. S. Tkachenko.
Ukr Bot Zh. 32(1), p 65-70, 1975.

Descriptors: *Vegetation, River basins, *Erosion control, Water conservation, Preservation, Cultivation, Forest management, Meadows.
Identifiers: Steppe, USSR(Donbas).

A brief description is presented of the present state of the Donbas (USSR) natural vegetation which resulted from geobotanical studies in the basins of the rivers Kazenyi Torets, Bakhmutka, Lugan and Krynka. Steppes, rocky exposures, forests, floodplain meadows and cultivated plants are described and their importance for erosion protection, for water protection and formation of the environment emphasized. These properties of the natural vegetation are lost to a considerable extent. This resulted from changes introduced by human activities.--Copyright 1976, Biological Abstracts, Inc.
W76-09096

VEGETATION AND LANDSLIDES, (IN FRENCH),
Toulouse-3 Univ. (France). Lab. of Botany and Biogeography.
M. Lorillard.
Bull Soc Hist Nat Toulouse. 110(1/2), p 88-92, 1974.

Descriptors: *Vegetation, *Landslides, Europe, Aquatic plants, Erosion control, *Erosion.
Identifiers: Alnus-Glutinosa, *France(Garonne-Ariege Rivers), Quercus-Ilex, Quercus-Pedunculata, Quercus-Pubescens, Quercus-Sessiliflora, Robinia-Pseudoacacia.

The relationship between landslides and vegetation along the Garonne and Ariege River S of Toulouse (France) was studied. Characteristic flora included Quercus sessiliflora, Q. pedunculata, Q. pubescens, Q. ilex, Alnus glutinosa, Robinia pseudoacacia and associated plant life. The natural imbalance due to human interference and resulting natural phenomena such as erosion are discussed. The importance of protective measures was emphasized.--Copyright 1975, Biological Abstracts, Inc.
W76-09101

PRE-IMPOUNDMENT SITE PREPARATION: A STUDY OF THE EFFECTS OF TOPSOIL STRIPPING ON RESERVOIR WATER QUALITY,
P. G. Campbell, B. Bobee, A. Caille, M. J. Demalsy, and P. Demalsy.

LIBRARY U. OF A. ARIZONA-Tucson, Ariz.

Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 1768-1777, 1975. 5 fig., 1 tab., 18 ref.

Descriptors: *Nitrogen, *Carbon, *Phosphorous, Water quality, Aquatic algae, Water chemistry, *Topsoil, *Soil management, *Reservoirs, Impoundments, Impounded waters, Primary productivity, Leaching, Methodology, *Canada, *Pre-impoundment, Applachian Mountain Region.
Identifiers: Bulstrode River, Quebec.

The immediate effect of topsoil stripping is to reduce or eliminate the influence of submerged soil on the overlying water. Nutrient concentrations (C,N,P) and biological activity are particularly affected, being significantly higher in experiments containing topsoil samples. The rate of stabilization of the latter systems, i.e. the rate at which the quality of the overlying water approaches that of the stripped medium is a function of the prevailing environmental conditions; under conditions of forced aeration and dominant heterotrophic activity. The effects of stripping are short-lived. Under normal conditions, effects persist longer. (Katz)
W76-09117

A GUIDE TO STATE PROGRAMS FOR THE RECLAMATION OF SURFACE MINED AREAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5G.
W76-09142

THE EFFECT OF ROAD DEICING SALTS ON SODIUM CONCENTRATION IN AN URBAN WATER COURSE,
York Univ., Downsview (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-09218

NORTHERN GREAT PLAINS RESOURCE PROGRAM. SURFACE RESOURCE WORK GROUP--REGIONAL PROFILE.
Northern Great Plains Resource Program, Denver, Colo.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-243 152, $18.75 in paper copy, $2.25 in microfiche. Report NGPRP/CD-74/400, February 1974. 761 p. 31 fig., 130 tab., 63 ref.

Descriptors: *Great Plains, *Natural resources, *Coal mines, *Mining, *Land reclamation, Montana, Nebraska, North Dakota, South Dakota, Wyoming, Land resources, Land use, Soils, Vegetation, Fish, Wildlife, Recreation, Agriculture, Scenery, Land tenure, Forestry, Economic aspects, Conservation, Ranges, Hunting, Wetlands, Waterfowl, Big game, Game birds, Lignite, Bentonite, Strip mines, Ecosystems.

The land, its uses and ownership; soils; vegetation; fish and wildlife; recreation facilities; agriculture; wilderness; scenery and forest products in Montana, Nebraska, North and South Dakota, and Wyoming, are identified and constraints affecting their development described in relation to the impacts on these resources of coal development. Much of the surface and subsurface ownership is fragmented; forests and woodlands comprise about 4% of the area with only 13 counties supporting about 2.19 billion cu ft of growing stock. A large part of the economy depends upon agriculture, with pastureland and rangeland representing the largest land use. Annual forage production is estimated and the ranges' suitability as wildlife habitat and corresponding wildlife values are described. Soil associations describe the landscape, geology, climate, vegetation, current use, and general productivity potentials and limitations; several important soil properties and interpretations of performance are presented with regard to their suitability for surfacing mine spoils. The vegetation inventory was oriented to the soil associations and the plant communities represent the ecological potential for the sites. The area is outstanding for large game and game birds, with relatively low hunting pressures, but provides appreciable income and recreation. The potentially valuable commercial fishery is presently limited because of market conditions. The scenery resource is described by physical subdivisions. The single most important factor in successful rehabilitation of mined lands is the amount and distribution of precipitation. The region contains an estimated 440 billion tons of lignite but the coalbeds are discontinuous and vary greatly in thickness. Land rehabilitation by existing mining operations is discussed. (Auen-Wisconsin).
W76-09228

PHASE I: AREA DESCRIPTION,
Gulf Coast Research Lab., Ocean Springs, Miss. Fisheries Section.
For primary bibliographic entry see Field 2L.
W76-09239

QUANTITATIVE ASSESSMENT OF CHANGES IN URBAN RUNOFF,
Texas Univ. Health Science Center, Houston. School of Public Health.
I. Cech, and K. Assif.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR1, Proceedings Paper 11957, p 119-125, March 1976. 4 fig, 12 ref, 1 append. NSF GI 39211.

Descriptors: *Urban runoff, *Coastal plains, *Drainage, *Texas, Floods, Hydrology, Maps, Surface drainage, Gulf Coastal Plain, Urbanization, Storm runoff, Runoff, Land use, Computers, Frequency analysis, Hydrologic budget.
Identifiers: Coastal zone, Flood estimate, Flood plain studies, Synographic mapping, Trend surface analysis.

The detection and quantitative assessment of the magnitude of man-induced changes in flood regimes in part of the Texas Gulf Coast were made using the method of trend surface analysis of distribution of storm runoff. The procedure incorporated the elements of frequency analysis and two- and three-dimensional synographic computer mapping. The natural geographic tendency in runoff distribution typical for the study area was compared with the runoff pattern induced by urbanization. The range of differences between urban and nonurban runoff found in this study was proposed as a guide for development planning in the coastal territories that are now primarily rural. (Roberts - ISWS)
W76-09267

PUMPS.
For primary bibliographic entry see Field 8C.
W76-09351

4D. Watershed Protection

SOIL AND WATER CONSERVATION WITH WESTERN IOWA TILLAGE SYSTEMS,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
R. G. Spomer, R. F. Piest, and H. G. Heinemann.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 108-112, January-February 1976. 2 fig, 3 tab, 11 ref.

Descriptors: *Soil conservation, *Water conservation, *Erosion control, *Cultivation, *Farm management, *Iowa, Runoff, Precipitation(Atmospheric), Rainfall, Crops, Corn(Field), Grasses, Terracing, Erosion rates, Cultivated lands, Sheet erosion, Soil erosion, Watersheds(Basins), Agricultural watersheds, Agricultural runoff, Agriculture.

Excessive rates of surface runoff and erosion from the research watersheds at Treynor, Iowa, were measured during a 10-yr study of two contour-planted watersheds cropped to corn. Low erosion rates occurred at a similarly cropped level-terraced watershed and from a bromegrass watershed. These measurements showed that level terraces and bromegrass are exceptionally effective conservation practices. But level terraces with point rows and irregular fields complicate farming and decrease farm machinery efficiency, and grass is not considered one of the more profitable crops for western Iowa loess soils. Mulch-tilled corn was also examined to assess its effect on surface runoff and soil loss. On one watershed, mulch tillage was used with parallel terraces (double normal spacing). The terrace-impounded water was removed by an underground drainage system, installed in the spring of 1972. The contour-planted watersheds lost more soil than the mulch-tilled, parallel-terraced watershed in 1972. (Sims-ISWS)
W76-08805

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5D.
W76-08840

DEVELOPMENT OF A MATHEMATICAL MODEL OF INFILTRATION WHICH INCLUDES THE EFFECTS OF RAINDROP IMPACT,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2G.
W76-08844

EVALUATION OF A MONTHLY WATER YIELD MODEL,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W76-09246

WIND EROSION: THE PROTECTIVE ROLE OF SIMULATED STANDING STUBBLE,
Agricultural Research Service, Manhattan, Kans. North Central Region.
L. Lyles, and B. E. Allison.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 61-64, January-February 1976. 5 tab, 11 ref.

Descriptors: *Wind erosion, *Soil conservation, *Soil erosion, Soils, Crops, Wheat, Sorghum, Corn(Field), Winds, Erosion, Farm management, Agriculture.
Identifiers: Stubble effects.

Wind-tunnel studies indicated that for standing stubble uniformly spaced or in rows normal to wind direction, critical friction-velocity ratios (CFVR) were 1.4 to 2.0 times larger than those for stubble in rows parallel to the wind - the larger the CFVR, the more effective the stubble in preventing wind erosion of the soil. On a weight basis, 5.5 and 8.7 times more standing grain sorghum and corn stubble, respectively, than standing wheat stubble were required to provide the same wind-erosion protection. Equations presented here may be used to determine if soil will erode and the total amount that will erode for a given wind-soil-stubble condition. (Sims-ISWS)
W76-09247

EROSION FOR CORN TILLAGE SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-09248

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE TIME STABILITY OF DISSOLVED MERCURY IN WATER SAMPLES-I. LITERATURE REVIEW,
Geological Survey, Menlo Park, Calif. Water Resources Div.
E. A. Jenne, and P. Avotins.
Journal of Environmental Quality, Vol. 4 No. 4 p 427-431 October-December 1975. 49 ref.

Descriptors: *Mercury, *Water quality, *Sampling, Bacteria, Preservation, *Pollutant identification, Reviews, Water analysis.
Identifiers: *Volatilization, *Literature reviews.

Conflicts in the published findings of adequacy of various preservation treatments for water samples intended for mercury analysis are common and appear to result from variations in (i) biological effects; (ii) initial concentrations of mercury; (iii) types of containers used; (iv) properties of the water or laboratory solution (particularly, the dissolved organic and reduced metal cation content); (v) duration of experiment; (vi) concentration of preservative; (vii) analysis, whether conducted in the original storage container or aliquots taken to another vessel; and (viii) the definition of adequacy employed. Of these variables the biological effects have been overlooked by most investigators. (See also W76-03009) (Skogerboe-Colorado State)
W76-08767

MERCURY CONTENT OF BIOTA IN COASTAL WATERS IN HAWAII,
Hawaii Univ., Honolulu. Pacific Biomedical Research Center.
For primary bibliographic entry see Field 5C.
W76-08776

INSECTICIDE RESIDUES IN TWO TURTLE SPECIES FOLLOWING TREATMENT WITH DDT,
Middle Tennessee State Univ., Murfreesboro. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08778

A CONTINUOUS FLOW BIOASSAY METHOD TO EVALUATE THE EFFECTS OF OUTBOARD MOTOR EXHAUSTS AND SELECTED AROMATIC TOXICANTS ON FISH,
Illinois Univ. at the Medical Center, Chicago. School of Public Health.
For primary bibliographic entry see Field 5C.
W76-08780

OBSERVATION AND MONITORING OF WATER QUALITY BY USE OF EXPERIMENTAL BIOLOGICAL METHODS,
Norsk Institutt for Vannforskning, Blindern.
O. M. Skulberg.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2053-2063, 1975, 5 fig., 2 tab., 17 ref.

Descriptors: *Monitoring, Methodology, *Testing procedures, *Artificial substrates, Water quality, *Biomass, *Benthos, Chemical analysis, *Seston, Trophic level, Bioassay, Pollutant identification, Rivers.
Identifiers: Artificial channels, Selenastrum, *Norway.

Laboratory and field observations indicate that for monitoring purposes, observations of biological populations in analog recipients operated at river stations can furnish important information to supplement results from conventional field methods. Culture experiments with test organisms should be regularly included in comparative investigations of water quality and impact of pollution on aquatic life. (Katz)
W76-08793

TRACE ELEMENT POLLUTION IN STREAMS OF NORTHWESTERN U.S.A.,
K. G. Wood.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 1641-1645, 1975, 2 tab., 5 ref.

Descriptors: *Trace elements, Water chemistry, *Copper, *Zinc, *Cadmium, Aquatic life, *Lead, Methodology, Water analysis, Fluvial sediments, *Pacific Northwest, U.S., Lake Erie, Lake Ontario, *Pollutant identification, Water pollution sources, *Mine wastes, Montana, Idaho.
Identifiers: *Atomic absorption analysis, *Thallium, Couer d'Alene River, Clark Fork.

Atomic absorption analysis was used to detect copper, zinc, cadmium, lead and thallium in streams affected by mill and smelter wastes in Northwestern U.S.A. Analyses were performed on unfiltered water, sediment, biota and on Cladophora suspended overnight at each site. Analysis of sediment and biota proved to be the most reliable evidence of trace element pollution. (Katz)
W76-08797

LABORATORY AND FIELD TESTS OF TEMPERATURE TOLERANCE ON GAMBUSIA A. AFFINIS, THE WESTERN MOSQUITOFISH,
For primary bibliographic entry see Field 5C.
W76-08798

PHOSPHORUS AVAILABILITY IN PARTICULATE MATERIALS TRANSPORTED BY URBAN RUNOFF,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5B.
W76-08804

ISOLATION AND CHARACTERIZATION OF ACTINOPOLYSPORA HALOPHILA, GEN. ET SP. NOV., AN EXTREMELY HALOPHILIC ACTINOMYCETE,
Ottawa Univ. (Ontario). Dept. of Biology; and Ottawa Univ. (Ontario). Dept. of Biochemistry.
For primary bibliographic entry see Field 5C.
W76-08837

INDICATORS OF AIR AND WATER QUALITY ARE TACKLED BY CEQ FOR CONSISTENCY,
Environmental Science and Technology, Vol. 10, No. 1, p 18-19, 1976.

Descriptors: *Standards, *Indicators, *Air pollution, *Water quality standards, Pollutants, Monitoring.
Identifiers: Air quality index.

Air pollution indices used by American and Canadian agencies are inconsistent in their reporting of air quality conditions. Differences were found in the way indices are calculated, number of pollutants included, reporting manner, and descriptive words used. A federal interagency task force was created to select an urban air quality index and standardize index monitoring and reporting. This index will have many features of the standardized urban air quality index and primary standards index, be based on national ambient air quality standards and federal episode criteria, consider major pollutants separately, be a segmented linear function, and consist of four or more descriptor categories. Air pollution control agencies and news media will use it to report local air quality daily. About 50 water quality indicators are being evaluated to develop a comparative guide. These indices can be broadly classified into single parameter, standards violation, lake quality, biological, perception based, water use, point source, non-point source, and water quality indices/judgmental or empirical multi-attribute indices. Guidelines are being developed to determine the best water quality indicator for a specific purpose. A national inventory of biological monitoring programs is being prepared. Reports of environmental quality indicators and statistics will be published periodically. (Buchanan-Davidson--Wisconsin)
W76-08838

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5D.
W76-08840

ENVIRONMENTAL ASPECTS OF THE COOLING SYSTEMS OF THERMAL POWER STATIONS: REPORT ON THE SEMINAR HELD AT ZURICH, MAY CONCLUSIONS AND RECOMMENDATIONS, (LES ASPECTS D'ENVIRONMENT DES SYSTEMS DE REFROIDISSEMENT DES CENTRALLES THERMIQUES),
Economic Commission for Europe (UN), Geneva (Switzerland). Div. of Energy.
For primary bibliographic entry see Field 6G.
W76-08850

A COMPARISON OF AERIAL INFRA-RED AND IN-SITU THERMAL PLUME MEASUREMENT TECHNIQUES,
Wisconsin Univ., Madison.
R. P. Madding, J. V. Tokar, and G. J. Marmer.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 163-186, 17 fig, 3 tab, 3 ref.

Descriptors: *Measurement, *Instrumentation, *Thermal pollution, Analytical techniques, On-site investigations, *Pollutant identification.

The infra-red experiments were conducted from a DC-3 platform. Thermal scans were made with a Texas Instrument RS-18A scanner in the 8- to 14-micrometer range with the data being recorded on analog tape and later digitized. In-situ measurements were made from a 5.5m boat using fast-response thermistor probes. Temperatures were taken at the surface and at 1/2 m intervals from 0.5 to 3 m from the surface. Thermal scanning measures temperatures within only a few tens of microns of the surface, whereas the boat method has the option of measuring at a number of different depths. Thermal scanning offers the capability of generating two orders of magnitude more data in about 1/100th the time required for boat measurements. The aerial infrared monitoring offers a truly synoptic detailed picture of the surface temperature, whereas the boat technique offers a time distorted picture of the plume. Results indicated a good agreement between the two techniquues includiing comparison of general plume configuration, centerline temperature decay, areas contained within isotherm, and point-by-point comparisons. (See also W76-08848) (Chilton-ORNL)
W76-08860

THE SIGNIFICANCE OF ISOMERY IN HYGIENIC STANDARDIZATION OF INDUSTRIAL CONTAMINATIONS OF WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinakii Institut (I) (USSR). Dept. of Public Hygiene.
S. N. Cherkinskii, and V. P. Laskina.

LIBRARY U. OF A. URBANA-CHAMPAIGN

Gig Sanit. 3. 6-10, p 1974.

Descriptors: *Alcohols, *Industrial wastes, Water pollution control, Organic wastes, *Pollutant identification, Toxicity.
Identifiers: *Benzene, Isomery.

Data on comparative hygienic and sanitary-toxicologic features of isomers of 15 organic industrial contaminations (benzene derivatives, alcohols) of water bodies were collected and assessed. Data on 1 of the isomers, as a rule, gives approximate information on the type of action and the level of innocuousness of the others.--Copyright 1975, Biological Abstracts, Inc.
W76-08864

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN WELL DRILLING OPERATIONS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W76-08889

ACUTE TOXICITY OF WELL-DRILLING TO RAINBOW TROUT,
Environmental Protection Service, Edmonton (Alberta). Aquatic Toxicology Lab.
R. H. Weir, and B. Moore.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 169-182, 4 fig, 4 tab, 4 ref.

Descriptors: *Drilling fluids, *Toxicity, *Bioassay, Fish, Toxins, *Rainbow trout, Canada, Arctic.
Identifiers: *Acute toxicity, 96 hour bioassay test, Potassium chloride, Canadian arctic exploratory well.

The toxicity of drilling muds to rainbow trout was investigated under 96 hour static bioassay test. Samples were taken from a Canadian Arctic exploratory well at various well depths and tested at various concentrations. The drilling-mud concentration which would kill 50 percent of the test population in 96 hours (LC sub 50) was used as the determining factor of the test. It was found that the toxicity could be grouped to its relationship with the mud system and depth at which the sample was taken. Three distinct groups of toxicity were defined. The first group exhibited an LC sub 50 value of less than 20 percent mud concentration by volume. The dominant toxic factor was the high level of potassium chloride used in the surface drilling. The second group exhibited a lack of dominant chemical or physical toxicant, with LC sub 50 values of 36 to 70 percent. The combination of drilling components appeared to cause the toxic action within the mud system. The third toxic group showed LC sub 50 values of 9 to 16 percent concentration by volume. These much higher toxic levels were due to an increase in solids and viscosity associated with weighted muds used for deeper drilling levels. (See also W76-08889) (Heiss-NWWA)
W76-08899

GROUND WATER PROBLEMS ASSOCIATED WITH WELL-DRILLING ADDITIVES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-08902

ENVIRONMENTAL IMPLICATIONS OF SEDIMENT BULK ANALYSIS TECHNIQUES FOR TRACE METALS IN OFFSHORE WELL-DRILLING OPERATIONS,
Gulf South Research Inst., New Orleans, La. Dept. of Analytical Chemistry.
J. G. Montalvo, and M. M. McKown.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 357-383, 5 fig. 9 tab, 35 ref.

Descriptors: *Sediments, *Trace elements, *Pollutant identification, Drilling fluids, Benthic Fauna, Biodegradation, Drilling, Offshore platforms, Well.
Identifiers: *Marine sediments, *Trace metals, *Drilling fluid additives, Sediment bulk analysis, Biogeochemical cycle.

Sea bottom sediments underlying well drilling platforms can be sampled in order to monitor trace metal pollution from components of drilling fluid. Increased trace metal levels in the surface sediments during well drilling operations may indicate a pollution problem. Trace metal contaminants from the chemicals used in the well-drilling operations may perturb the marine sediments in the biogeochemical cycle, which can be revealed by chemical analysis for trace metal levels. The analysis (partial or total) must be carefully considered. Trace metals exist in various forms and locations. Analysis must be specifically tailored to each form and location so as to represent meaningful data. There are obvious needs for improved sediment bulk analysis methodology for environmental monitoring and control in offshore well-drilling operations. Many of the principles developed can be applied to other environmental applications requiring bulk sediment analysis for trace metals. (See also W76-08889) (Heiss-NWWA)
W76-08908

A METHOD FOR ESTIMATING THE TOXICITY OF CHLORINATED DISCHARGES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-08928

PHOTOSYNTHETIC MEASUREMENTS IN THE CENTRAL NORTH PACIFIC: THE DARK LOSS OF CARBON IN 24-HOUR INCUBATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08940

ASSAY OF NITRATE REDUCTASE FROM PLASMOLYZED MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08943

LEUCOTHRIX: ABSENCE OF DEMONSTRABLE FIXATION OF N2,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08953

IMPROVED METHODOLOGY FOR ATP DETERMINATION IN MARINE ENVIRONMENTS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08958

COPEPOD SLICK IN THE NORTHWEST PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08959

SPECIFIC POLLUTANTS IN URBAN WASTE WATERS AND THE EFFICIENCY OF THEIR PURIFICATION (SPETSIFICHESKIE ZAGRYAZNENIYA GORODSKIKH STOCHNYKH VOD I EFFEKTIVNOST' IKH OCHISTKI),
Ya. I. Kostovetskiy, G. M. Rakhov, and E. I. Shteynberg.
Vodosnabzhenie i Sanitarnaya Tekhnika, No. 10, p 34-35, 1975. 1 fig, 2 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Pollutant identification, Heavy metals, Phenols, *Inorganic compounds, Organic compounds, *Organic wastes, *Metals.
Identifiers: USSR.

Waste water samples collected in Donetsk, Chernigov, Krivoy Rog and Voroshilovgrad (USSR) were analyzed for specific organic and inorganic pollutants, and the efficiency of municipal biological waste water treatment plants in the elimination of these pollutants was studied. Phenols, cyanides, thiocyanates, and caprolactam were identified as the major specific organic pollutants. They were almost completely eliminated by biological purification. While tantalum, thallium, arsenic, tungsten, hafnium, indium, lithium, cadmium, cerium, and antimony were absent in all waste water samples, traces of scandium, gallium, niobium, bismuth, and lanthanum were found. Lead, barium, molybdenum, tin, copper, silver, zinc, nickel, zirconium, cobalt, strontium and chromium were ubiquitous. The rate of elimination in biological treatment plants was 30-75%; 80-100% for cobalt, 62-78% for tin and barium, and 40-50% for nickel and zirconium. Copper and silver passed the treatment plant in more or less unchanged concentrations. The efficiency of aeration basins and biological filters in terms of heavy metal elimination was about the same. Additional reduction of the concentration can be reached by final treatment in lagoons (by 10-25% for copper, silver and zirconium, and by 60% for chromium). (Takacs-FIRL)
W76-09002

MEASUREMENT OF THE OXYGENATION CAPACITY IN WASTE WATER TREATMENT PLANTS USING COMPLETELY MIXED ACTIVATED SLUDGE (MESURE DE LA CAPACITE D'OXYGENATION DANS LES STATIONS DE TRAITEMENT A BOUES ACTIVEES EN MELANGE INTEGRAL),
For primary bibliographic entry see Field 5D.
W76-09006

MULTI-REACTION PROTON ACTIVATION ANALYSIS FOR TRACES OF MOLYBDENUM,
Max-Planck-Institut fuer Metallforchung, Stuttgart (West Germany). Institut fuer Werkstoffwissenschaften.
V. Krivan.
Analytica Chimica Acta, Vol. 79, p. 161-173, November 1975, 2 fig, 5 tab, 19 ref.

Descriptors: *Heavy metals, *Molybdenum, Analytical techniques, *Cobalt, *Pollutant identification, Trace element.
Identifiers: *Proton analysis(Multi-reaction).

Molybdenum can be determined with high sensitivity by proton activation analysis via five proton-induced principal reactions. Thick molybdenum targets were bombarded with 12-MeV and 15-MeV protons and the different principal reactions studied. This multi-reaction activation technique allows for the checking of accuracy of the analysis with regard to nuclear and instrumental interferences as well as with regard to the depth distribution of molybdenum in the sample. Analytical application of this multi-reaction proton activation analysis is illustrated by the instrumental determination of molybdenum in cobalt. (Hoyle-Vanderbilt)
W76-09036

THE EFFECT OF LEAD ON MOUSE BRAIN DEVELOPMENT,
Mount Sinai School of Medicine, New York.
For primary bibliographic entry see Field 5C.
W76-09038

SOME COMMENTS ON INTERFERENCES BY CU(II) IONS AND AG(I) IONS ON THE WET REDUCTION-FLAMELESS ATOMIC ABSORPTION DETERMINATION OF MERCURY,
Geological Survey of Canada, Ottawa (Ontario).
L. R. Jonasson.
Journal of Geochemical Exploration, Vol. 3, No. 1, p. 77-81, March 1974, 1 fig, 4 ref.

Descriptors: *Heavy metals, Geochemistry, Analytical techniques, *Copper, *Mercury, Soil analysis, Pollutant identification.
Identifiers: *Ion interferences, *Flameless atomic absorption, *Silver.

It has been determined that previously reported interference by Cu(II) and Ag(I) ions in the determination of mercury by a wet-reduction-flameless atomic absorption is caused by the presence of chloride ions. If chloride ion is excluded from the system or at least kept very low, there is no interference from Cu(II) or Ag(I). The Jonasson et al. method involves leaching the samples in 100 ml of a solution 4 M in HN03 and 0.143 M in (1973) HC1, then generation of elemental mercury upon addition of 15 ml 5% w/v tin(II) sulphate dissolved in M H2S04. Thus, the final chloride concentration of the system is 0.124 M or 4400 ppm. Coprecipitated AgC1 in the leachate is redissolved after an hour hot leaching. The mechanism for interference by Cu(II) in the presence of chloride ion, and effects of Ag(I), Pb(II) and Zn(II) are discussed. (Hoyle-Vanderbilt)
W76-09039

TITRATION OF ANTIMONY (III) WITH CERIUM (IV) SULPHATE AND DIPHENYLAMINE AND ITS DERIVATIVES AS REVERSIBLE INDICATORS,
Andhra Univ., Waltair (India). Dept. of Chemistry.
G. Rao, S. G. Viswanath, and M. Gandikota.
Analytica Chimica Acta, Vol. 79, p. 273-278, October, 1975, 4 tab, 17 ref.

Descriptors: *Indicators, Analytical techniques, *Iron, Arsenic compounds, *Pollutant identification, Volumetric analysis.
Identifiers: Diphenylamine, Antimony, Cerium sulphate, Arsenic.

Diphenylamine, barium diphenylamine sulphonate, N-phenylanthranitic acid and 2-nitrodiphenylamine had been investigated as reversible indicators for the titration of antimony (III) with cerium (IV) sulphate in 0.5-2 M sulphuric acid medium. Diphenylamine is the most satisfactory in titrations of antimony (III) in chloride-free solutions as low chloride concentrations affect the indicator action of the others. Iodine catalyst is necessary to accelerate the reduction of the oxidized indicator by antimony (III). Titrations of antimony (III) in mixtures with iron (II) and arsenic (III) are also considered. (Hoyle-Vanderbilt)
W76-09040

CONTENTS OF ELEVEN TRACE ELEMENTS IN UREILITE ACHONDRITES,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
C. M. Binz, M. Ikramuddin, and M. E. Lipschutz.
Geochimica et Cosmochimica Acta, Vol. 39, p. 1576-1579, 1975, 1 fig, 1 tab, 23 ref.

Descriptors: *Trace elements, *Heavy metals, Analytical techniques, *Geochemistry, *Minerology, *Pollutant identification.
Identifiers: *Ureilite achondrites.

Eleven trace elements: As, Bi, Cd, Co, Cs, Ga, In, Se, Te, Tl and Zn, were determined in the six known ureilite achondrites by neutron activation analysis. All 11 elements are depleted below Cl levels and their characteristic abundance pattern differs substantially from those of chondritic groups. Thus ureilites do not represent a simple mixture of volatile-rich chondrites with achondritic material but perhaps cosmochemically-fractionated achondritic material and a late distillate of mobile elements. (Hoyle-Vanderbilt)
W76-09041

SIMULTANEOUS SPECTROPHOTOMETRIC DETERMINATION OF NICKEL AND COBALT IN MIXTURES WITH 3-HYDROXYPICOLINEALDEHYDE AZINE,
Seville Univ., (Spain), Dept. of Analytical Chemistry.
A. G. DeTorres, M. Valcarcel, and F. Pino.
Analytica Chimica Acta, Vol. 79, p. 257-263, October 1975, 3 fig, 3 tab, 2 ref.

Descriptors: *Heavy metals, *Nickel, *Cobalt, *Analytical techniques, *Spectrophotometry, *Pollutant identification, Chemical properties.
Identifiers: 3-hydroxypicolinealdehyde azine.

The properties of the nickel complex of 3-hydroxypicolinealdehyde azine are described. The optimal conditions for a selective and sensitive spectrophotometric determination of nickel and mixtures of nickel and cobalt in ratios from 0.1 to 10 cm are discussed. The absorption spectra of the nickel and cobalt complexes are sufficiently different to allow the simultaneous spectrophotometric determination of both ions when the absorbances are measured at 480 nm and 540 nm. (Hoyle-Vanderbilt)
W76-09042

CHEMICAL INTERFERENCE EFFECTS IN THE ATOMIC ABSORPTION SPECTROMETRIC DETERMINATION OF LEAD WITH PREMIXED INERT GAS (ENTRAINED AIR)-HYDROGEN FLAMES.
Osaka Prefecture Univ., (Japan). Dept. of Applied Chemistry.
T. Nakahara, and S. Musha.
Applied Spectroscopy, Vol. 29, No. 4, p. 352-354, July/August, 1975, 1 fig, 2 tab, 12 ref.

Descriptors: *Heavy metals, *Lead, Analytical techniques, *Pollutant identification.
Identifiers: *Chemical interference, *Magnesium chloride, *Lead atomic absorption, Inert gas(Entrained air)-hydrogen flames.

An investigation is described of chemical interference effects and their elimination in the atomic absorption spectrometric determination of lead with the argon (entrained air)- and nitrogen (entrained air)-hydrogen flames. Depressing interferences were observed over wide ranges of concentration of many diverse elements, but a large amount of magnesium in the form of magnesium chloride eliminated these interferences. The effects of various other elements on lead atomic absorption in the inert gas (entrained air)-hydrogen flames were studied in detail at constant concentration levels. Other possible additives to eliminate interferences were also studied. The method was successfully applied to the determination of lead in several alloys. (Hoyle-Vanderbilt)
W76-09043

HYDROGEOLOGICAL CONDITIONS OF AL-HAMAD AREA, IRAQ,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
For primary bibliographic entry see Field 2F.
W76-09068

CHEMILUMINESCENT METHOD OF DETERMINING MANGANESE IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2K.
W76-09077

EXPEDIENT TECHNIQUE OF PERMANENT OBSERVATIONS -- AN INDISPENSABLE TOOL ON STUDYING THE LIMNOLOGY OF RIVERS,
For primary bibliographic entry see Field 7B.
W76-09106

FISHES IN OXYGEN-MINIMUM ZONES: BLOOD OXYGENATION CHARACTERISTICS,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-09112

EFFECTS OF COPPER ON THE CORAL REEF ECHINOID ECHINOMETRA MATHAEI,
Guam Univ., Agana. Marine Lab.
For primary bibliographic entry see Field 5C.
W76-09113

TOXICITY OF MINE DRAINAGE TO EMBRYONIC AND LARVAL BOREAL TOADS (BUFONIDAE: BUFO BOREAS),
Denver Univ., Colo. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-09115

FIELD EVALUATION OF BENZOPYRENE HYDROXYLASE INDUCTION AS A MONITOR FOR MARINE PETROLEUM POLLUTION,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
J. F. Payne.
Science, Vol. 191 No. 4230, p 945-946, 1976. 1 fig, 6 ref.

Descriptors: *Marine fish, *Enzymes, Biochemistry, *Oil pollution, *Oil wastes, Water pollution, Pathology, *Monitoring, Analytical techniques, *Pollutant identification, Bioindicators, Canada.
Identifiers: *Benzopyrene hydroxylase, *Cunner, Tautogolabrus adspersus, Sublethal responses, Newfoundland.

Fish from petroleum-contaminated sites in the marine environment have elevated levels of benzopyrene hydroxylase activity in liver and gill tissue. This sublethal response appears to be a practical biological monitor for marine petroleum pollution. (Katz)
W76-09116

AXENIC CULTURES OF TETRAHYMENA PYRIFORMIS AS TOXICOLOGICAL TOOLS,
V. Moravcova.
Acta Hydrochimica et Hydrobiologica, Vol. 1, No. 4, 2 fig., 3 tab., 33 ref.p. 83-94, 1976.

Descriptors: *Pollutant identification, *Protozoa, Microorganisms, Water quality control, *Bioindicators, Analytical techniques, *Bioassay, Methodology, Laboratory tests, *Toxicity, Cultures, Invertebrates, Growth rate, Nutrient requirements, Testing, Lethal limit, Herbicides, Pesticides, Insecticides, Phenols.
Identifiers: *Tetrahymena pyriformis, Agrion, Arborol, o-Cresol, Novozir.

The method of determining toxicity in streams by the use of axenic cultures of the protozoan species Tetrahymena pyriformis is described. Very simple media can be used for the cultivation of test organisms and duration of the whole direct toxicity test is limited to 24 hours. Other advantages included very rapid growth in freshly inoculated media so that cultures are ready for tests in three days and good growth in media with minimal nutrient content. Long-term tests can also be followed for 2-4 weeks. The disadvantage falls in the need for laborious microscopical counts at short intervals. (Katz)
W76-09121

LIBRARY U. OF A. ...

MEASUREMENT OF METAL TOXICITY BY BIOCHEMICAL OXYGEN DEMAND,
Rockland County Sewage Treatment Plant, Orangeburg, N. Y.
A. Mowat.
Journal of the Water Pollution Control Federation, Vol. 48, p. 853-865, 1976. 16 fig., 14 tab., 8 ref.

Descriptors: *Biochemical oxygen demand, *Toxicity, Mercury, *Metals, *Bioassay, Chromium, Iron, Copper, Cadmium, Nickel, *Heavy metals, Cobalt, Zinc, Laboratory tests, Water analysis, Analytical techniques, Microorganisms, Measurement, *Pollutant identification.
Identifiers: Silver, Tin, Cyanide, Cr(III), Cr(IV).

The toxicities of 12 common metals and cyanide were assayed by the biochemical oxygen demand method over a period of 1.5 yr using a 5 percent raw wastewater inoculum. Tin and zinc were assayed from 40 mg/l in 5 days were in the following order: Hg, Ag, Cr(III), Al, Fe, Cu, CN, Ni, Cd, Co, Cr(VI), Sn, Zn. All metals showed decreases in toxicity after 2 wk incubation. A series of 5-day biochemical oxygen demands at low metals concentration gave toxicities as follows: Ag, Hg, Cu, CN, Cd, Co, Ni, Cr(III), Cr(VI), Al. (Katz)
W76-09127

CIRCULATORY ADAPTATIONS TO THE OXYGEN MINIMUM LAYER IN THE BATHYPELAGIC MYSID GNATHOPHAUSIA INGENS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-09128

EFFECT OF SAMPLE PREPARATION ON BLOOD LEAD VALUES,
National Research Inst. for Occupational Diseases, Johannesburg (South Africa).
P. Baily, and T. A. Kilroe-Smith.
Analytica Chimica Acta, Vol. 77, p. 29-36, July, 1975. 2 fig, 2 tab, 16 ref.

Descriptors: *Heavy metal, *Pollutant identification, *Lead, *Analytical techniques, *Spectrophotometry, Chemical precipitation, Toxins, Human diseases, Toxicity, Separation techniques, Digestion, Drying.
Identifiers: *Atomic absorption, *Blood lead values, *Sample preparation, Carbon rod atomizer, Trichloroacetic acid, Massmann cuvette, Graphite tubes, Ashing, Atomization.

The determination of lead in blood by graphite-furnace atomic absorption spectrometry is markedly affected by the method of preparing the blood. Seven different methods of preparation were investigated. These included dilution of 0.5 ml blood with 4.5 ml double-distilled water, 0.01 M hydrochloric acid, or 2% Triton-X, and addition of 1.0 ml Unisol to 0.5 ml blood with subsequent addition of 3.5 ml double-distilled water or 3.5 ml 0.01 M hydrochloric acid. These methods had large confidence intervals and very high background absorbances. The last two methods, a slightly modified acid extraction method of Einarsson and Lindstedt, and the digestion method of Mahin and Lofberg, had low background levels and small confidence intervals. Because of the convenience of the Einarsson-Lindstedt method, which was faster than the Mahin and Lofberg method, required no heat for digestion, and which could be carried out in a single tube, this was the method adopted. (Davis-Vanderbilt)
W76-09130

GROUND-WATER DATA FOR SUNFLOWER COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09140

GROUND-WATER DATA FOR CARROLL COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09141

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN CHAMBERS, LIBERTY, AND MONTGOMERY COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-09144

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 7C.
W76-09145

RESULTS OF PHYTOPLANKTON SAMPLING AT NATIONAL STREAM QUALITY ACCOUNTING NETWORK STATIONS IN MONTANA--1975 WATER YEAR,
Geological Survey, Helena, Mont.
J. R. Knapton, and B. M. Bochy.
Open-file report 76-219, March 1976. 27 p, 2 fig, 13 tab, 4 ref, append.

Descriptors: *Phytoplankton, *Streams, *Water quality, *Montana, *Eutrophication, Baseline studies, Networks, Primary productivity, Systematics, Algae, Dissolved oxygen, Photosynthetic oxygen, Nutrients, Water pollution effects.
Identifiers: *Cell counts, Nutrient loading, Filamentous, Organic pollution.

Twelve National Stream Quality Accounting Network stations were operated in Montana during the 1975 water year (Oct. 1, 1974-Sept. 30, 1975). The network was established to acquire a base of hydrologic data for use by agencies engaged in water-resources planning on a national or regional scale. Among the characteristics analyzed were phytoplankton identification and cell counts. Samples consisted of composites of equal aliquots, collected at the center of each quartile of flow, using modified suspended-sediment samplers and sediment collection techniques. Identification and counting were done using the Sedgwick-Rafter cell method. Cell counts ranged from 21 cells per millilitre at Flathead River at Flathead, British Columbia to 27,000 cells per millilitre at Yellowstone River near Sidney. The class Bacillariophyceae was most abundant in both number and variety at all sampling sites. Anabaena and Aphanizomenon of the phyllum Cyanophyta were found at six stations and two stations respectively. These two genera of blue-green algae often become abundant in enriched waters resulting in nuisance conditions. (Woodard-USGS)
W76-09146

WATER RESOURCES OF WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-09149

NUTRIENT MASS BALANCE IN COLUMNS REPRESENTING FILL SYSTEMS FOR DISPOSAL OF SEPTIC TANK EFFLUENTS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5E.
W76-09164

INSTRUMENTATION FOR ANALYZING TOD (INSTRUMENTELLE TSB-ANALYTIK),
R. Schulze-Rettmer.
Zeitschrift fuer Wasser-und Abwasser Forschung, Vol. 9, No. 1, p 11-17, 1976. 7 fig. 24 ref.

Descriptors: *Oxygen demand, Equipment, *Analytical techniques, Automation, Laboratory equipment, *Pollutant identification, *Instrumentation.
Identifiers: *Total oxygen demand.

Automatic equipment manufactured by seven different firms for total oxygen demand (TOD) analysis is described. Four of these use dichromate-sulfuric acid at temperatures between 130 C and 180 C. Due to the constant flow and constant temperature of reaction, accuracy of automatic equipment is superior to that of the manual method of dichromate oxygen demand by the reflux method. The other three types of analyzers operate at a higher temperature (900 C) using oxygen and a platinum catalyst. Performance of the analysis is simple and rapid. Ammonia and chlorides are oxidized; nitrate, sulfate and phosphate are partially reduced. The high temperature TOD-measurement procedure is most useful for determining the oxygen demand in certain industrial effluents and process steams. The method has not been established for use in the monitoring of sewage treatment plant effluents or river water. (Kramer-FIRL)
W76-09185

REPRESENTATIVE ANALYTICAL WASTE WATER SAMPLES. NOTE I--A NEW SAMPLER (SIGNIFICATIVA DI CAMPIONI ANALITICI DI ACQUE REFLUE. NOTA I -- NUOVO DISPOSITIVO DI CAMPIONAMENTO),
C. Versino.
Inquinamento, Vol. 17, No. 12, p 17-30, December, 1975.

Descriptors: Monitoring, *Sampling, Analtyical techniques, Equipment, Water analysis, *Water sampling, *Pollutant identification.

New equipment for taking multiple waste water samples works by determining the level of the liquid in the duct, and positioning the frame on the telescopic rod in such a way that, when the system operates, the pumps are completely submerged. Once the aspiration apertures have been adjusted to the various samples, the equipment is placed in the duct. Following the arragement of the pipe terminals in each collection receptacle, the system begins to record the position and time of the sampling. The advantages of this system include the definition of a maximum size of the suspended particles in the sample, instantaneous and simultaneous sampling at various depths or at various angles with respect to the axis, and the possibility of differentiating and characterizing parts of the area and the depth of the system under examination. The actual characteristics of the samples are not altered during the process; as with communicating receptacles, there is no air in either the aspiration tubes or the pumps. (Waltner-FIRL)
W76-09186

ENERGY SAVING--AN IMPORTANT CONSIDERATION,
K. Scherb, and H. Bauer.
Water and Pollution Control, Vol. 114, No. 2, p 25, February, 1976. 1 fig.

Descriptors: Waste water treatment, *Pollutant identification, *Oxygen, *Measurement, Treatment facilities, Equipment, Activated sludge, Biological treatment, Dissolved oxygen analyzers, Energy.
Identifiers: Oxygen sensor.

The development of a new oxygen sensor for use in activated sludge plants is reported. Manufactured by Zullig, the sensor works according to the principle of Todt, based on the production of a polarized current between two different precious metals in an electrolyte solution, the value depending on the amount of dissolved oxygen. The water sludge mixture to be tested is continuously brought to two concentric metal rings (electrodes)

by the vertical movement of a cup surrounding the electrodes. The influence of temperature on the produced current is eliminated by a thermistor which compensates for the temperature effect at the moment of measurement. Compared to other oxygen measurement systems, this sensor is low in maintainance, due to the continuous cleaning of the electrodes. Only exterior cleaning and testing is necessary after one or two months of operation. The electrodes are continuously cleaned by means of a rotating grinding stone, which must be replaced about every three to four months. The continuous measurement of dissolved oxygen permits the control required to ensure optimum bacterial sewage breakdown, resulting in a savings in energy. (Kramer-FIRL)
W76-09187

THE NATURE OF ACTIVATED SLUDGE FLOCS,
University Coll., Cardiff (Wales). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-09188

COMPARISON OF WARBURG AND MARAIS METHODS OF DETERMINING OXYGEN UPTAKE RATE CONSTANTS,
North Dakota Univ., Fargo. Dept. of Civil Engineering.
Y. T. Hung, and W. W. Eckenfeld, Jr.
Water and Pollution Control, Vol. 114, No. 2, p 6-7, 9, 25, February, 1976. 3 fig, 3 tab, 12 ref.

Descriptors: *Dissolved oxygen, *Biochemical oxygen demand, Measurement, Rates, Biodegradation, Rivers, Texas, *Pollutant identification, Waste assimilative capacity.
Identifiers: *Warburg method, *Marais method, *Oxygen uptake constant.

A major parameter required for the dissolved oxygen model is the oxygen uptake rate constant (k) at which waste waters are biodegraded as they enter a river. The Warburg respirometric technique has been used to determine BOD and k values in waste waters. A second method, that proposed by Marais, combines the use of a galvanic cell oxygen analyzer and a reaeration technique to determine these values. Studies were made to apply the Marais technique to the determination of oxygen uptake rate constant values of the Houston, Texas, Ship Channel waters. Results were compared with those obtained by the Warburg method. The constant for these waters was found to vary from 0.027 to 0.14 per day with an average value of 0.092 per day by the Marais method. Correlations between the results of k values and ultimate BOD values obtained by the Warburg method were poor. It was concluded that the Marais method is better applied to the determination of k values in such waters as the Houston Ship Channel than the Warburg method, particularly because these waters had low oxygen uptake rate values. (Kramer-FIRL)
W76-09189

IMPROVED METHOD FOR THE PHOSPHATE DETERMINATION IN WASTE WATER (VERBESSERTE METHODE ZUR PHOSPHATBESTIMMUNG IM ABWASSER),
U. Bretscher.
Gas- und Wasserfach-Wasser/Abwasser, Vol. 117, No. 1, p 31-32, 1976. 1 fig, 7 ref.

Descriptors: *Phosphates, *Pollutant identification, Waste water treatment, *Analytical techniques, Nutrients.
Identifiers: *Ohle's method.

An improved variety of Ohle's method for the determination of phosphate in waste water is described. To prevent the oxidation of stannous chloride present in the reducing solution on exposure to air, a reducing solution was prepared by dissolving stannous chloride in anhydrous glycerin at 40-50 C. The reducing solution thus obtained is stable for six months, while that according to Ohle's method had to be prepared freshly daily. For reasons yet unclear, the method using the improved reducing solution is slightly more sensitive than the original method. (Takacs-FIRL)
W76-09190

THE PHENOL-SULFURIC ACID TEST,
Mississippi State Univ., State College.
Water and Sewage Works, Vol. 123, No. 2, p 55, February, 1976. 1 fig, 9 ref.

Descriptors: *Phenols, *Analytical techniques, *Sludge, *Carbohydrates, Anthrone test, Measurement, Biological treatment, Waste water treatment, *Pollutant identification.
Identifiers: Sludge analysis, *Phenol-sulfuric acid test.

Total carbohydrate content is often measured in biological sludges in order to understand the complex biochemical processes that occur within abiological treatment system. The phenol-sulfuric acid test constitutes an effective alternate method of carbohydrate analysis to the standard anthrone test. The phenol-sulfuric acid method is generally less expensive, less complicated and easier to employ, and will frequently give more realistic results. The new method measures sugars, such as heptoses, pentoses, uronic acids, and the sugar components of nucleic acids, while the anthrone reagent is relatively insensitive to all these substances. The phenol method has also been used for the analysis of carbohydrate in freeze-dried activated sludges, with excellent results. The reagents required for the test and the analytical procedure were detailed. It has been demonstrated that if the analytical result desired is total carbohydrate rather than a specific carbohydrate, the method of choice should be the phenol-sulfuric acid test. (Kramer-FIRL)
W76-09191

METHODS AND INSTRUMENTS FOR MONITORING SURFACE WATER AND WASTE WATER QUALITY (VERFAHREN UND GERAETE ZUR UEBERWACHUNG DER OBERFLAECHEN- UND ABWASSERQUALITAET).
Draht-Fachzeitschrift, Vol. 26, No. 1, p 17-19, 1976. 3 fig, 1 ref.

Descriptors: *Monitoring, *Instrumentation, Surface waters, Chemical properties, Physical properties, Measurement, Oxygen, Dissolved oxygen, Turbidity, Analytical techniques, *Pollutant identification.

Methods and instruments for monitoring certain physical and chemical parameters of surface waters and waste waters are described. The continuous monitoring of suspended solid matter content is possible by a turbidimetric method based upon the light scattering principle, where the proportion of transmitted light is maintained at a constant value, and the scattered light is a measure of turbidity. The oxygen content is measured by means of a water-impermeable but oxygen-permeable plastic membrane, where the oxygen passing through the membrane generates electric current in an electrochemical cell. The electric conductivity is determined by an inductive method with the water circulated through two ring-core transformers in a closed loop. An autonomous, automatic water quality monitoring station incorporating instruments for the measurement of turbidity, dissolved oxygen, pH value, and conductivity is suitable for continuous operation for three months. (Takacs-FIRL)
W76-09192

A NEW STRATIFIED PLANKTON SAMPLER FOR SHALLOW WATERS, (IN SPANISH),
La Plata Univ. (Argentina). Instituto del Museo.
For primary bibliographic entry see Field 7B.
W76-09193

WATER POLLUTION MONITORING USING MATCHED SPATIAL FILTERS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Physics.
S. P. Almeida, and J. K-T. Eu.
Applied Optics, Vol. 15, No. 2, p 510-515, February, 1976. 4 fig, 15 ref.

Descriptors: *Monitoring, *Water pollution control, *Filters, Optical properties, *Diatoms, Algae, Automation, Instrumentation, Equipment, *Pollutant identification.

A prototype optical processing system has been developed for identifying biological specimens called diatoms using matched spatial filtering techniques. This semi-automated system would be an important alternative to the tedious counting and classification operation which is presently conducted under a microscope by a highly trained person. Results were obtained from a parallel processor and demonstrated that matched filtering techniques are capable of identifying the diatoms. The degree of discrimination is dependent on the spatial frequency of the filter, its diatom orientation, the diatom's size variation, and whether the filter was averaged. Construction of the filters, including averaged filters to take into account variations in depth of focus and size, was detailed. Some sample inputs and the signals detected were illustrated. Autocorrelation between signals to identify similar diatoms was also described. (Kramer-FIRL)
W76-09194

IDENTIFICATION OF NITROGEN AS A GROWTH-LIMITING NUTRIENT IN WASTEWATERS AND COASTAL MARINE WATERS THROUGH CONTINUOUS CULTURE ALGAL ASSAYS,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman.
Water Research, Vol. 10, No. 2, p 97-104, 1976. 7 fig, 2 tab, 54 ref.

Descriptors: *Pollutant identification, *Nitrogen, *Biomass, Algae, Eutrophication, *Bioassay, Water pollution, Water pollution effects, Marine algae, Massachusetts, Rhode Island, Coasts, Sea water, Phosphorus, Nutrients.
Identifiers: *Algal assays, Continuous culture algal assays, Growth-limiting nutrients, Particulate phosphorus, Particulate nitrogen.

Nitrogen can often be a growth limiting nutrient in both waste waters and in coastal waters in which the major contribution of nutrients originates from domestic waste discharges. The results of continuous culture algal assays on waste water-sea water mixtures supporting this view are reported. Analytical expressions are presented that give the limiting nutrient present in a given water. Two series of assays were conducted on waste waters from the coasts of Massachusetts and Rhode Island. In the first series waste waters representing different degrees of treatment were added to sea water in volume ratios of 1:3 and 1:1 waste water:sea water. In the second series, ratios were reduced to 1:12 and 1:6.5. Waste water was collected at the treatment facilities and mixed with sea water in the desired ratios in the laboratory. All indigenous algae were removed and the particular test algae were added. Particulate nitrogen, ash-free dry weight, and particulate phosphorus were measured to determine algal biomass. The results show that nitrogen is the growth-limiting nutrient in the waste waters studied and in the marine waters receiving these wastes. There was a linear relationship between total inorganic nitrogen in the influent and particulate nitrogen representing algal biomass up to a total inorganic nitrogen concentration of 10 mg/liter. The nitrogen-phosphorus ratios in the test algae varied

LIBRARY OF THE UNIVERSITY OF

between 10 and 20 and in the sea water they varied between 4 and 12. Phosphorus had little effect on algal growth. The elimination of phosphate free detergents will have little effect on the degree of eutrification in coastal waters. (Pinto-FIRL)
W76-09195

CHLORINATION AND IODINATION OF POLIOVIRUS AND F2,
Maryland Dept. of Natural Resources, Annapolis.
W. N. Cramer, K. Kawata, and C. W. Kruse.
Journal Water Pollution Control Federation, Vol. 48, No. 1, p 61-76, January, 1976. 6 fig, 5 tab, 43 ref.

Descriptors: *Waste water treatment, *Bacteria, *Viruses, *Pollutant identification, Model studies, Bioassay, *Chlorination, Iodine.
Identifiers: *Poliovirus III, f2, *Iodination.

There is a need for in-plant studies of virus removal during waste water treatment. The best assessment of virus survival patterns may be obtained by seeding the treatment plant to a high titer with one virus, as has been done with poliovirus III. This type of animal virus, however, is expensive and takes an impractically long amount of time to obtain. Thus, the bacterial virus f2 has been suggested as a substitute for the poliovirus because it so closely resembles members of that enterovirus group. To be an acceptible substitute, f2 must not multiply or die away in waste water and must exhibit a susceptibility to halogenation that is reasonably similar to the more resistant members of the enteric virus group. Both f2 and poliovirus III were seeded together in autoclaved waste water and exposed simultaneously to chlorine and iodine. Results indicated that f2 bacterial virus is an acceptable mode for the enteric virus group. It can be grown in large quantities, and assayed with relative ease. (Kramer-FIRL)
W76-09196

NITROGEN AND PHOSPHORUS LEVELS IN SOILS BENEATH SEWAGE DISPOSAL PONDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
L. J. Lund, A. L. Page, and C. O. Nelson.
Journal of Environmental Quality, Vol. 5, No. 1, p 26-30, January/March, 1976. 4 fig, 2 tab, 12 ref.

Descriptors: *Analytical techniques, *Soil analysis, *Phosphorus, *Nitrogen, *Path of pollutants, Nutrients, Groundwater, *Sewage disposal.

Soil cores were collected at two treatment plants beneath sewage sludge and effluent ponds and an evaluation was made of the movement of phosphorus and nitrogen in the soil. Both soil profiles were coarse-textured and open. Total nitrogen in the soils was enriched to 4 m and 8 m, the maximum sampling depths. Considerable excesses of ammonium-nitrogen concentrations compared to controls, as deep as 4.0 m, demonstrated movement of substantial quantities of ammonium in the soil below the ponds. Concentrations of nitrate-nitrogen in soil solutions under disposal sites were considerably higher than those from control sites in situations where sampling encountered the water table, demonstrating that nitrate-nitrogen had reached the water table. Phosphorus enrichment was evident as deep as 3 m beneath the ponds. Ponding sewage waste water on porous open soils and subsequent percolation through soil may contaminate underground water supplies with phosphorus, nitrate-nitrogen, and ammonium-nitrogen. Water table depth, downward soil solution flow rates relative to lateral groundwater flow rates, and resultant mixing influence the extent of the effect. (Snyder-FIRL)
W76-09197

RECOMMENDATION FOR THE EVALUATION OF THE BIOLOGICAL DEGRADABILITY OF EFFLUENTS OF VARYING ORIGIN (VORSCHLAG ZUR BEURTEILUNG DER BIOLOGISCHEN ABBAUBARKEIT VON ABWAESSERN UNTERSCHIEDLICHER HERKUNFT),
G. Straten, and H. Witte.
Zeitschrift fuer Wasser- und Abwasser-Forschung, Vol. 9, No. 2, p 38-41, 1976. 3 fig, 30 ref.

Descriptors: *Biochemical oxygen demand, *Pollutant identification, *Measurement, Waste water treatment, Standards, Water quality, *Biodegradation, Industrial wastes, Municipal wastes.
Identifiers: Municipal/industrial wastes.

Biochemical oxygen demand (BOD) measurements are inaccurate, particularly in the evaluation of the biodegradability of industrial effluents. A method of BOD measurement and evaluation is proposed, to help minimize disadvantages in the sharing of costs of building and maintaining waste water treatment facilities. Effluents are mixed with varying amounts of a standardized food-solution, to guarantee a constant minimum food level in the testflask of the BOD test. The standard liquor has a composition similar to that of domestic sewage. It can then be seen whether the waste water composition in question has any toxic effect on the standard solution. It would be possible to compare the results with different types of effluents in an objective and reproducible manner and to determine what would be the most probable BOD values, when industrial effluent is mixed with domestic sewage. (Kramer-FIRL)
W76-09198

PHOTOGRAPHIC ANALYSIS OF WATER QUALITY CHANGES,
Georgia Univ., Athens.
C. P. Lo.
Photogrammetric Engineering and Remote Sensing, Vol. 42, No. 3, p 309-315, March, 1976. 7 fig, 5 ref.

Descriptors: *Photography, *Water analysis, Water quality, *Aerial photography, *Pollutant identification, Water pollution sources, Asia, *Path of pollutants, Remote sensing.
Identifiers: *Hong Kong, Color photography.

The effect of coastal reclamation and accompanying changes in land use on water quality in Hong Kong's Rambler Channel was studied. Black-and-white aerial photographs from 1956 were compared with true color aerial transparencies from 1975. Artificial pollution became evident, especially in the inlets and bays where land is reclaimed and factories set up. The most seriously polluted sites usually are in confined locations. Immediate measures for clearing up these sites are recommended. True-color aerial photography in the form of transparencies was found to be useful in identifying pollution sources and types of pollutants. (Snyder-FIRL)
W76-09199

FACTORS AFFECTING THE EXTRACTION AND ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS IN WATER,
Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering.
M. A. Acheson, R. M. Harrison, R. Perry, and R. A. Wellings.
Water Research, Vol. 10, No. 3, p 207-212, 1976. 3 fig, 5 tab, 18 ref.

Descriptors: *Analytical techniques, *Pollutant identification, Aromatic compounds, *Chromatography, Extraction, Organic compounds.
Identifiers: Polycyclic aromatic hydrocarbons, Thin layer chromatography, Gas-liquid chromatography.

Factors such as the initial concentration of polycyclic aromatic hydrocarbons (PAH), the presence of suspended solids, and prolonged storage of samples prior to analysis, which are expected to affect the efficiency of extraction of polynuclear aromatic hydrocarbons from environmental water samples, were systematically investigated. PAH were added to purified water and to purified water with Fullers Earth added, and then extracted by Ultra-Turrax. Some samples of both solutions were mixed for 6 hr instead of the usual several min, and continuous solvent extraction was compared to Ultra-Turrax for samples containing Fullers Earth. Two extract purification procedures were compared, as were thin layer chromatography (TLC) and gas-liquid chromatography (GLC) for analysis. Both TLC and GLC were used to analyze environmental water samples. Extraction efficiencies were between 30% and 85%. Although precise prediction of efficiency for a given sample is impossible, probable extraction efficiency can be predicted and makes more accurate measurements of PAH possible. An existing purification procedure had serious drawbacks, which were overcome by use of dimethylsulfoxide. TLC has poor sensitivity for several compounds, but has high accuracy for the compounds determined and avoids extract purification and associated losses. GLC has a more uniform sensitivity, but is unable to separate some isometic compounds, and is more susceptible to interference by background organic materials, and apparently less accurate than TLC. Use of various analytical techniques on river water and road runoff tended to reaffirm the results of the previous laboratory investigations. (Snyder-FIRL)
W76-09200

DETERMINATION OF AMMONIA AND KJELDAHL NITROGEN BY INDOPHENOL METHOD,
Technion-Israel Inst. of Tech. Haifa, Israel. Environmental Engineering Lab.
D. Scheiner.
Water Research, Vol. 10, No. 1, p 31-36, 1976. 6 fig, 4 tab, 20 ref.

Descriptors: *Ammonia, *Nitrogen, *Pollutant identification, *Waste water(Pollution), Analytical techniques, Measurement.
Identifiers: Kjeldahl nitrogen.

The Berthelot reaction was studied and modified for determining ammonia and Kjeldahl nitrogen in fresh water and waste water. It is based on development of a deep blue color when ammonia reacts with phenol and alkaline hypochlorite. A stable calibration curve was obtained using samples of known concentration. The modified analytical procedure is convenient and reliable. The phenol, the nitroprusside, and the buffer solution to minimize the effect of the pH of the sample are combined into a single reagent suitable for examining domestic waste water with a pH between 3 and 11.5 without correction. A separate measurement is not needed for the hypochlorite reagent. Results are highly reproducible between 0.02 and one mg/liter ammonia nitrogen. Forty-five minutes are required for the color to develop at room temperature, and it remains stable for 48 hr. Hardness above 400 mg/liter and above 5 mg/liter N nitrite ions can cause interference in domestic waste water. The dilution required by the measurements eliminates this interference in waste water samples that are high in ammonia. (Snyder-FIRL)
W76-09201

MONITORING DISSOLVED-OXYGEN CONTENT TO ASSURE CLEAN WASTEWATER,
J. R. Reeves.
Power, Vol 120, No. 4, p 68-69, April, 1976.

Descriptors: *Dissolved oxygen, Measurement, *Monitoring, *Activated sludge, Aeration, Waste water treatment, *Pollutant identification, Analytical techniques.
Identifiers: *Dissolved oxygen analyzers.

Numerous methods have been developed for measuring dissolved oxygen. These methods derive their importance from the fact that the dissolved-oxygen level must be held within a certain range in the activated sludge process. This process uses aerobic bacteria to break down water pollutants. The laboratory procedures for measuring dissolved oxygen include the Winkler method, which involves a chemical test of a water sample. There are also four alternative electrochemical methods: conductimetric, coulometric, potentiometric, and amperometric. In membrane-electrode techniques, a semipermeable membrane separates the electrolyte and the electrodes from the water. It is preferred that aeration basins contain 0.5 to 2.0 ppm oxygen. They should be measured between 2 and 3 ft beneath the surface near the effluent of the pond. To determine the oxygen concentration of a sample from its partial pressure, its temperature must be known, and most dissolved-oxygen analyzers include a temperature-sensing element. (Snyder-FIRL)
W76-09202

AN IMPROVED DETERMINATION OF CHEMICAL OXYGEN DEMAND IN WATER AND WASTES BY A SIMPLIFIED ACID DICHROMATE DIGESTION,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
E. Canelli, D. G. Mitchell, and R. W. Pause.
Water Research, Vol 10, No. 4, p 351-355, 1976. 3 fig, 1 tab, 22 ref.

Descriptors: *Chemical oxygen demand, *Analytical techniques, *Waste water(Pollution), *Water analysis, Laboratory tests, *Pollutant identification.
Identifiers: *Acid dichromate digestion.

An improved method was developed for determining chemical oxygen demand (COD) in water and waste water samples containing up to 1500 mg chlorine/liter. Sulfuric acid, potassium dichromate, silver sulfate, mercury (II) sulfate, and sulfamic acid are used to digest samples for 2 hr in glass tubes. While being digested, the samples are heated at about 140 C without boiling or refluxing. A colorimetric determination of excess dichromate oxidant is then performed. About 12 samples can be analyzed per hr. It is not necessary to correct for chlorine interference when there is less than 500 mg chlorine/liter. Three mg/liter is the detection limit. At 112 mg COD/liter, the relative standard deviation is 4.3%. This procedure was compared with the standard dichromate reflux method by analyzing 35 samples of waste water. The two data sets did not differ significantly. (Snyder-FIRL)
W76-09203

DESIGN OF NATIONWIDE WATER-QUALITY-MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
R. J. Pickering, and J. F. Ficke.
American Water Works Association Journal, Vol. 68, No. 2, p 82-85, February, 1976. 2 fig, 1 tab.

Descriptors: *Monitoring, *Water quality control, *Measurement, *Data collections, *Networks, Surface waters, Groundwater, Rivers, Administration, Planning, *Design criteria, Water quality standards.

The usefulness of a water quality monitoring network depends upon the water quality characteristics to be measured, the sites at which these measurements are to be taken, the frequency of measurement for each characteristic and at each point and the statistical parameter chosen to report each characteristic. In designing the type of water data network, one must define the function of the network and the geographic scope. The differences between surface water quality monitoring and groundwater monitoring are related to accessibility of sampling and patterns of measurements. Data to provide a measure of the quality of the United States' major rivers has been gathered by the National Stream Quality Accounting Network (NASQAN), consisting of 325 hydrographic data collection sites. While networks are applicable to deriving general patterns, it is too costly to design an all-purpose water quality monitoring network which includes all the facets of physical, chemical, and biological water quality. Specific objectives of any monitoring program should be outlined so that a proper mix of sampling sites, characteristics to be measured, and frequency of measurement may be selected. Information gathered through such networks should be in the form most suited to the needs of environmental planners and administrators. (Kramer-FIRL)
W76-09209

ANALYTICAL CHEMISTRY IN WATER POLLUTION CONTROL,
Michigan Univ., Ann Arbor.
K. H. Mancy.
Pure and Applied Chemistry, Vol. 44, No. 3, p 555-568, 1975. 1 fig, 3 tab, 27 ref.

Descriptors: Model studies, *Water quality control, *Monitoring, *Measurement, Data collections, Data storage and retrieval, *Pollutant identification, *Networks, Analytical techniques, Design criteria.
Identifiers: *Poland.

Optimal design of systems for measuring water quality should follow a rational stepwise procedure. The procedure includes defining short and long-term objectives, selecting parameters, sites, and frequency for measurement, and selecting analysis methods and data processing requirement. Developing a preliminary model able to satisfy the measurement objectives is very important. Such models can identify quantities and types of missing information as well as surplus information. The program and model may both be modified by cost-effectiveness analysis. An example of a strong water pollution measurement program is that set up in Poland with assistance from the United Nations Development Program and the World Health Organization. (Snyder-FIRL)
W76-09221

STUDY ON THE BALANCE OF HEAVY METALS IN ACTIVATED SLUDGE TREATMENT PROCESS (GESUI SHORI SHISETSU NI OKERU JUKINZOKURUI NO SHUSHI NI KANSURU KENKYU),
Public Works Research Inst., Tokyo (Japan).
K. Saito, S. Ochi, K. Kobori, and I. Yagihashi.
Kankocho Kogai Senmon Shiryo, (Government Offices-Pollution Data), Vol. 11, No. 1, p 86-118, January, 1976. 32 fig, 35 tab, 27 ref.

Descriptors: *Heavy metals, *Sludge treatment, *Activated sludge, *Waste water treatment, Bacteria, Protozoa, *Pollutant identification.
Identifiers: Microbial populations.

A study was conducted between 1972 and 1974 to investigate the effects of low concentrations of heavy metals on a sewage treatment plant in terms of the overall treatment efficiency, and the growth and decomposition rates of activated sludge. The accumulation of heavy metals into the sludge and the loading balance of heavy metals in the treatment process were also determined. Laboratory scale activated sludge units of the continuous and plug flow types were operated. The heavy metals added to the sewage were Cd, Pb, Hg, Ni, Cu, Zn, and Cr in the forms of CdSO4, Pb(N03)2, HgC12, Ni(N03)2, Cu(N03)2, ZnS04, and K2Cr207. The critical concentration at which the inhibition occurred was one to ten Cd mg/liter, 10 mg Pb/liter and 0.005 to one mg Hg/liter. An increase in suspended solids in the effluent was symptomatic of the inhibition. Sludge production increased as the heavy metal concentration in the influent increased within the range of the experiment. Bacteria became dominant while the protozoa population decreased, indicating that one of the causes of increased sludge production is a change in the steps of the food chain due to the heavy metal addition. (Kramer-FIRL)
W76-09222

POSSIBLE INFLUENCE OF ATMOSPHERIC TRANSPORT ON THE TOTAL MERCURY CONTENT OF SOUTHEASTERN ATLANTIC CONTINENTAL SHELF SURFACE WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W76-09224

THE APPLICATION OF THE SCANNING ELECTRON MICROSCOPE TO FRESHWATER PHYTOPLANKTON TAXONOMY AND MORPHOLOGY,
Max-Planck-Institut fuer Limnologie zu Ploen (West Germany).
B. Hickel.
Archiv fur Hydrobiologie, Vol. 76, No. 2, p. 218-228, 1975. 15 fig., 31 ref.

Descriptors: *Analytical techniques, *Electron microscopy, *Algae, *Testing procedures, Phytoplankton, *Systematics, Cyanophyta, Chrysophyta, Euglenophyta, Chlorophyta, Europe, Diatoms, *Pollutant identification.
Identifiers: East Holstein Lakes(Germany), Cryptophyta, Dinophyta, Xanthophyta.

Scanning electron microscopy was used to study 250 different preparations of plankton from the East Holstein Lakes, Germany. Unfixed or fixed specimens were air-dried or dehydrated in a series of alcohol-ether solutions, then coated with gold over a thin layer of coal. Surfaces which were vacuum resistant and electrically conductive could then be photographed. Many planktonic algae are labile and require special treatment; washing is necessary to remove salt crystals. Care must be taken to avoid artifacts and distortion. Phytoplankton have different cell wall properties, so preparation must be adapted to each particular organism. The physiological condition of the plankton may also influence preservation of surface structures. Only Cyanophyceae and Cryptophyceae were not suitable for this method; however two similarly shaped Cryptophycean species were differentiated by their pellicular structure. Studies of Dinophycean cellulose walls, Chrysophycean cellulose or silica receptacles, and Diatomophyceae were very satisfactory. Studies of Xanthophycea should reveal new information about its structure. Few studies of the lorica of Euglenophyceae have been made. Studies of Chlorophyceae, especially Chlorococcales and desmids, show promise. (Buchanan-Davidson--Wisconsin).
W76-09225

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, MISSISSIPPI.
For primary bibliographic entry see Field 2L.
W76-09238

PHASE II: HYDROLOGY,
Gulf Coast Research Lab., Ocean Springs, Miss. Fisheries Section.
For primary bibliographic entry see Field 2L.
W76-09240

CANADIAN EXPERIENCE WITH THE REDUCTION OF MERCURY AT CHLOR-ALKALI PLANTS,
Canadian Industries Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5G.
W76-09273

NEED FOR AN INTEGRAL APPROACH TO TO THE PROBLEM OF QUANTITATIVE DETERMINATION OF LIGNOSULFONIC ACIDS IN MILL EFFLUENTS AND SURFACE WATERS (O POTRZEBIE KOMPLEKSOWEGO UJMOWANIA PROBLEMU ILOSCIOWEGO OZNACZANIA KWASOW LIGNINOSULFONOWYCH W SCIEKACH POCELULOZOWYCH I WODACH POWIERZCHNIOWYCH),
Instytut Inzynierii Ochrony Srodowiska Politechniki Slaskiej, Gliwice (Poland).
S. Jurkiewicz.
Przeglad Papierniczy, Vol. 31, No. 10, p 387-391, October, 1975. 3 fig, 29 ref.

Descriptors: *Pulp wastes, *Lignins, *Water analysis, Analytical techniques, Water pollution sources, Wastes, Industrial wastes, Surface waters, Chemical analysis, Instrumentation, *Pollutant identification, Organic compounds, Colorimetry, Sulfonates, Effluents.
Identifiers: *Lignosulfonic acids, Sulfite pulp mills.

Among many available analytical methods for the quantitative determination of lignin compounds, a standard method is still lacking. One reason for this situation is that many of the methods developed are suitable only for a given type of effluent or surface water under specified conditions. The development of a universal analytical method requires the consideration of various factors, such as the type of effluent or surface water, the nature of impurities and their effect on lignin determination, the type of standard used, and the conditions of the determination (medium, pH, concentration of chemicals used, etc.). These factors are discussed with respect to lignosulfonic acids and instrumental determination methods. Present standardization attempts based on colorimetric determinations and substitute standards (tannins) and the reliability of the conversion factors must be demonstrated. Elimination of interfering impurities by dilution or, in the case of very low lignosulfonic acids concentrations, by ether extraction, appear promising. (Stapinski-IPC)
W76-09277

PHENOLS -- PRODUCTS OF LIGNIN DEGRADATION -- IN EFFLUENTS OF THE BAIKAL PULP AND PAPER MILL (FENOLI -- PRODUKTY RAZRUSHENIYA LIGNINA -- V STOCHNYKH VODAKH BAIKAL'-SKOGO TSELLYULOZNOGO ZAVODA),
Leningradskaya Lestekhicheskaya Akademiya (USSR).
Yu. I. Chernousov, V. M. Nikitin, and V. N. Piyalkin.
Khimiya i Ispol'zovanie Lignina (Chemistry and Utilization of Lignin), Riga, 1974, p 390-396. 18 ref, 2 tab.

Descriptors: *Phenols, *Pulp wastes, *Lignins, Wastes, Industrial wastes, Water pollution sources, Chemical analysis, Gas chromatography, Biological treatment, Aeration, Analytical techniques, Waste water treatment, Organic compounds, Pine trees, Softwood, Coniferous trees, Effluents, Bleaching wastes, *Pollutant identification.
Identifiers: *Lake Baikal(USSR), Guaiacol, Larch trees(Larix), Black liquor, Kraft mills, Spent pulping liquors.

Chemical methods and gas chromatography were used to determine the contents of phenols, products of lignin degradation, in black liquors from prehydrolysis-kraft pulping of pinewood and larchwood, the amounts of phenols in effluents from individual plants of the pulp mill and from the paper mill, and their content in purified effluents, which are discharged into Lake Baikal. Guaiacol was found to constitute 50% of the phenols in black liquors. The content of phenol in black liquors was less than 0.5%. At least 15 individual compounds were separated and identified in black liquors. The total amount of phenols contributed by the pulp mill, the bleach plant, and the paper mill was over 195 g/ton of pulp, the largest amount being contributed by the evaporation plant. Following biological and chemical purification and passage through the aeration ponds, the reduction of total phenols content was 93.2%, of monohydric phenols 95.2%, of polyhydric phenols and their derivatives 90%, and of phenol 100%. Considering dilution at the point of deep discharge into the lake, the content of phenols in the lake water at the discharge point did not exceed 0.001 mg/liter. The procedures used for the isolation and separation of the phenols are described, and the analytical data obtained are tabulated. (Stapinski -- IPC)
W76-09281

FILTER MEDIA COMPARISON AT PRINCE GEORGE PULP AND PAPER (LIMITED),
Prince George Pulp and Paper Ltd. (British Columbia).
For primary bibliographic entry see Field 5D.
W76-09286

STANDARDIZATION OF METHODS FOR THE DETERMINATION OF TRACES OF SOME VOLATILE CHLORINATED ALIPHATIC HYDROCARBONS IN AIR AND WATER BY GAS CHROMATOGRAPHY,
Bureau International Technique des Solvants Chlores, Brussels (Belgium).
A. A. Deetman, P. Demeulemeester, M. Garcia, G. Hauck, and J. I. Hollies.
Analytica Chimica Acta Vol. 82, No. 1, p 1-17, March, 1976. 3 fig, 19 ref, 1 tab.

Descriptors: *Chlorinated hydrocarbon pesticides, *Water analysis, *Gas chromatography, Water pollution sources, Analytical techniques, Organic compounds, Chemical analysis, Chromatography, Trace elements, Air pollution, *Pollutant identification, Pollutants.

Methods are described for the routine determination of some volatile chlorinated aliphatic hydrocarbons (such as chloroform, carbon tetrachloride, tri- and perchloroethylene, penta- and hexachloroethane) in environmental samples of air and water. The procedures are based on gas chromatography with electron-capture detection. The chlorinated compounds are determined in the ranges 1-100 ng/liter of air and 0.01-10 micrograms/kg of water. The overall repeatability of both methods is 20% relative. The procedures are easily adapted to the determination of other volatile halogenated materials. (Witt-IPC)
W76-09287

PRACTICAL APPLICATION OF THE TOXICITY EMISSION RATE CONCEPT IN A SURVEY OF MARITIME PULP AND PAPER MILLS,
R. C. H. Wilson, R. H. Cook, and E. Pessah.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P. Q.), p 33-38. 2 fig, 14 ref, 5 tab.

Descriptors: *Toxicity, *Pulp wastes, *Biological treatment, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution effects, Canada, Foreign countries, Sulfite liquors, Water pollution control, Pulp and paper industry.
Identifiers: Groundwood mills, Kraft mills, Sulfite mills.

The toxic emissions of effluents from seven pulp and paper mills in eastern Canada were quantified prior to and following biological treatment. A toxicity emission index (TEI) defined as the mass emission of toxicants produced by a unit of production is proposed. It was found that the TEI was lowest at groundwood operations and highest at bleached sulfite pulp mills. The TEI was reduced across well-operated secondary treatment systems. It is suggested that the TEI is a tool which may be useful in the framing of a quantitative toxicity requirement in effluent regulations and in the characterization of treatment system performance. Because of the paucity of usable data, however, its application to either function would have to be preceded by intensive data gathering. Further it is evident that the acute lethal bioassay is too insensitive to quantify precisely the toxicity reduction attainable through the secondary treatment of kraft mill wastes. (Witt-IPC)
W76-09293

CHEMICAL CHARACTERISTICS, ACUTE TOXICITY AND DETOXIFICATION OF FOAM IN TWO AERATED LAGOONS,
International Pacific Salmon Fisheries Commission, Cultus Lake (British Columbia). Sweltzer Creek Salmon Research Lab.
For primary bibliographic entry see Field 5C.
W76-09295

COLOUR MEASUREMENT OF PULP MILL EFFLUENTS,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
J. Dorica, V. Berzins, and S. Prahacs.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 57-64. 8 fig, 21 ref, 6 tab.

Descriptors: *Color, *Pulp wastes, *Water analysis, Water quality, Water properties, Water quality standards, Water pollution sources, Industrial wastes, Wastes, Hydrogen ion concentration, Filtration, Filters, Light, Absorption, Standards, Water pollution, Colorimetry, Effluents.

This report summarizes the results of preliminary experimental studies, and subsequent round-robin tests, which lead to drafting of a new CPPA Technical Section Standard, H.5P, for the measurement of pulp mill effluent color. The procedure adopted involves sample pretreatment, including the adjustment of pH to 7.6, filtration first through a coarse glass fiber filter and then through a membrane filter having a nominal pore size of 0.8 micron, followed by measurement of light absorbance at a wavelength of 465 nm. Color is expressed in arbitrary color units based on the light absorbence by Pt-Co standard solutions at the same wavelength. (Witt-IPC)
W76-09296

PROCEEDINGS OF JOINT CONFERENCE ON PREVENTION AND CONTROL OF OIL SPILLS, MARCH 13-15, 1973, WASHINGTON, D.C.,
American Petroleum Inst., Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-09312

ON SPENT SEMICHEMICAL PULPING LIQUORS. (4) XYLAN IN NEUTRAL SULFITE SEMICHEMICAL SPENT LIQUOR (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood Chemistry Lab.
For primary bibliographic entry see Field 5C.
W76-09338

FLOW INJECTION ANALYSIS. PART IV. STREAM SAMPLE SPLITTING AND ITS APPLICATION TO THE CONTINUOUS SPECTROPHOTOMETRIC DETERMINATION OF CHLORIDE IN BRACKISH WATERS,
Centro de Energia Nuclear na Agricultura, Sao Paulo (Brazil).
J. Ruzicka, J. W. B. Stewart, and E. A. Zagatto.
Analytica Chimica Acta, Vol. 81, No. 2, p 387-396, February, 1976. 6 fig, 8 ref, 1 tab.

Descriptors: *Chlorides, *Brackish water, *Water analysis, *Spectrophotometry, Analytical techniques, Water pollution sources, Saline water, Inorganic compounds, *Pollutant identification.

The rapid determination of chloride in water samples based on spectrophotometric measurement of iron (III) thiocyanate has been adapted to flow injection analysis. (cf. Analytica Chimica Acta, Vol 78, p. 145-157, 1975). The simple manifold allows a routine sampling rate of 300 samples/hr, and evidence is presented that 500 samples/hr are possible. For increased accuracy in the measurement of samples of widely varying chloride content, the sample is split in the reagent stream so that the relevant absorbance of the split sample zones varies from 1:2 to 1:10, allowing expansion of the analytical range without loss of accuracy. (Witt-IPC)
W76-09339

WATER MONITORING - JIM BRIDGER PROJECT - SWEETWATER COUNTY, WYOMING,
Fox (F. M.) and Associates, Inc., Wheat Ridge, Colo.
B. A. Florquist, and P. A. Hilbelink.
Ground Water, Vol. 14, No. 3, p 157-162, May-June, 1976. 2 fig, 1 tab, 4 ref.

Descriptors: *Water quality, *Dissolved solids, *Monitoring, *Data collection, *Observation wells, Turbidity, Water, Temperature, Hydrogen ion concentration, Dissolved oxygen, Phenols, Ammonia, Lead, Groundwater, Subsurface flow, Surface waters, Evaporation, *Wyoming, Pollutant identification.
Identifiers: Jim Bridger Project(Wyo), *Groundwater levels, *Monitoring wells, Sweetwater County(Wyo).

Beginning in February of 1974 and continuing through the start-up of the first generating unit at the Jim Bridger Power Plant on August 8, 1974, monitoring holes were drilled, water samples were taken, water quality was evaluated, and groundwater levels were measured. Over 25 water quality stations were monitored. Most of the monitoring wells were drilled into Tertiary or Cretaceous sedimentary rock. Surface water monitoring sites were located on two major streams, the fresh water surge pond and the evaporation ponds that receive the blow-down water from the cooling towers. These waters were analyzed for at least 21 minerals and/or ions as well as for pH, dissolved oxygen, turbidity, temperature and such exotics as phenols, hydrazine and ammonia. Seven of the nine toxic substances cited by the Public Health Service standards were analyzed. Lead levels were excessive during some months at all well sites. The water quality was found to have a definite relationship to the geology of the area. (Heiss-NWWA)
W76-09349

INTERACTION BETWEEN SURFACTANT AND DYE IV. APPLICATION OF THE ACRIDINE ORANGE METHOD TO THE SURVEY OF POLLUTION OF ALKYLBENZENE SULFONATE IN RIVERS AND THE SURVEY OF WATER POLLUTION IN KINOKAWA,
Wakayama Prefectural Inst. of Public Health (Japan).
T. Yokoyama, S. Tokutsu, and H. Tsuiisawa.
Eisei Kagaku, (The Journal of Hygienic Chemistry), Vol. 21, No. 6, p 365-368, December, 1975. 4 fig, 3 tab.

Descriptors: *Analytical techniques, *Pollutant identification, *Path of pollutants, Alkylbenzene sulfonates, Rivers, *Surfactants, Monitoring, *Dyes.
Identifiers: Acridine orange.

A previously tested acridine orange method for determining alkylbenzene sulfonate has been applied to a survey of pollution in river water. Although the proposed method gave slightly higher values than the standard method using methylene blue, it was better because of its small coefficient of variation. It was concluded from the results of the survey that the proposed acridine orange method should be routinely available for the survey of alkylbenzene sulfonate pollution in river water. (Kramer-FIRL)
W76-09364

PHOSPHATE DETERMINATIONS IN WATERS USING AN ANION EXCHANGE RESIN,
Missouri Agricultural Experimental Station, Columbia.
R. W. Blanchar, and D. Riego.
Journal of Environmental Quality, Vol. 4, No. 1, p 45-49, January-March 1975. 5 fig, 4 tab, 10 ref. OWRT B-051-MO(3).

Descriptors: *Phosphates, Water quality, Water quality control, *Pollutant identification, Sampling, *Anion exchange, Analytical techniques.
Identifiers: *Phosphate analysis.

Amounts of water samples from 1 to 1000 ml were passed through 10-cc columns of 100- to 200-mesh Dowex 1-X8 anion-exchange resin. Orthophosphate was quantitatively removed from the water sample by the resin and could be eluted from the column with 25 ml of 1M KCl. Phosphate in the 1M KCl eluent was reacted with ammonium molybdate, extracted into isobutanol, reduced with SnCl (2), and the optical density of the blue complex measured. The working range of the method was between 1 and 8 micrograms of P. Analysis of water samples indicated that in the 1 to 20 ppb P range an appreciable amount of the phosphate exists as pyro- and tripoly-phosphate. The resin method is not specific for dissolved orthophosphate in water, but may give a more valid estimate than direct reaction with the acid molybdate reagent. (Skogerboe-Colorado State)
W76-09370

DEVELOPMENT OF A WATER QUALITY INSTRUMENTATION PACKAGE FOR LONG-TERM OPERATION FROM BUOYS AND OTHER UNATTENDED MARINE PLATFORMS,
National Marine Fisheries Service, Washington, D.C. Data Buoy Office.
For primary bibliographic entry see Field 5G.
W76-09372

COMPARISON OF TWO METHODS FOR DETERMINATION OF PRIMARY PRODUCTIVITY ON COASTAL WATERS OF THE GULF OF MEXICO, (IN SPANISH),
Universidad Nacional Autonoma de Mexico City. Instituto de Biologia.
E. Jordan.
An Inst Biol Univ Nac Auton Mex Ser Cienc Mar Limnol. 43(1), p 21-32, 1972.

Descriptors: *Gulf of Mexico, *Primary productivity, Mexico, Coasts, *Pollutant identification, Methodology.
Identifiers: Carbon-14, Technique.

Measurements of primary productivity rates were made in coastal waters of the Gulf of Mexico between Tamaulipas and a reef on Campeche Bank as part of the continuing marine program of the Instituto de Biologia, Universidad Nacional Autonoma de Mexico. Both the 14C and the 'light and dark bottle' methods were used simultaneously, to measure primary production rates in land-influenced coastal waters, in order to evaluate the reliability and accuracy of the 2 techniques. The 14C method is more reliable for coastal waters, but 2 techniques or more should be used simultaneously to best evaluate the production data.--Copyright 1975, Biological Abstracts, Inc.
W76-09391

A NEW DEVICE FOR SUBSAMPLING PLANKTON SAMPLES,
South Carolina Marine Resource Research Inst., Charleston.
For primary bibliographic entry see Field 7B.
W76-09396

A METHOD FOR THE RAPID SORTING OF PLANKTON INTO A NUMBER OF SIZE GROUPS,
Oslo Univ. (Norway). Inst. of Marine Biology; and Olso Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 7B.
W76-09397

5B. Sources Of Pollution

BIODEGRADATION OF POLYNUCLEAR AROMATIC HYDROCARBON POLLUTANTS BY SOIL AND WATER MICROORGANISMS,
Illinois Univ. at Urbana-Champaign. Dept. of Microbiology.
E. J. McKenna, and R. D. Heath.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 964, $4.00 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 113, April 1976. 25 p, 4 tab, 7 fig, 45 ref. OWRT A-073-ILL(1) USDI 14-31-0001-5013.

Descriptors: *Biodegradation, *Aromatic compounds, Pollutants, *Soil microorganisms, *Aquatic microorganisms, Oil spills, Coal conversion, Enzymes, *Oxidation.
Identifiers: *Polynuclear aromatic hydrocarbons, Carcinogenic chemicals.

Polynuclear aromatic hydrocarbons (PNAs) are widely distributed in natural soils and waters and further are introduced into the environment by, e. g., oil spills and coal conversion processes. Since these toxic chemicals not only persist in nature but also can be converted into a carcinogenic agent in the animal, their complete removal or transformation to a harmless species is important. This study (1) delineated the structural limits of PNA degradability by measuring initial rates of aromatic hydrocarbon oxidation by soil and water microorganisms and (2) determined the persistence of selected PNAs by measuring percent remaining hydrocarbon in the presence of pure and mixed microbial cultures as a function of time and by demonstrating the appearance of metabolic products. Extensive removal of potentially carcinogenic PNAs can be effected even by the very dilute microbial suspensions found in natural waters. Since bacterial degradation of aromatic hydrocarbons does not produce a carcinogenic species, it may be that in the natural environment microbes exert a protective effect on higher organisms by continuously removing these potentially harmful chemicals from the biosphere. It is anticipated that an assessment of the biodegradability of PNAs will be of assistance to bioengineers responsible for waste management in coal conversion plants and others concerned with abatement of PNA pollution of the environment.
W76-08752

THE EFFECTS OF WASTE WATER DIVERSION ON HEAVY METAL LEVELS IN THE SEDIMENTS OF A LARGE URBAN LAKE,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. E. Spyridakis, and R. S. Barnes.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 796, $4.00 in paper copy, $2.25 in microfiche. Completion Report, April 15, 1976. 33 p, 7 fig, 3 tab, 21 ref. OWRT A-070-WASH(1) 14-31-0001-5048.

Descriptors: *Heavy metals, *Sewage, Diversion, Sediments, Copper, Zinc, Lead, History, Environmental effects, Lakes, Sediments, Mass balances,

LIBRARY OF THE UNIVERSITY OF

*Washington, *Lake sediments, Urbanization, Cities.
Identifiers: *Lake Washington(Wash), Sediment traps, Urban lakes.

The effects of wastewater diversion on the levels of lead, copper and zinc in the profundal sediments of Lake Washington, a large urban lake, were examined using sediment cores and sedimentation rates based on 210 Pb dating. Estimates of current and past trace metal loadings were made based on sediment cores, sediment trap, water, rainfall/dustfall samples and sedimentation rates. Copper and zinc levels in the profundal sediments were found to respond promptly to the diversion of an estimated 14.3 mgd of secondary sewage effluents. Contemporary profundal surface sediment concentrations of 46 mg/kg Cu, 192 mg/kg Zn and 192 mg/kg Pb are 28%, 20%, and -22% lower, respectively, than levels in prediversion sediments. The increase in lead discharges to the lake from general area sources was found to more than offset any decrease in lead resulting from diversion. A sample mass balance for copper, zinc and lead shows that aeolian input account for 47, 10, and 74% respectively of the total inputs to the lake. Based on the fraction of total metal inputs to the lake retained in the profundal sediments, entering Pb, Cu and Zn were removed to the sediments with 67, 38 and 19% efficiencies respectively.
W76-08754

A SIMULATION MODEL OF BIOPHYSIOCHEMICAL TRANSFORMATIONS OF NITROGEN IN TILE-DRAINED CORN BELT SOIL,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
J. Duffy, C. Chung, C. Boast, and M. Franklin.
Journal of Environmental Quality, Vol. 4, No. 4, p 477-486, October-December 1975. 8 fig, 1 tab, 30 ref.

Descriptors: *Model studies, *Simulation analysis, *Nitrogen, Corn(Field), *Drainage, Water quality, Nitrification, Denitrification, Evapotranspiration, Crop response, *Computer models, Path of pollutants, Soils, *Corn belt.

A computer simulation model of nitrogen transformations and transport in soil in a Corn Belt field was developed to predict nitrate concentrations in tile effluent as a function of farm management practices and climatic conditions. Water flow in the unsaturated and saturated zones, evapotranspiration, and nitrogen flow due to mass flow, dispersion, and diffusion are simulated along with nitrogen transformations of mineralization, immobilization, nitrification, and denitrification. Growth of corn and soybeans is included. Predicted values of tile water flow, water table height, nitrate -nitrogen concentrations in the soilwater profile and in the tile effluent compared favorably to measured values for 2 field for 1972; also, predic tions of nitrate-nitrogen concentrations in tile effluent for 1970-71 agree well with actual data. (Skogerboe-Colorado State)
W76-08761

SOLUBLE SALTS AND NITRATE DISTRIBUTION IN IRRIGATED LETTUCE BEDS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-08763

NATURAL (15)N ABUNDANCE IN SOIL, LEAVES, AND GRAIN AS INFLUENCED BY LONG TERM ADDITIONS OF FERTILIZER N AT SEVERAL RATES,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W76-08765

RIVER POLLUTION BY ANTICHOLINESTERASE AGENTS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-08782

TRACE ELEMENT POLLUTION IN STREAMS OF NORTHWESTERN U.S.A.,
For primary bibliographic entry see Field 5A.
W76-08797

PHOSPHORUS AVAILABILITY IN PARTICULATE MATERIALS TRANSPORTED BY URBAN RUNOFF,
Wisconsin Univ., Madison. Water Chemistry Program.
W. F. Cowen, and G. F. Lee.
Journal Water Pollution Control Federation, Vol. 48, No. 3, p 580-591, March 1976. 4 fig, 5 tab, 19 ref. EPA R-800537.

Descriptors: *Phosphorus, *Urban runoff, *Phosphorus compounds, *Water pollution sources, Urban drainage, Phosphates, Inorganic compounds, Analytical techniques, Nutrients, Chemical analysis, Eutrophication, Water properties, Water quality, Storm runoff, Urbanization, Drainage systems, *Pollutant identification, Membranes, Filtration, Bioassay, Water pollution, Algae, *Path of pollutants, *Wisconsin.
Identifiers: Phosphorus availability, Particulate phosphorus, *Madison(Wis), Algal bioassays.

Samples of urban runoff were analyzed for dissolved reactive phosphorus, total soluble phosphorus, particulate phosphorus, and total phosphorus. Particles were isolated by membrane filtration and extracted with acid, base, and anion exchange resins, and the inorganic phosphorus in the extracts were compared with the particulate phosphorus extracted. Ranges of group mean values for various urban land uses were 33 to 46, 22 to 27, and 13 to 17% of particulate phosphorus for acid, base, and resin extractions, respectively. Bioassays with Selenastrum capricornutum showed a range of 8 to 55% of particulate phosphorus available to the algae. Long-term aerobic incubations of unfiltered runoff with resin generally showed the same percentage of particulate phosphorus extractable by resin as did short-term extraction. At most 30% of the particulate phosphorus should be considered available to algae in the receiving water. (Henley-ISWS)
W76-08804

AREAL AND SEASONAL VARIATIONS IN THE CHEMISTRY OF SUSPENDED PARTICULATE MATTER IN A DEEP WATER FJORD,
Endinburgh Univ. (Scotland). Grant Inst. of Geology.
For primary bibliographic entry see Field 2L.
W76-08829

KINETICS AND MECHANISMS OF THE OXIDATIVE DEGRADATION OF NITRILOTRIACETIC ACID (NTA) IN AQUEOUS SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
S. B. Hanna.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 772 $3.50 in paper copy ,$2.25 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, April 1976. 13 p, 4 fig, 6 ref. OWRT A-081-MO(1), 14-31-0001-4025.

Descriptors: *Oxidation, *Chemical degradation, Amno acids, Water pollution, *Kinetics, Detergents, *Nitrilotriacetic acid, *Chemical reaction, Industrial wastes, Waste water treatment, Aqueous solutions.

The stoichiometry of the reaction between Ce(IV and NTA in HClO4 media was determined Degradation was rapid. The decompositio products included CO2, formaldehyde iminodiacetic acid, glycine and an amine com ponent. Rate of reaction measurements were mad using three oxidizing agents, Ce(IV), perman ganate (MnO4) and hypochlorite (OCl). Th hypochlorite oxidation appears the most promisin for use in both potable and waste water treatmen The work provides basic chemical data o degradation of NTA. The findings have practica application in chemical industries that use NTA a a chelating agent. (Smith - Missouri)
W76-08843

ENVIRONMENTAL EFFECTS OF COOLIN SYSTEMS AT NUCLEAR POWER PLANTS,
International Atomic Energy Agency, Vienn (Austria).
For primary bibliographic entry see Field 5C.
W76-08848

A TWO-DIMENSIONAL HYDRODYNAMI MODEL FOR COOLING-TOWER PLUMES,
Eidgenoessisches Institut fuer Reaktorforschung Wuerenlingen (Switzerland).
J. P. Trepp.
In: Environmental Effects of Cooling Systems Nuclear Power Plants, CONF-74082 Proceedings of a symposium held at Oslo, Augu 26-30, 1974. p 37-44, 1 fig, 11 ref.

Descriptors: *Model studies, *Cooling tower *Environmental effects, Temperature, Humidity Rain, Clouds, Winds, Microclimatology, Microe vironment, *Computer models.

The computer model, simulating the cooling-tow plume, solves numerically the time-depende equations of motion, continuity and those th describe the transport of heat, water vapour an water droplets for the lower atmosphere. The fin aim of the model is to evaluate the climat changes in the nearer surroundings of a coolin tower or of a whole cooling-tower system. Th models calculate the changes in temperature, h midity, wind, and droplet spectrum (includin cloud water and rain). From these changes the e fect on the micro climate can be deduced. Exper mental verification is required especially of th parameters used in the turbulent transport term (See also W76-08848)
W76-08851

COMBINED DRY/WET-COOLING TOWERS THEIR ENVIRONMENTAL PROMISE AN THEIR PROBLEMS,
Motor-Columbus Consulting Engineers Inc Baden (Switzerland).
P. Bogh, and N. Bhargava.
In: Environmental Effects of Cooling Systems Nuclear Power Plants, CONF-74082 Proceedings of a symposium held at Oslo, Augu 26-30, 1974. p 45-62, 11 fig, 1 tab, 4 ref.

Descriptors: *Model studies, *Cooling tower *Environmental effects, Nuclear powerplants.
Identifiers: *Plumes.

A model program, SAMOA, which is a combin tion of wet-cooling tower program and dry tow program was used as a tool to study the dry/we cooling tower plume. In some cases, the visib plume of the dry/wet-cooling tower was eve larger than for the wet tower of the same capacit The most important result of the preliminary st dies performed is that a superheating of the plum at tower outlet is a necessary but not sufficie condition for plume reduction. It is also necessa to ensure a rapid mixing of the plume with e vironmental air to reduce plume rise in order reduce adiabatic cooling and mixing with cold a A method to obtain this rapid mixing consists distributing the cooling power over several small towers. (See also W76-08848) (Chilton-ORNL)

W76-08852

ATMOSPHERIC DISPERSION OF COOLING-TOWER BLOWDOWN,
Environmental Systems Corp., Knoxville, Tenn.
G. O. Schrecker, S. L. Williams, and F. M. Shofner.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 63-74, 2 tab, 7 ref.

Descriptors: *Environmental engineering, *Cooling towers, *Particle size, Distribution, Dispersion, Air pollution effects.
Identifiers: Cooling tower blowdown.

Atmospheric dispersion of blowdown is accomplished by injecting the blowdown through spray nozzles into the exhaust air flow of the cooling tower. An extensive data base on local meteorology, ambient airborne mineral concentration, mineral composition of the cooling water, spray-nozzle particle-size distribution and load schedule of the cooling tower is essential in evaluating application to specific sites. The paper demonstrates that the particle-size distribution of entrained droplets is fundamentally important in evaluating environmental effects. (See also W76-08848) (Chilton-ORNL)
W76-08853

COMPUTATIONS OF THE TEMPERATURE RESPONSE OF STRATIFIED SILL FJORDS TO COOLING-WATER DISCHARGES,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
T. Audunson, J. Land, and H. Rye.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 113-140, 15 fig, 1 tab, 20 ref.

Descriptors: *Model studies, *Numerical analysis, Environmental effects, Cooling water, Temperature, Fjords.

A numerical analysis of thermal effects on seasonal temperature cycles in stratified sill fjords is described which takes into account spatial and temporal variations in the vertical eddy diffusion coefficient and in the horizontal in- and out-flows to the fjords. The fjords are considered in connection with the siting of a nuclear power station in the Oslofjord area. Temperature, salinity and wind-shear effects on the vertical diffusion coefficient are considered through an assumed functional relationship between the vertical diffusion coefficient and the stability of the water column. Two cases were considered; one which the heated effluent was convected from the discharge area into a semi-enclosed sill fjord, and one in which the discharge was located within a semi-enclosed sill fjord. In the first case, measurements showed that the effluent may form either deep or surface water inside the fjord depending upon the time of the year. In the second case, results showed that the excess temperature from thermal discharges are strongly dependent upon the water-exchange across the sills. The investigation demonstrates that the observed yearly mean temperature cycle may be simulated to within 1 degree C with a one-dimensional numerical model. (See also W76-08848) (Chilton-ORNL)
W76-08857

HEAT DISCHARGES INTO THE SEA AT THE OLKILUOTO SITE: LABORATORY MODEL TEST RESULTS AND REASONS FOR SELECTED ARRANGEMENTS,
Teollisuuden Voima OY Industrins Kraft Ab. Kile (Finland).
I. Mikkola.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 141-150, 8 fig, 2 ref.

Descriptors: *Model studies, *Environmental effects, *Cooling water, Design criteria.

A laboratory model of an area of 20 km by 11.5 km of the Gulf of Bothnia was built to a scale of 1 : 500. Different cooling arrangement designs are presented and the results are compared to the jet-stream theory and control observations. The aim of the cooling system arrangements sought by means of laboratory tests was to minimize water temperature changes-to prevent recirculation, minimize heated areas, to get the warm water to float on the surface in such directions that the effects on summer resorts and professional fishing are minimal. (See also W76-08848) (Chilton-ORNL)
W76-08858

HEATING OF ESTUARINE AND COASTAL WATERS BY NUCLEAR POWER STATIONS IN FRANCE, (ECHAUFFEMENT DES EAUX PAR DES CENTRALES NUCLEAIRES EN ESTUAIRE ET BORD DE MER EN FRANCE),
Laboratoire National d'Hydraulique, Chatou (France).
A. Daubert.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 151-162, 6 fig.

Descriptors: *Model studies, *Environmental effects, Mathematical models, Cooling water, Nuclear powerplants, Temperature, Velocity, Estuarine environment, Coasts.

The induced heating of water at several sites which are under consideration for the construction of nuclear power stations was studied. Average convection and dispersion, which cause heated waters to spread over a surface, and atmospheric exchange which produces heat transfer through the surface, were the principal factors studied. The velocity field was obtained by means of mathematical models or directly by on-site measurements. The temperature field was calculated by means of mathematical models in all cases. Results are given for an estuarine site, a site on a straight coastline, and a site sheltered by a harbour. (See also W76-08848) (Chilton-ORNL)
W76-08859

THE CHALK POINT COOLING TOWER PROJECT,
Maryland Dept. of Natural Resources, Annapolis. Power Plant Siting Program.
J. Pell.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 187-216, 7 fig, 4 tab, 36 ref. AT(11-1)-2381.

Descriptors: *Environmental effects, *Thermal pollution, Monitoring, Mathematical models, Saline water, Vegetation effects, Maryland.
Identifiers: Chalk Point Cooling Tower Project(Md).

The goals of the Chalk Point Cooling Tower Project are to fully characterize the effluent plume discharged to the atmosphere for assessment of the environmental impact of such hyperbolic cooling towers. Factors such as fogging, precipitation enhancement, and downwind icing were studied as well as possible effects on vegetation and man-made structures by the deposition of salts from saline water drift. An intensive monitoring program was conducted together with ground observations by stereo photography, on-site meteorological observations, a major vegetation effects and mathematical modeling program, and airborne instrumentation. (See also W76-08848) (Chilton-ORNL)
W76-08861

UNITED KINGDOM EXPERIENCE OF THE PHYSICAL BEHAVIOUR OF HEATED EFFLUENTS IN THE ATMOSPHERE AND IN VARIOUS TYPES OF AQUATIC SYSTEMS,
Central Electricity Generating Board, London (England).
G. Spurr, and R. A. Scriven.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 227-248, 8 fig, 1 tab, 20 ref.

Descriptors: *Environmental effects, *Nuclear powerplants, *Thermal pollution, Cooling towers, Fog, Precipitation(Atmospheric).

In England and Wales the mean load density in terms of megawatts generated per unit area is considerably higher than in the US and in Europe. A long coast line and a large tidal range have been advantageous in locating power stations on the sea coast and in estuaries. Inland sites employ the use of natural-draught cooling towers. This paper describes studies on heat dispersion from a water surface to the atmosphere and dispersion by direct discharges. The potential environmental effects of cooling towers are identified as the effect on the frequency of ground fog and high relative humidity, precipitation due to drift or carry over and visual interference of the towers and their persistent water plumes. (See also W76-08848) (Chilton-ORNL)
W76-08863

A MODEL FOR SALT DRIFT DEPOSITION FROM SPRAY PONDS,
Massachusetts Institute of Tech., Cambridge.
E. C. Guyer, and M. W. Golay.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 331-345, 4 fig, 1 tab, 7 ref.

Descriptors: *Model studies, *Salts, *Dispersion, Sprays, Saline water, Nuclear powerplants, Drops(Fluids), Ponds.
Identifiers: *Salt drift deposition.

The drift dispersion model developed and applied to salt water spray ponds is seen to be adequate for the estimation of the time-averaged environmental salt deposition providing that some means for describing the drift-droplet source is available. The proposed model also allows the prediction of the effect of variations in the parameters which characterize the drift-droplet dispersion processes. However, the time-averaged salt deposition rates calculated using the proposed model may differ substantially from the actual instantaneous deposition rates. The major problem associated with the prediction of the salt deposition from spray ponds was the description of the drift source. (See also W76-08848) (Chilton-ORNL)
W76-08866

THE TOTAL HEAT-EXCHANGE COEFFICIENT OF SURFACE WATERS,
Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
F. Gunneberg.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 347-355, 3 fig, 1 tab, 3 ref.

Descriptors: *Heat balance, *Mathematical studies, Surfaces, Temperature, Thermal pollution, Surface waters.
Identifiers: Heat exchange coefficient.

The total heat-exchange coefficient, A, together with water depth or river discharge, yields the

LIBRARY U. OF A. ...

relaxation time or the relaxation surface which describes temperature developments by exponential functions. The paper sites four methods by which the coefficient, A, can be evaluated: (1) from the temperature difference between an undisturbed and a thermally leaded water body under the same conditions, (2) from the lapse of temperature down a river subjected to a heat inflow at one point, (3) from the change in temperature of a water body after an abrupt change in weather conditions, and (4) from the investigation of the individual physical processes which make up the heat exchange. Examples are given for all four procedures. (See also W76-08848) (Chilton-ORNL)
W76-08867

TWO METHODS OF MEASURING THE HEAT DISSIPATION OF DISCHARGED COOLING WATER: A PHENOMENOLOGICAL APPROACH,
Keuring van Electrotechnische Materialen N.V., Arnhem (Netherlands). Environmental Dept. of the Central Lab.
H. E. Sweers.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants,CONF-740820, Proceedings of a Symposium held at Oslo, August 26-30, 1974. p 357-367, 7 fig, 1 tab, 2 ref.

Descriptors: *Heat balance, *Cooling water, Temperature, Air-water interfaces, Diurnal, Dissipation, Measurement.
Identifiers: *Heat-exchange coefficient.

The coefficient of heat exchange at the air-water interface along the Amsterdam-Rhine canal was measured by the heat wave method and by the natural temperature method. The movement and decay of heat waves from two power plant discharges was followed and used to calculate the heat-exchange coefficient. In an area not influenced by thermal discharges, daily variations in the natural temperature of the canal were correlated to the daily mean difference between air and water temperature. The heat-wave method is considered theoretically sound but it is applicabe only under very specific experimental conditions. The validity of the natural temperature method is not obvious since it rests on a number of hypotheses that cannot be justified physically. The preliminary data analysis suggests that the results are promising. The major advantage of the natural temperature method is its simplicity. (See also W76-08848) (Chilton-ORNL)
W76-08868

GROUND WATER PROBLEMS ASSOCIATED WITH WELL-DRILLING ADDITIVES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
C. D. Shew, and J. W. Keeley.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 223-230.

Descriptors: *Water resources, *Groundwater, *Drilling fluids, Wastes, Water pollution, Biodegradation, Anaerobic bacteria, DDT, Chemical degradation, Toxicity.
Identifiers: *Ground water contamination, *Drilling fluid additives, Aerobic bacteria, Waste treatment, Chemical by-product toxicity.

The importance of ground water is discussed along with the consequences of its degradation. Legislation governing ground water supplies is weak to non-existent. The concept of ground water is largely not understood by the public. Implications of its destruction are extremely hard to understand and more difficult to deal with. This is due principally to the very slow movement of ground water and the more subtle movements of pollutants. The subsurface is an extremely complex environment which changes dramatically in only short distances. Biological activity is of prime interest in the movement and fate of pollutants in the subsurface environment. Aerobic bacteria are principally responsible for waste stabilization in conventional treatment facilities. Anaerobic bacterial degrade DDT rather rapidly in a subsurface environment. In ground water, DDT does not migrate to any great extent, however, the question which concerns us is the solubility of the anaerobic degradation products. If they become free to move through the aquifer and are more toxic than the parent compound, then the microbes have behaved in a detrimental manner. (See also W76-08889) (Heiss-NWWA)
W76-08902

CHEMICAL APPLICATIONS IN OIL AND GAS WELL-DRILLING AND COMPLETION OPERATIONS,
Bartlesville Energy Research Center, Okla.
For primary bibliographic entry see Field 8G.
W76-08903

MOBILITY OF WELL-DRILLING ADDITIVES IN THE GROUND WATER SYSTEM,
National Water Well Association, Worthington, Ohio. Research Facility.
M. D. Campbell, and G. R. Gray.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 261-284, 9 fig, 47 ref.

Descriptors: *Water pollution, *Drilling fluids, Groundwater, Aquifer characteristics, Water wells.
Identifiers: *Groundwater contaminant behavior.

The components of the drilling fluid may enter and contaminate an aquifer through surface waters, outcrops, stream runoff, percolation and abandoned wells. Contaminants from the borehole may enter ground water as a consequence of lost circulation, seepage, filtration, or blowout. Contaminant behavior is determined by it properties, the characteristics of the aquifer and the interstitial water. Physical separation of suspended solids depend on particle size, shape, concentration, density and the porosity of the aquifer. Particle and gaseous adsorption in the reservoir are important and of a complexity seldom reconstructed in the laboratory. Introduction of drilling fluid materials into the ground water can be determined by the aquifer permeability and pressure gradient. These flow characteristics may be changed by the contaminants and their effect on existing aquifer conditions. (See also W76-08889) (Heiss-NWWA)
W76-08904

MOVEMENT OF CHEMICAL CONTAMINANTS IN GROUND WATER,
Dames and Moore, Park Ridge, Ill.
D. O. Gregg, and K. G. Kennedy.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 289-309, 6 fig, 1 tab, 8 ref.

Descriptors: Wastes, *Aquifer characteristics, Dispersion, Chemical degradation, Radioactive wastes, Groundwater movement, *Path of pollutants, Chemical wastes, Geochemistry, Chlorides, Darcys law.
Identifiers: Arsenic, Cyanide, Cesium 137, Strontium 90.

Ground water flow and dispersion are the means by which chemical contaminants move through aquifers. Darcy's equation can describe approximate ground water velocities in a homogeneous aquifer. More commonly, ground water flows through a locally heterogenious aquifer of variable permeability with variable gradients and recharge characteristics. Convection and dispersion further compound the uncertainties of accurately predicting contaminant movement rates in ground water. Contaminant concentration commonly decrease with time and distance from the source area. This dilution, depending on the contaminants, may be due to convection, dispersion, additional recharge, ion exchange, sorption, chemical precipitation, biological distruction or uptake, and radioactive decay. Ion exchange on clays and slits removes the more active cations such as calcium, cesium, sodium and arsenic from the solution. This mechanism is not readily effective for dissociated anions such as chloride or nitrate. Radioactive decay reduces the original concentrations of isotopes such as strontium 90, cesium 137 and tritium. (See also W76-08889) (Heiss-NWWA)
W76-08905

FIELD EVALUATION OF A PREDICTIVE MODEL FOR THERMAL STRATIFICATION IN LAKES AND RESERVOIRS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W76-08920

PENETRATION AND MIXING OF HEATED DISCHARGES INTO WATERWAYS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
J. A. Schetz, C. H. Lewis, B. L. Sill, J. C. Chien, and D. Markham.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 957 $4.00 in paper copy, $2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 93, April 1976. 41 p, 23 fig, 15 ref. OWRT B-041-VA (7) and B-054-VA (3).

Descriptors: *Thermal pollution, *Mixing, *Heat transfer, *Jets, Numerical analysis, Path of pollutants, Diffusion, *Open channel flow, Model studies.
Identifiers: Multi-port diffuser, *Thermal discharge, Mixing zones.

Results are presented of a series of related studies of thermal discharges into water-ways and the resulting mixing zones. The first investigation involved the physical situation of a single, isolated horizontal jet discharge below the surface of a deep, moving channel. The results of laboratory experiments, approximate analysis and direct numerical solutions are reported for this physical situation. The second investigation considered the configuration of a tangential jet discharge along one bank of a shallow, moving channel. As with the first configuration, results are reported for laboratory experiments, approximate analysis and numerical solutions. In addition, limited comparisons between the predictions of the approximate analysis and some field measurements are provided. The final investigation was a comparative study of the effects of three more types of injector geometries for thermal discharges-a multiport diffuser, a single jet on the surface that is discharging perpendicular to the main channel flow, and a single jet resting on the channel bottom and also discharging perpendicular to the main flow. For these geometries, comparative data are provided on recirculation zones, hot spots, and surface temperature distributions.
W76-08926

RESEARCH ON THE MARINE FOOD CHAIN.
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08935

DYNAMICS OF PHOSPHORUS CYCLING IN THE EUPHOTIC WATERS OF THE CENTRAL NORTH PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08939

A THERMODYNAMIC MODEL FOR STEADY STATE METABOLISM OF PHYTOPLANKTON, PART I. THEORY,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08944

A THERMODYNAMIC MODEL FOR STEADY STATE METABOLISM OF PHYTOPLANKTON, PART II. LIGHT AND CARBON LIMITED GROWTH,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08945

CHLORINE REACTIONS WITH SEAWATER CONSTITUENTS AND THE INHIBITION ON PHOTOSYNTHESIS OF NATURAL MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08946

CYCLING OF ORGANIC CARBON IN THE OCEAN: USE OF NATURALLY-OCCURRING RADIOCARBON AS A LONG AND SHORT TERM TRACER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08956

CRUISE SUMMARY, A. SOUTHERN CALIFORNIA BIGHT STUDIES (SCBS).
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08960

CRUISE SUMMARY, B. GULF OF CALIFORNIA PHOTOBIOLOGY CRUISE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08961

URBAN RUNOFF MODELLING,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Div.
For primary bibliographic entry see Field 4A.
W76-09033

EXPERIMENTAL STUDY OF THE EFFECT OF TEMPERATURE AND DEGREE OF OXYGEN SATURATION ON THE DESTRUCTION RATE OF SOLUBLE PROTEINS IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-09078

PHOSPHOROUS FLUX THROUGH FISHES,
For primary bibliographic entry see Field 5C.
W76-09104

ALGAL COMMUNITIES IN POLLUTED RIVERS OF SOUTH WALES,
For primary bibliographic entry see Field 5C.
W76-09107

FIELD EVALUATION OF BENZOPYRENE HYDROXYLASE INDUCTION AS A MONITOR FOR MARINE PETROLEUM POLLUTION,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
For primary bibliographic entry see Field 5A.
W76-09116

THE AVAILABILITY OF 137-CS TO FISHES FROM INGESTED CLAYS,
For primary bibliographic entry see Field 5C.
W76-09118

ENDRIN TOXICITY AND DISTRIBUTION IN FRESHWATER: A REVIEW,
Bureau of Sport Fisheries and Wildlife, Marion, Ala. Southeastern Fish Cultural Lab.
For primary bibliographic entry see Field 5C.
W76-09122

GROUND-WATER LEVELS AND CHEMICAL QUALITY OF GROUND WATER IN LINCOLN, MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 7C.
W76-09132

HYDROLOGIC ENVIRONMENTAL EFFECTS OF SPRAYED SEWAGE EFFLUENT, TALLAHASSEE, FLORIDA,
Geological Survey, Tallahassee, Fla.
L. J. Slack.
Water-Resources Investigations 55-75, December 1975. 73 p, 14 fig, 13 tab, 37 ref.

Descriptors: *Path of pollutants, *Sewage effluents, *Aquifers, *Groundwater, *Florida, Hydrologic data, Water pollution sources, Sewage treatment, Water pollution effects, Water quality.
Identifiers: *Tallahassee(Fla).

Since 1966, Tallahassee has been experimentally disposing of the effluent from secondarily-treated sewage by spraying at the Thomas P. Smith Wastewater Renovation Plant. This report describes the disposal system, assesses the hydrologic and chemical effects of sewage effluent disposal on groundwater in the area around the plant, and provides data useful for the development of basic criteria for land disposal of sewage effluent. Based on average data (collected from July 1972 to June 1974) there was a reduction in concentration of approximately 12 mg/litre of the total nitrogen from the effluent which was applied at a rate of 2 to 8 in per week in an area with a cover crop. On the same basis there was an approximate concentration reduction of 5 mg/litre of the total nitrogen from the effluent applied at a rate of 14 in per week to an undisturbed forest. The high-rate application of effluent (14 per week) resulted in increased chloride and nitrogen concentrations to a depth of at least 270 ft in the underlying fresh-water aquifer. Effluent-percolate has moved from the plant at about 2,400 feet per year. As of June 1974 the leading edge of the waste front was between 1,800 and 4,000 ft downgradient from the plant and groundwater in about 140 acres of the underlying aquifer had increased in nitrate-N and chloride concentrations. (Woodard-USGS)
W76-09134

THE EFFECTS OF GROUND-WATER DEVELOPMENT ON THE WATER SUPPLY IN THE POST HEADQUARTERS AREA, WHITE SANDS MISSILE RANGE, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
T. E. Kelly, and G. A. Hearne.
Open-file report 76-277, April 1976. 97 p, 18 fig, 6 tab, 33 ref.

Descriptors: *Water pollution sources, *Groundwater mining, *Groundwater basins, *Military reservations, *New Mexico, Hydrologic data, Hydrogeology, Aquifer characteristics, Saline water intrusion, Pumping, Model studies, Water levels, Water quality, Projections, Groundwater resources, *Water supply.
Identifiers: White Sands Missile Range(N Mex).

Water-level declines in the Post Headquarters area, White Sands Missile Range, N. Mex., have been accompanied by slight but progressive increases in the concentration of dissolved solids in water withdrawn from the aquifer. Projected water-level declines through 1996 are estimated from a digital simulation model to not exceed 200 feet (61 metres). A conceptual model of water quality provides three potential sources for water that is relatively high in dissolved solids: brine from the Tularosa Basin to the east, slightly saline water beneath the subjacent aquatard, and very slightly saline water from the less permeable units within the aquifer itself. Management of the well field to minimize drawdown and spread the cone of depression would minimize the rate of water-quality deterioration. A well designed monitoring network may provide advance warning of severe or rapid water-quality deterioration. The Soledad Canyon area 10 miles (16.1 kilometres) south of the Post Headquarters offers the greatest potential for development of additional water supplies. (Woodard-USGS)
W76-09137

A TECHNIQUE FOR ESTIMATING THE TIME OF TRAVEL OF WATER IN INDIANA STREAMS,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 4A.
W76-09138

MACROSCOPIC BENTHIC FAUNA OF THREE TIDAL CREEKS ADJOINING THE RHODE RIVER, MARYLAND,
Geological Survey, Edgewater, Md.
J. M. Redding, and R. L. Cory.
Available from National Technical Information Service, Springfield, Va 22161 as PB-251 995 as $4.00 printed copy; $2.25 microfiche. Water-Resources Investigations 39-75, 1975. 23 p, 2 fig, 5 tab, 22 ref.

Descriptors: *Benthic fauna, *Estuaries, *Maryland, *Baseline studies, Environmental effects, Sediments, Biomass, Ecotypes, Tidal streams.
Identifiers: *Rhode River(Md), Fauna species diversity.

The macroscopic benthic fauna of three tidal creeks adjoining the Rhode River in Maryland were sampled between September 1972 and August 1973 using a modified 230 sq cm (6 in.) Eckman grab. A total of 7943 individuals were collected representing 15 different species. Faunal similarity between creeks was high, although the relative abundance of each species was quite variable. Within each creek, abundance, biomass, and species diversity were analyzed on the basis of sediment type. Two different communities were recognized. In all creeks, the sand biotope exhibited a more diverse community structure and a greater biotic capacity than the mud biotope. (Woodard-USGS)
W76-09143

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN SELECTED COAL-ENERGY AREAS OF UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-09148

NITROGEN AND PHOSPHORUS LEVELS IN SOILS BENEATH SEWAGE DISPOSAL PONDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-09197

PHOTOGRAPHIC ANALYSIS OF WATER QUALITY CHANGES,
Georgia Univ., Athens.

For primary bibliographic entry see Field 5A.
W76-09199

FLOW VELOCITY AS A RATE DETERMINING FACTOR FOR SELF-PURIFICATION IN RIVERS (UBER DEN EINFLUSS DER STROMUNGSGESCHWINDIGKEIT AUF DIE SELBSTREINIGUNG IN FLIESSGEWAESSERN),
For primary bibliographic entry see Field 5F.
W76-09204

QUALITY CONTROL IN SEWAGE TREATMENT PLANT (GESUISHORIJO NO SHISHUTSU SEIGYO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
For primary bibliographic entry see Field 5D.
W76-09205

DISCHARGE OF TREATED WASTE WATER IN LAKES (DIE EINLEITUNG VON GEREINIGTEM ABWASSER IN SEEN),
H. Buhrer, and H. Ambuhl.
Schweizerische Zeitschrift fuer Hydrologie, Vol. 32, No. 2, p 347-369, 1975. 9 fig, 11 tab, 5 ref.

Descriptors: *Waste disposal, *Lakes, Waste dilution, Mixing, Path of pollutants, Discharge(Water), Outfall sewers, Outlets, Ultimate disposal.
Identifiers: Lake Constance(Switzerland).

A study was conducted to find the optimum means of discharging treated waste water into a lake. Paths of waste water discharged into a lake were traced four times. Waste water was marked with aluminum powder and the cloud in the lake was registered by an echo-sounder. One measurement was made at the beginning of the overturn period, the rest were taken during the stagnation period. It was found that if there is a steady current in the lake, the waste water drifts, in the form of a plume. If the lake is calm, it accumulates as a cloud at the pipe's mouth and can well up to the depth of bathing. To avoid such an accumulation, currents must be known. A discharge site should be placed only where currents are steady. Based on events measured at Lake Constance, the mixing of one part of waste water with five parts of lake water should be enough to limit the vertical movement to two meters. (Kramer-FIRL)
W76-09216

THE EFFECT OF ROAD DEICING SALTS ON SODIUM CONCENTRATION IN AN URBAN WATER COURSE,
York Univ., Downsview (Ontario). Dept. of Geography.
W. S. Scott.
Environmental Pollution, Vol. 10, No. 2, p 141-153, February, 1976. 4 fig, 1 tab, 11 ref.

Descriptors: *Water pollution sources, *Runoff, *Sodium, Streams, Lakes, Snowmelt, Water pollution, Urban runoff, Deicers, Salts, Canada.
Identifiers: De-icing salts, Toronto(Canada).

The amount of de-icing salts in a Metropolitan Toronto stream and their spatial and temporal pattern of movement were studied. The stream was sampled during two major thaws at frequent intervals and at many locations which were closely spaced. The highest sodium concentrations occurred immediately after a thaw period started. They increased as much as fiftyfold during one thaw. These high concentrations last no longer than a few days, due to rapid dilution by melting snow. Both thaws occurred after long cold periods when salt and snow accumulated on roadsides. Because the very soluble salts are flushed downstream, salt may accumulate in lakes and ponds further downstream. (Snyder-FIRL)
W76-09218

POSSIBLE INFLUENCE OF ATMOSPHERIC TRANSPORT ON THE TOTAL MERCURY CONTENT OF SOUTHEASTERN ATLANTIC CONTINENTAL SHELF SURFACE WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom, R. E. Taylor, and E. M. Waiters.
Deep-Sea Research, Vol. 22, No. 9, p. 629-633, 1975. 1 fig., 3 tab., 9 ref. EPA R 800372.

Descriptors: *Winds, *Mercury, *Atlantic Ocean, *Continental shelf, Surface waters, Air pollution effects, Seasonal, Transport, Advection, *Path of pollutants, Pollutant identification.

Water samples were collected from the southeastern Atlantic Continental Shelf surface waters in order to determine their mercury concentrations and to identify the processes responsible for the observed variations. Samples were collected during different seasons in order to evaluate the relative importance of such transfer mechanisms as atmospheric transport, river runoff, and horizontal advection. The mercury content varied seasonally, apparently in response to wind conditions. When the winds were predominantly westerly, the concentrations were higher in the surface waters than after periods of easterly winds. These relationships suggested two possible processes: first, exchange with offshore waters and secondly, atmospheric transport. The annual input of mercury from rivers was insufficient to explain the seasonal variations in mercury, even though river discharge volumes also vary seasonally; also no clearly discernible concentration gradients existed near shore. Exchange of mercury with open ocean waters is a less likely cause of observed variations. It is concluded that variations in the mercury concentration of continental shelf waters are due to seasonal variations in atmospheric mercury input from continental U.S. and would presumably occur in pulses. (Buchanan-Davidson--Wisconsin).
W76-09224

THE REPLICATION OF BIOLOGICAL EVENTS IN ENCLOSED WATER COLUMNS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-09226

POLLUTION FROM NON-POINT SOURCES,
Environmental Protection Agency, Seattle, Wash. Region X.
W. D. Clothier.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p. 23-31. 1 tab.

Descriptors: *Legislation, *Water pollution sources, *Water quality standards, Pacific Northwest U.S., Land use, Washington, Oregon, Water quality control, Water pollution control, State governments, Management, Pollution abatement, Federal Water Pollution Control Act.
Identifiers: Nonpoint sources.

The difficulties in controlling nonpoint water pollution sources and in designing appropriate federal and state legislation to abate nonpoint pollution, highlighted by the lumbering industry in Washington and Oregon, are reviewed. The Environmental Protection Agency's efforts to implement the Federal Water Pollution Control Act Amendments of 1972 emphasize the Best Management Practices designed to achieve water quality objectives but do not allow for adapting these practices on a local basis to the particular problems and environmental conditions. Washington's standard based on a 5 JTUs criteria indicates that it is impossible to operate logging operations without exceeding this limit, consequently there is no rational basis for managing water quality affected by lumbering activities. Congress recognized the problem in stating that nonpoint sources need to be controlled only 'to the extent feasible,' nevertheless water quality standards are absolute under the FWPCA and there does not seem to be any exception in the Act concerning standards compliance for nonpoint sources. The dichotomy in the Act with respect to nonpoint pollution sources and water quality standards should be eliminated. Water quality standards should be set that consider uses to be made of related land resources as well as the uses of the water itself. (See also W76-09230) (Auen-Wisconsin).
W76-09232

A FINITE ELEMENT MODEL OF CONTAMINANT MOVEMENT IN GROUNDWATER,
Chile Univ., Santiago, Centro de Recursos Hidraulicos.
G. Cabrera, and M. A. Marino.
Water Resources Bulletin, Vol. 12, No. 2, p 317-335, April 1976. 9 fig, 17 ref.

Descriptors: *Model studies, Wastes, *Groundwater movement, Mathematical models, Computer models, *Finite element analysis, Pollutants, *Path of pollutants, Groundwater, Aquifers, Streams, Recharge, Groundwater recharge, Infiltration, Flow, Surface-groundwater relationships, Subsurface flow, Subsurface waters.
Identifiers: Stream-aquifer systems.

Transient, two-dimensional solutions were developed which describe the movement and distribution of a conservative substance in a stream-aquifer system. The solutions were obtained by solving sequentially the groundwater flow and mass transport equations. A variational approach in conjunction with the finite element method was used to solve the groundwater flow equation. Galerkin's approach coupled with the finite element method was used to solve the mass transport equation. Linear approximated triangular elements and a centered scheme of numerical integration were employed to calculate the hydraulic head distribution and the concentration of solute in the flow region. The linear approximation used to define the concentration function within each element is not appropriate for cases involving steep concentration gradients. For such cases, higher order approximations are necessary to assure the continuity of gradients across interelemental boundaries. Numerical examples that illustrate the applicability of the model were presented. (Sims - ISWS)
W76-09253

SUBSURFACE BRINE DISPOSAL - BE REASONABLE,
Engineering Enterprises, Inc., Norman, Okla.
J. S. Fryberger.
Ground Water, Vol. 14, No. 3, p 150-156, May-June 1976. 5 fig, 11 ref.

Descriptors: *Brine disposal, *Groundwater, *Hydrogeology, *Oklahoma, Oil wells, Oil wastes, Injection wells, Brines, Waste disposal, Wastes, Pollutants, Aquifers, Piezometry, Potentiometric level, Geology, Legal aspects, Oil industry, Agriculture, Irrigation.
Identifiers: *Texas County(Okla).

A classic battle between landowners desiring to protect their fresh groundwater from pollution and oil companies needing a disposal zone for injection of oilfield brines developed in Texas County, Oklahoma. Initial studies showed that the disposal zone (Glorieta Formation) was in places only 500 feet below the bottom of the fresh-water aquifer (Ogallala Formation). Solution/collapse features in the intervening formations plus numerous poorly plugged wells and exploration holes provided potential avenues of brine migration. The potential for pollution appeared very real. The landowners not only wanted to halt construction of new brine disposal wells, but also wanted all 33 existing disposal wells abandoned and plugged. Tempers flared and intermittent litigation continued for over two years. A more complete hydrogeologic

analysis led to the following observations: (1) the potentiometric surface in the Glorieta is 100 to 400 feet below the water table in the Ogallala in areas where brine disposal is taking place; and (2) the transmissivities of the Glorieta and disposal rates are such that even pressure gradients around disposal wells are below the water level in the Ogallala. These hydrologic facts led to the conclusion that, even with a perfectly open conduit connecting the two formations, migration of disposal brine from the Glorieta into the fresh-water Ogallala would be impossible in the critical area because of pressure relationships. (Sims-ISWS)
W76-09261

TEMPERATURE, OXYGEN, AND NUTRIENT DISTRIBUTION PATTERNS IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 485-511, March 1976. 19 fig, 1 tab, 21 ref.

Descriptors: Chemical properties, Physical properties, *Lake Erie, *Temperature, *Dissolved oxygen, *Great Lakes, *Nutrients, Analytical techniques, Water temperature, Oxygen, Eutrophication, Nitrates, Phosphates, Lakes, Chemical analysis, Turbidity, Water properties, Silica, Surface waters, *Distribution patterns, Hydrogen ion concentration, Chlorides, Sulfates.
Identifiers: Soluble phosphorus, Particulate phosphorus, Organic detritus.

Ten major surveys of biological and chemical variables in Lake Erie were carried out during the 1970 shipping season. The observed distributions of temperature, turbidity, oxygen, soluble and particulate phosphorus, nitrate plus nitrite, ammonia, and soluble reactive silica were presented. Comment on the probable causes of the observed distribution patterns has been included where appropriate. Ammonia quantities in the lake remained almost unchanged throughout the year while nitrate plus nitrite quantities varied considerably. The ratio of particulate to total phosphorus showed very little seasonal change. (Henley-ISWS)
W76-09262

HEAVY METALS IN THE AQUATIC ENVIRONMENT.
Pergamon Press Ltd. Oxford/New York/Toronto/Sydney/Braunschweig, c1975, 352 p. P. A. Krenkel (editor).

Descriptors: *Heavy metals, *Aquatic environment, *Water pollution sources, *Water analysis, Pollutants, Toxicity, Analysis, Pollutants, Toxicity, Analyticaltechniques, Distribution patterns, Wate water treatment, Waste treatment, Legislation, Water quality standards, Monitoring, Pollutant identificationWater purification, Water pollution control, Water pollution treatment, Pollution abatement, Water pollution.

This volume contains the proceedings of an international conference held in Nashville, Tennessee, December 4-7, 1975, which was cosponsored by the International Association of Water Pollution Research, the Sport Fishing Institute, the American Fishing Tackle Manufacturers Association, and the Department of Environmental and Water Resources Engineering at Vanderbilt University. The volume is organized into 6 parts dealing, respectively, with toxicology of and physiological response to heavy metals, analytical techniques for quantitative determination of heavy metals, transport mechanisms of heavy metals in the environment (2 sessions), distribution of heavy metals in the environment, source reduction methodology, corrective measures for restoring metal-contaminated waters, and legislation, standards, surveillance, and monitoring of heavy metals in the environment. Subject and author indexes are appended. (Witt-IPC)
W76-09272

OVERSNOW RUNOFF EVENTS AFFECT STREAMFLOW AND WATER QUALITY,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 2C.
W76-09274

WOOD PRESERVATIVES: THEIR DEPLETION AS FUNGICIDES AND FATE IN THE ENVIRONMENT,
Canadian Forest Service, Ottawa (Ontario). Eastern Forest Products Lab.
D. W. Stranks.
Canadian Forestry Service, Eastern Forest Products Laboratory (Ottawa), Technical Report 10, 38 p, 1976. 2 fig, 157 ref.

Descriptors: *Wood preservatives(Pesticides), *Biodegradation, *Pesticide residues, Creosote, Chlorinated hydrocarbon pesticides, Inorganic pesticides, Aromatic compounds, Aliphatic pesticides, Microbial degradation, Water pollution sources, *Reviews, *Bibliographies, Pollutants.
Identifiers: Photodegradation.

This is a literature review of the fate of wood preservatives in the environment. Biological and other factors affecting the permanence, depletion, and breakdown of creosote, chlorinated organic toxicants, and inorganic salt preservatives are discussed. Outlines of the basic mechanisms by which microorganisms break down aliphatic, aromatic, and inorganic moleculesare included, and brief reference is made to photodegradation of toxicants. Possible directions for the future development of preservatives that have little if any potential to damage the environment are also indicated. Environmental problems from wood preservative usage are not expected in the immediate future apart from those possibly created by the release of effluents from treating plants. (Witt-IPC)
W76-09275

MECHANISM OF CONVERSION OF LIGNIN AND ITS DERIVATIVES IN NATURAL WATERS (MEKHANIZM PREVRASHCHENIYA LIGNINA I EGO PROIZVODNYKH V PRIRODNOJ VODE),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
V. A. Kriul'kov, V. T. Kaplin, and G. I. Ganin.
Khimiya i Ispol'zovanie Lignina (Chemistry and Utilization of Lignin), Riga, 1974, p 397-408. 9 fig, 8 ref, 1 tab.

Descriptors: *Lignins, Natural streams, *Biodegradation, *Pulp wastes, Water pollution sources, Wastes, Industrial wastes, Dissolved oxygen, Benthos, Laboratory tests, Oxidation, Ultraviolet radiation, Aerobic conditions, Anaerobic conditions, Water pollution, Wood wastes, Phenols, *Waste assimilative capacity.
Identifiers: Alkali lignin, Thiolignin, Kraft mills.

The conversions of lignin in natural waters were studied in laboratory model experiments on kraft lignin and soluble thiolignin, in the presence and absence of bottom sediments. The complex character of biochemical conversions during lignin degradation was indicated by changes of the concentration of dissolved oxygen, and a more rapid degradation in the presence of bottom sediment microorganisms was evidence by a higher oxygen deficiency in the presence of the sediments. In the first stage of degradation, water-soluble compounds are formed, apparently through splitting of soluble fragments from the lignin molecules, probably by rupture of ether bonds. Further degradation of this soluble fraction is analogous to the degradation of soluble thiolignin, and results in the formation of mono- and dihydroxybenzenes and carboxylic acids. The splitting from the soluble lignin of side chains begins after about 7 days, and is terminated after 28-32 days, when dimeric structures are decomposed into polyhydric phenols. A scheme of lignin decomposition in natural waters is presented, in which quinones, formed through oxidation of polyhydrric phenols, are either condensed to humic acids or are converted to carboxylic acid through opening of the quinone ring. A study was made of the effect of UV radiation on the rate and the mechanism of lignin degradation using soluble thiolignin under anaerobic, aerobic, and aeration conditions. Phenolic compounds, carboxylic acids, and methanol were the photolytic degradation products. A mechanism of lignin photodegradation is proposed involving the intermediate formation of oxonium complexes. (Stapinski-IPC)
W76-09280

PHENOLS -- PRODUCTS OF LIGNIN DEGRADATION -- IN EFFLUENTS OF THE BAIKAL PULP AND PAPER MILL (FENOLI -- PRODUKTY RAZRUSHENIYA LIGNINA -- V STOCHNYKH VODAKH BAIKAL'-SKOGO TSELLYULOZNOGO ZAVODA),
Leningradskaya Lestekhicheskaya Akademiya (USSR).
For primary bibliographic entry see Field 5A.
W76-09281

PHYTOPLANKTON DISTRIBUTION IN THE VICINITY OF THE PERU CURRENT NEAR 8 DEGREES S. LATITUDE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
T. N. Rat'kova.
Okeanologiya. 14(6); p 1077-1081, 1974.

Descriptors: *Phytoplankton, *Distribution patterns, Algae, South America, Cytological studies, *Path of pollutants.
Identifiers: *Peru current, *Pycnocline.

The hydrological peculiarities of the Peru Current influence the distribution of phytoplankton. Maximum phytoplankton numbers are recorded in the near-shore Peru Current areas. Phytoplankton numbers decrease with increasing distance from shore. The minimum algal concentration is found in the Peru continental area. The vertical distribution of algae is uneven. Maximum phytoplankton numbers are found in the water layer above the pycnocline or in the pycnocline itself. At the stations within the upwelling zone, the peculiar average diameter of the cells increases under the pycnocline.--Copyright 1975, Biological Abstracts, Inc.
W76-09283

SEWAGE EFFLUENT INFILTRATES FROZEN FOREST SOIL,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
A. R. Harris.
U.S.D.A. Forest Service, Research Note NC-197, 2 p, 1976. 1 fig, 4 ref.

Descriptors: *Forest soils, *Sewage effluents, *Frozen soils, *Irrigation, Jack pine trees, Oak trees, Sewage disposal, Water pollution sources, Nitrogen compounds, Phosphorus compounds, Permeability, Soil disposal fields, Soil water, Pine trees.

Secondarily-treated sewage effluent, applied at the rate of 1 and 2 inches per week, infiltrated a frozen Sparta sand soil forested with jack pine (Pinus banksiana) and scrub oak. Maximum frost depth averaged 60 cm in treated plots and 35 cm in control plots. Nitrogen was mobile, with some accumulation. Phosphorus was absorbed. (Witt-IPC)
W76-09288

LIBRARY OF THE UNIVERSITY OF

MINERAL RESOURCE MANAGEMENT OF THE OUTER CONTINENTAL SHELF.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6G.
W76-09306

REPORT ON THE HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE SPOIL DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5E.
W76-09309

WIND AND CURRENT EFFECTS ON LARGE-SCALE OIL SLICKS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5G.
W76-09310

PROCEEDINGS OF JOINT CONFERENCE ON PREVENTION AND CONTROL OF OIL SPILLS, MARCH 13-15, 1973, WASHINGTON, D.C.,
American Petroleum Inst., Washington, D. C.
Prevention and Control of Oil Spills, Proceedings of Conference held at Washington, D. C., March 13-15, 1973. Sponsored by American Petroleum Institute, Environmental Protection Agency and United States Coast Guard. 840 p. fig, ref.

Descriptors: *Continental Shelf, *Environmental effects, *Water resources, *Resources development, *Oil spills, *Oil pollution, *Water pollution effects, *Water pollution sources, *Pollution identification, *Water quality control, Offshore structures.
Identifiers: *Outer Continental Shelf, Offshore technology, Biological effects, Water pollution prevention.

This collection of 85 papers constitute the Proceedings of the Joint Conference on Prevention and Control of Oil Spills held March 13-15, 1973, in Washington, D. C. sponsored by the American Petroleum Institute, Environmental Protection Agency and the United States Coast Guard. The papers are grouped by subjects presented at the six sessions: Prevention; Detection and Monitoring of Spills; Identification of Oil; Control Technology - R and D; Fate of Oil; Applied Control Technology; and Biological Effects. Only papers dealing with environmental effects on water resources have been abstracted and will be found distributed separately within the SWRA series. (See also W76-09313 thru W76-09328) (Sinha-OEIS)
W76-09312

AN ANALYSIS OF OIL OUTFLOWS DUE TO TANKER ACCIDENTS,
Coast Guard, Washington, D. C.
V. F. Keith, and J. D. Porricelli.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D. C., March 13-15, 1973, p 3-14, 2 fig, 14 tab, 8 ref, 1 illust.

Descriptors: *Continental shelf, *Oil pollution, *Environmental effects, *Water pollution sources, *Oil spills, Explosions, Accidents, Water quality, Transportation, Fossil fuels.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Tankers, Groundings, Collisions, Casualties.

This study shows the following important points: Accidental oil outflows from tankers is on the order of 215,000 long tons or 218,440 metric tons per year; structural failures, groundings, and explosions involving the total loss of tankers have a distinct effect upon any analysis conducted. In this respect, tanker survivability must be considered; groundings exceed collisions in terms of outflows by a factor of 4 to 1. This would tend to put an extreme accent on the need for bottom protection over side protection; explosions on large tankers especially, and on all tankers in general, deserve some immediate reaction; certain flags of registry appear to need an upgrading in their standards and maintenance requirements; and there is not clear indication that tanker size has any relationship to casualty frequency and oil outflow other than in the case of explosions. (See also W76-09312) (Sinha-OEIS)
W76-09313

OCCURRENCE, CAUSE AND AVOIDANCE OF THE SPILLING OF OIL BY TANKERS,
International Tanker Owners Pollution Federation Ltd., London (England).
J. W. Smith.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D. C., March 13-15, 1973. p 15-20, 10 tab, 6 ref.

Descriptors: *Continental Shelf, *Oil spills, *Oil pollution, *Water pollution sources, *Environmental effects, Navigation, Accidents, Fossil fuels.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Collisions, *Tankers, Groundings, Strandings, Casualties.

Analysis of the data presented suggests that the majority of oil spills occur at, or very close to, the oil terminal, usually while the tanker is actually transferring cargo or bunker fuel. No one operation is particularly prone to result in an accidental spill. The most common cause for an oil spill is that the tanks overflow, either because, on loading, the tank was overfilled, or on discharging, because residue from a discharge tank was being pumped into a slop tank which was already full. The number of spills resulting from equipment failure is relatively small. Size of the tanker appears to be unrelated to number of accidents. Major spills are shown to be due to strandings, or collision in areas of high traffic density and low visibility. (See also W76-09312) (Sinha-OEIS)
W76-09314

MICROBIAL ECOLOGY OF PETROLEUM UTILIZATION IN CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-09319

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 11-12, 1975, SAVANNAH, GEORGIA.
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
For primary bibliographic entry see Field 5G.
W76-09329

THE OCS FORGOTTEN LAND: TERRITORIAL SEA, NEARSHORE, AND ESTUARY,
Florida Dept. of Administration, Tallahassee. Div. of State Planning.
For primary bibliographic entry see Field 5G.
W76-09330

THE ROLE OF ENGINEERING IN MINIMIZING OFFSHORE IMPACTS,
Duke Univ., Durham, N. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-09331

OFFSHORE PETROLEUM DRILLING AND PRODUCTION,
Exxon Co., New Orleans, La. Southeastern Div.
For primary bibliographic entry see Field 5G.
W76-09332

INTACT MANURE PACK HALTS SEEPAGE,
For primary bibliographic entry see Field 5G.
W76-09344

COUNTERMEASURES TO CONTROL OIL SPILLS IN WESTERN CANADA,
EBA Engineering Consultants Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5G.
W76-09346

APPLICATION OF GROUND-WATER FLOW THEORY TO A SUBSURFACE OIL SPILL,
Geological Survey, Menlo Park, Calif. Engineering Geology Branch.
For primary bibliographic entry see Field 2L.
W76-09350

CATHODIC PROTECTION WELLS AND GROUND WATER POLLUTION,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W76-09357

THERMAL STRUCTURE OF LAKE MASCARDI (PROVINCE OF RIO NEGRO, ARGENTINA, (IN SPANISH),
Instituto National de Limnologia, Santo Tome (Argentina).
For primary bibliographic entry see Field 2H.
W76-09358

MAKING THE WORLD SAFE FOR GROUND WATER,
A. B. Stanley.
Water Well Journal, Vol. 30, No. 4, p. 34-36, April, 1976.

Descriptors: *Research facilities, *Water pollution, *Groundwater, Biodegradation, Liquid wastes, Research equipment.
Identifiers: *Groundwater pollution research.

Ground water pollution research is currently being done by the Ground Water Branch of the Robert S. Kerr Environmental Research Laboratory in Ada, Oklahoma. The Kerr Laboratory is a part of the Environmental Protection Agency's research and development center network. The Kerr Center responds to specific research problems on a regional or local level. The major research emphasis is on the fate of pollutants in ground water; the biodegradation, degradation products, and the effects on the ground water system of these pollutants and their by-products. The center uses a mass spectrometer for trace element identification and is in the process of developing a ground water sampling unit which will provide contamination-free samples. (Heiss-NWWA)
W76-09360

INTERACTION BETWEEN SURFACTANT AND DYE IV. APPLICATION OF THE ACRIDINE ORANGE METHOD TO THE SURVEY OF POLLUTION OF ALKYLBENZENE SULFONATE IN RIVERS AND THE SURVEY OF WATER POLLUTION IN KINOKAWA,
Wakayama Prefectural Inst. of Public Health (Japan).
For primary bibliographic entry see Field 5A.
W76-09364

EFFECTS OF SELECTED HERBICIDES ON BACTERIAL POPULATIONS IN NONTREATED AND TREATED WATER,
Clemson Univ., S. C. Dept. of Biochemistry; and Clemson Univ., S. C. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-09369

EVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, EXAS. PREPRINTS, VOLUME II.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09371

NDUSTRY CANDIDATES AND GENERAL LOCATIONS FOR ARTIFICIAL INDUSTRIAL-ORT ISLANDS,
Texas A and M. Univ., College Station.
For primary bibliographic entry see Field 5G.
W76-09377

MASS TRANSPORT AND DISPERSION OFF A IDAL INLET,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W76-09381

THE OFFSHORE ECOLOGY INVESTIGATION,
Gulf Universities Research Consortium, Gulfport, Miss.
For primary bibliographic entry see Field 5G.
W76-09382

HYDROCARBONS IN WATER AND SEDIMENT AMPLES FROM COAL OIL POINT AREA, OFFSHORE CALIFORNIA,
Exxon Production Research Co., Linden, N.J.
C. B. Koons, and D. E. Brandon.
n: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. reprints, Volume III, 1975. No. OTC 2387. p 513-21, 3 fig, 3 tab. 8 ref.

Descriptors: *Seepage, *Oil pollution, Resources evelopment, Water pollution sources, Environmental effects, *California, Continental helf, Organic compounds.
Identifiers: *Outer Continental Shelf, Natural eepage, *Coal Oil Point(CA), Environmental impact.

Water samples collected within about a 1-sq nautical mile area of the Coal Oil Point submarine oil eeps contain somewhat higher amounts of dissolved hydrocarbons, both heavy (C15+) and light C3-C8), than do water samples collected 10-15 iles to the ESE in the offshore Pt. Dume area. lowever, the difference in concentrations is much ore pronounced for the dissolved heavy ydrocarbons than for the lighter ones. The heavy ydrocarbon concentrations found in these ffshore California water samples ranged from 0.2 16 ppb and agreed closely with concentrations Atlantic and Gulf of Mexico waters. Bottom ediments collected close to the submarine seeps ontain on the average about 25 times more heavy ydrocarbons than do sediments collected in areas ell away from the seeps. Chromatographic nalyses of the hydrocarbons extracted from the ediments clearly distinguish those hydrocarbons troduced into the sediments by the oil seeps om those introduced by natural biologic and hemical processes. The hydrocarbons in the sedients around Coal Oil Point are mainly derived om the seepage. In conclusion, the active eepage at Coal Oil Point does not appear to be uilding up hydrocarbon concentrations in the aters and sediments or changing the type of ydrocarbons except very close to the seeps. ydrocarbons from the seeps are not moving over wide area and being incorporated in the sedients or the water column. They should have little nvironmental impact. (See also W76-09374) Sinha - OEIS)
W76-09384

NFLUX OF PETROLEUM HYDROCARBONS NTO THE OCEAN,
oast Guard, Washington, D. C.
or primary bibliographic entry see Field 5G.
W76-09385

EVALUATION OF OFFSHORE BREAKWATER STABILITY UNDER WAVE ACTION,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09387

PHOTOOXIDATION AS A FACTOR IN THE ENVIRONMENTAL DISPERSAL OF CURDE OIL,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). Exploration and Production Research Div.
R. Burwood, and G. C. Speers.
Estuarine Coastal Mar Sci. 2(2): 117-135. 1974.

Descriptors: *Path of pollutants, *Dispersion, *Oil wastes, Biodegradation, Water pollution sources, Environmental effects.
Identifiers: Carbon, Crude, Dispersal, Dissolution, Environmental, Factor, Hydro, Laboratory, Marine, Oil, Oxidation, Oxides, Photo, Pollution, Processes, Simulation, Thiacyclane, Weathering, *Photooxidation, *Crude oil.

Processes relating to the dispersion and subsequent fate of crude oil in the marine environment are briefly reviewed. An important, but little studied, aspect of the dispersal and degradation of crude oil involves weathering processes effecting chemical transformations which assist the dissolution of petroleum components. Conditions experienced by crude oil in the marine environment include abundantly oxygenated surface waters, often accompanied by intense photo-illumination, suggesting that oxidative processes are operative. Laboratory simulation of the solubilization of crude oils in sea water confirmed previous observations on the rapid selective dissolution of the light aromatic hydrocarbons and provided evidence for the occurrence of a particular oxidation process. Prolonged equilibration of a medium sulfur content (2% wt) Middle East crude oil with sea water was accompanied by a conspicuous increase in the complex envelope of higher boiling soluble components in the aqueous phase. After 4 wk, this envelope constituted about 75% of the water-soluble fraction, and characterization of its components by chemical and combined g.c.-m.s. (gas chromatography-mass spectroscopy) techniques showed that they consisted almost exclusively of a complex mixture of thiacyclane-I-oxides. The complex mixture was previously reported as polar aromatic material, but is now shown to be oxidation products derived from indigenous crude oil thiacyclanes. A possible scheme for the oxidative conversion of the latter compounds to their I-oxides is outlined and the relevance of this mechanism to the partial dispersal of the sulfur content of crudes is considered.--Copyright 1975, Biological Abstracts, Inc.
W76-09389

DISTRIBUTION, CIRCULATION AND EVOLUTION OF NUTRIENTS, PARTICULARLY INORGANIC PHOSPHORUS IN LAKE ETANG DEBERRE: INFLUENCE OF RIVER DURANCE WATERS, (IN FRENCH),
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Oceanographie.
M. Minas.
Int Rev Gesamten Hydrobiol. 59(4); p 509-542, 1974.

Descriptors: *Distribution, *Nutrients, *Phosphorus, Photosynthesis, Lakes, Salinity, Brackish water, Nitrogen, Path of pollutants, Circulation.
Identifiers: Anoxic conditions, Marseilles, *Brackish lakes, France, River Durance(France), *Lake Etang de Berre(France).

The Etang de Berre is a brackish lake near Marseille (France). It was studies between 1965 and 1969, during which period a new hydroelectric plant caused the River Durance to be diverted into it. After the River Durance was diverted into the lake the total amount of inorganic P and N entering the lake was increased. Dilution caused a change of salinity from 30-34 ppt,to 2-25 ppt, but there remained a permanent halocile in the deepest part of lake, near the outlet to the Mediterranean Sea. Below the pycnocline the water became anoxic and this deep water acted as nutrient tapl becaaue of its isolation from the photsynthetic zone.--Copyright 1975, Biological Abstracts, Inc.
W76-09393

DEGRADATION OF BUNKER C OIL UNDER DIFFERENT COASTAL ENVIRONMENTS OF CHEDABUCTO BAY, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia)
M. A. Rashid.
Estuarine Coastal Mar Sci. 2(2); p 137-144, 1974.

Descriptors: *Biodegradation, *Oil spills, *Canada, *Oil pollution, Environment, Bacteria, Beaches, Coasts, Bays, Oxidation, Aromatic compounds.
Identifiers: *Bunker oil, C, *Chedabucto Bay(NC).

The extent of degradation of spilled oil in marine areas depends, in a large measure, upon the environmental conditions of coastal areas. The degradation is rapid in the high energy environment but is relatively slow in protected areas. Bacterial as well as oxidative processes alter the composition of oil. Oils exposed to high energy shoreline environments lose n-alkanes more rapidly. This loss is probably due to bacterial degradation because no other known physical or chemical process can account for this. With weathering the saturated and aromatic hydrocarbons decrease with a corresponding increase in the non-hydrocarbons, particularly in resins and NSO compounds. These changes which are possibly due to microbial and oxidative degradation processes are prominent in the oils of high energy environment. The rates of degradation of saturated and aromatic fractions are the same. The specific gravity increases with an increase in degradation of oil. The viscosity values show a marked increase with weathering. The increased viscosity of the oil residues in the high energy environment reduces its mobility. The residual oils present in varying amounts on nearly all contaminated beaches (Canada) of the protected areas of low and moderate energy environments will probably persist for several years. In high energy environments the residual oils are substantially altered due to the loss of n-alkanes and a parallel increase in resins and NSO compounds. The resulting residues are highly viscous and remain adhering to sand and pebble substrate.--Copyright 1975, Biological Abstracts, Inc.
W76-09394

5C. Effects Of Pollution

BIODEGRADATION OF POLYNUCLEAR AROMATIC HYDROCARBON POLLUTANTS BY SOIL AND WATER MICROORGANISMS,
Illinois Univ. at Urbana-Champaign. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-08752

THE EFFECTS OF INCREASING SALINITY ON THE PYRAMID LAKE FISHERY,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev.
R. Taylor.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 795, $3.50 in paper copy, $2.25 in microfiche. Nevada Water Resources Center, Desert Research Institute, Reno, Completion Report, May 1976. 9 p, 4 tab, 8 ref. OWRT A-040-NEV(2) 14-31-0001-3228.

LIBRARY OF THE UNIVERSITY OF

Descriptors: Fish physiology, Saline lakes, *Nevada, *Salinity, Alkaline water, Lakes, Diversion, *Trout, Ions, Dissolved solids.
Identifiers: *Pyramid Lake(Nev), Alkaline lakes, Lahontan cutthroat trout, *Water diversion effects(Fish).

Pyramid Lake is a large terminal lake in Nevada. Since 1910 the lake has been receding because of water diversions from the Truckee River which is the only perennial stream entering the lake. Consequently, the waters of Pyramid Lake are becoming more saline and alkaline producing a threat to the fishes present. Tests were conducted on various trout species to determine the effects of increased ion concentrations on the fish. Results showed Lahontan Cutthroat trout (Salmo clarki henshawi) were the most adaptable species to these increased ionic conditions. However, in order for even the Lahontan Cutthroat to survive in Pyramid Lake the dissolved solids level should never exceed 12,500 ppm (parts per million) at which time the elevation of the lake would be approximately 1115 metre above mean sea level. (Fallon-Nevada)
W76-08753

THE EFFECTS OF WASTE WATER DIVERSION ON HEAVY METAL LEVELS IN THE SEDIMENTS OF A LARGE URBAN LAKE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-08754

MERCURY CONCENTRATIONS IN SPRING AND FALL ZOOPLANKTON OF THE ESTUARY OF THE AROSA RIVER, (IN SPANISH),
Instituto Espanol de Oceanografia, Madrid (Spain). Central Laboratories.
J. Corral, and C. Masso.
Bol Inst Esp Oceanogr. 184, p 1-16, 1975.

Descriptors: *Mercury, *Estuaries, Seasonal, Europe, *Zooplankton, Rivers.
Identifiers: *Spain(Arosa River estuary).

Hg concentrations (on a dry weight basis) in plankton taken in the Arosa River (Spain) in May, June and Sept.-Oct., 1974 are given. Among the values found, 30 ranged from 0.5-2.78 ppm and 3 other concentrations were: 12.03, 14.63 and 16.80 ppm.--Copyright 1975, Biological Abstracts, Inc.
W76-08768

UPTAKE AND EFFECT OF CADMIUM ON ZEBRAFISH,
Marist Coll., Poughkeepsie, N. Y. Environmental Science Program.
R. Rehwoldt, and D. Karimian-Teherani.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 4, p 442-446, 1976. 1 fig, 2 tab, 11 ref.

Descriptors: *Cadmium, *Bioassay, *Heavy Metals, *Water Pollution Effects, Environmental effects, *Laboratory tests, *Absorption, *Reproduction, Fish reproduction, Fish eggs, Analytical techniques, Methodology.
Identifiers: *Zebrafish, Brachydanio sp., Sublethal effects.

Mature zebrafish (Brachydanio rerio) were maintained in the laboratory and fed 10 ppm cadmium mixed with the regular fish food. Fish were bred weekly and the eggs allowed to hatch. A control group of zebrafish was maintained without cadmium added to the diet. The accumulation curve for cadmium showed a steep rise followed by slower uptake and finally a plateau. Female zebrafish reached a peak concentration of cadmium a 12.7 micrograms/gram dry weight and males peaked at 5.1 micrograms/gram dry weight. The monthly total of eggs began to decline after the first month and there was a highly significant decrease in the number of zebrafish offspring after chronic long-term ingestion of cadmium. Analysis of offspring showed no detectable amounts of cadmium. (Katz)
W76-08772

THE EFFECT OF DURSBAN UPON FRESH WATER PHYTOPLANKTON,
Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
J. R. Brown, L. Y. Chow, and C. B. Deng.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 4, p. 437-441, 1976. 2 fig., 2 tab., 4 ref.

Descriptors: *Growth rates, *Phytoplankton, *Pesticides, *Environmental effects, *Organophosphorous pesticides, *Inhibitors, *Diatoms, Primary productivity, Pesticide residues, Plant growth, Aquatic algae, Lakes, On-site investigations, Analytical techniques, Plant populations, Plankton, Aquatic plants, Ponds, Canada.
Identifiers: *Dursban, Sublethal effects, Ceratium sp.

Test cylinders were constructed in a fresh water lake with known phytoplankton populations to test the effect of small amounts of Dursban, an organophosphorous pesticide, on fresh water phytoplankton and diatoms. The lowest test concentration of Dursban, 1.2 ppb, decreased the population of all phytoplankton observed except for Ceratium sp., which were unaffected at 240 ppb Dursban. The concentration of Dursban declined rapidly within the test cylinders, but the effect upon phytoplankton remained apparent after seventeen days. Growth inhibition of phytoplankton was most pronounced during their active growth phase. (Katz)
W76-08773

THE EFFECT OF FERTILIZATION ON THE SPECIES COMPOSITION OF SALT MARSH DIATOMS,
Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.
C. D. Van Raalte, I. Valiela, and J. M. Teal.
Water Research, Vol. 10, p 1-4, 1976, 2 fig, 2 tab, 24 ref.

Descriptors: *Fertilization, *Diatoms, Plant groupings, *Marsh plants, *Sewage sludge, *Sludge disposal, *Salt marshes, Coastal marshes, Tidal marshes, *Ureas, Microorganisms, Halophytes, Inhibitors, Nitrogen compounds, Massachusetts, *Marshes, Water pollution effects.
Identifiers: *Epibenthic algae, Navicula salinarum, Great Sippewisset Salt Marsh, Cape Cod.

The diversity of epibenthic diatoms in a salt marsh was reduced by fertilization with either sewage sludge or urea. Counts of 500 individuals were sufficient to demonstrate a lower total number of species, a smaller number of rare species and a greater dominance of the most abundant species in the fertilized areas as compared with the controls. Navicula salinarum Grun., which formed 5-9% of the diatoms in the controls became dominant in the fertilized plots, comprising 20-25% of the population. (Katz)
W76-08774

THE ROLE OF PH ON THE ACUTE TOXICITY OF SULFITE IN WATER,
Government Industrial Research Inst., Osaka (Japan).
H. Sano.
Water Research, Vol. 10, p 139-142, 1976, 6 fig., 1 tab., 11 ref.

Descriptors: Methodology, *Bioassay, *Hydrogen ion concentration, Fish, *Toxicity, *Correlation analysis, *Chemical wastes, *Sulfur compounds, *Laboratory animals, Water pollution effects, Laboratory tests.
Identifiers: *Sulfite, *Sulfur dioxide, Acute toxicity, Flue Gas, Gupppy, Lebistes reticulatus, Median Tolerance Limit(TLm).

The toxicity of sulfite to fish decreases with increasing pH value, because the HSO3(-) ion more toxic than the S03(2-) ion. An effecti sulfite concentration Seff which is proportional the toxicity on fish, is expressed by the followi equation: Seff = (HSO3(-) + f(SO3)(2-)) where f a coefficient which expresses the change of toxic ty of sulfite depending on the pH of the water, a varies for each species of fish. For goldfish, owi to the very small toxic contribution of SO3(2-) i (f = 0.07), the pH dependence of the toxicity sulfite on pH was so strong that sulfite seemed most non-toxic in basic solution. However, f f guppy is somewhat larger (f = 0.20) so that the to icity of sulfite weakly depends on the pH value water. (Katz)
W76-08775

MERCURY CONTENT OF BIOTA IN COASTA WATERS IN HAWAII,
Hawaii Univ., Honolulu. Pacific Biomedic Research Center.
H. W. Klemmer, C. S. Unninayer, and W. I. Okubo.
Bulletin of Environmental Contamination a Toxicology, Vol. 15, No. 4, p. 454-457, 1976. tab., 8 ref.

Descriptors: *Mercury, Path of pollutan *Absorption, *Trophic level, *Benthos, *Fo chains, Analytical techniques, Carnivores, Fo chains, Sampling, *Hawaii.
Identifiers: Bioaccumulation, Tissue analysis.

Biota collected from four coastal areas of Haw were analyzed for total mercury content and cl sified according to primary food material as h bivores, omnivores, primary benthic carnivo and secondary benthic carnivores. Of the 58 s cies collected, most were benthic in habitat. M cury concentrations ranged from undetectable 26% of the samples to a high of 1.0 ppm in sample. The mean value was 0.08 ppm. Highly nificant differences existed between values mercury for different trophic levels with an crease in mean mercury value with each elevati in trophic level. This suggests successive biolo cal concentration and transport of this eleme (Katz)
W76-08776

CILIATE ASSOCIATIONS (CILIATA) IN T PRADNIK STREAM, WHICH IS POLLUTED RESIDUAL WATERS OF A DAIRY, FRENCH),
Jagellonian Univ., Krakow (Poland). Dept. Hydrobiology.
A. Czapik.
Acta Hydrobiol. 17(1), p 21-34, 1975.

Descriptors: *Protozoa, *Farm wastes, Water p lution effects, Dairy industry, Europe, *Alg Streams, Nutrients.
Identifiers: *Poland(Pradnik Stream).

The infusoria living on the bottom of Prad stream was examined. This stream crosses Oj National Park and falls into the River Vistul the territory of Cracow (Poland). Samples w taken from shallow places close to the banks of stream where mud settles and algae develop. these places the infusoria formed mixed commu ties with a predominance of algophagocytic cies over microphagocytic ones. The infus were classified into groups depending on mode nutrition. The waste water from the dairy, brin a large amount of undecomposed organic mat is a permanentdanger for the biological balance this stream.-Copyright 1975, Biological Abstra Inc.
W76-08777

ECTICIDE RESIDUES IN TWO TURTLE ECIES FOLLOWING TREATMENT WITH T,
ldle Tennessee State Univ., Murfreesboro. ot. of Biology.
. Owen, and M. R. Wells.
letin of Environmental Contamination and ticology, Vol. 15, No. 4, p. 406-411, 1976. 2 , 10 ref.

criptors: Path of pollutants, *DDT, *DDD, DE, *Bioassay, *Pesticide residues, *Food s, *Turtles, Absorption, Pesticides, Aquatic nals, Reptiles, Laboratory tests, Chlorinated rocarbon pesticides, Animal physiology, secticides, Pollutant identification.
ntifiers: Tissue analysis, *Chrysemys sp., Red-d turtles, Mudland painted turtles, Bioaccu-ation.

l-eared and midland painted turtles (Chrysemys pta and C. picta, respectively) were treated n 100 mg DDT/kg of body weight, administered ly. The test included one group receiving only dose of DDT and another group receiving e doses at weekly intervals. Tissue analyses wed no pattern to the fate of DDT or its abolites. The major organ of degradation was liver, which contained DDT and its metabolites oth species 3, 6, and 12 hours after treatment. idues detected in the brain before the 24 hours tment period were probably residual, how-r, higher concentrations were detected after e week treatment. Large quantities of residues e detected in fat. Both species were able to abolize DDT to its less toxic forms and could rete all forms immediately. Based on this data, concentrations of DDT previously used in the ironment would not pose a health problem for les. (Katz)
6-08778

OWTH AND SURVIVAL OF YOUNG-OF-3-YEAR EMERALD SHINERS (NOTROPIS HERINOIDES) AT DIFFERENT TEMPERA-RES,
ironmental Research Lab., Duluth, Minn.
. McCormick, and C. F. Kleiner.
nal of the Fisheries Research Board of ada, Vol. 33, p. 839-842, 1976.

criptors: *Growth rates, *Shiners, mperature, *Biomass, *Lethal limit, rtality, Forage fish, Aquaculture, *Heated er, Laboratory tests, Fish, Productivity, Food ns, Environmental effects.
ntifiers: Notropis atherinoides.

ng-of-the-year emerald shiners (Notropis rinoides) were exposed to mean constant tem-tures of 6.9, 11.9, 16.0, 19.8, 24.0, 26.9, 28.9, , 32.8, 34.9 and 36.7C for 6 weeks. Maximum s of growth and net biomass gain occurred at C, but were not statistically greater than those .9 and 24.0C. Death rates were low at test tem-tures up to 32.8C but high at 34.9C and above. incipient 7-day TL50 was estimated to be 35.2. 1-day TL50 of fish taken from the natural tat, where peak temperatures ranged from 20 C, was 32.6 C. Natural production of this im-ant forage species would probably be best re temperatures are at least 19 C but not above for extended periods. (Katz)
-08779

ONTINUOUS FLOW BIOASSAY METHOD EVALUATE THE EFFECTS OF OUTBOARD TOR EXHAUSTS AND SELECTED ARO-IC TOXICANTS ON FISH,
is Univ. at the Medical Center, Chicago. ol of Public Health.
renniman, R. Hartung, and W. J. Weber, Jr.
r Research, Vol. 10, p. 165-169, 1976, 1 fig., 2 22 ref.

Descriptors: Methodology, *Bioassay, Analytical techniques, *Toxicity, *Water pollution source, Water pollution, *Laboratory tests, Laboratory animals, Fish environment, Water pollution effects.
Identifiers: *Goldfish, Continuous flow bioassay, Toluene, Xylene, 1,3,5 Trimethylbenzene, *Outboard Motor Exhaust(OME), LC-50, Carassius auratus, Static bioassay, Volatile toxicants, Leaded OME, Non-leaded OME.

A continuous flow bioassay system was designed to measure the effects of outboard motor exhaust (OME) emissions and selected volatile and evaporative aromatic toxicants on goldfish (Carassius auratus). Continuous flow bioassays were run for 24, 48, 72, 96, and 720 h to determine lethal concentrations for 50% of individuals (LC-50's) for leaded OME, non-leaded OME, and toluene, xylene, and 1,3,5 trimethylbenzene, the three individual compounds having been identified as significant aromatic components of OME. The 96 h LC-50's for these substances were 171, 168, 23, 17, and 13 ppm, respectively. The values of 171 and 168 ppm for the two OME's are given in terms of gallons of fuel burned per million gallons of water. The continuous flow bioassay method was demonstrated to be a more reliable indicator of the effects of OME pollutants on on aquatic organisms than is the static bioassay method. (Katz)
W76-08780

ACUTE AND CHRONIC TOXICITY OF LEAD TO RAINBOW TROUT SALMO GAIRDNERI, IN HARD AND SOFT WATER,
Fishery Research Centre, Fort Collins, Colo.
P. H. Davies, J. P. Goettl Jr., J. R. Sinley, and N. F. Smith.
Water Research, Vol. 10, p. 199-206, 1976, 4 fig, 4 tab, 26 ref.

Descriptors: Methodology, *Bioassay, *Analytical techniques, *Toxicity, *Rainbow trout, *Lead, *Chemical analysis, *Larvae, *Fish eggs, Pathology, Water pollution effects, Laboratory tests, Fish environment, Heavy metals, Water chemistry, *Rainbow trout.
Identifiers: Hard water, Soft water, Static bioassay, LC50, Dissolved lead, Total lead, Maximum Accepted Toxicant Concentrations(MATC), Acute bioassay, Continuous flow bioassay.

Lead was highly toxic to rainbow trout in both hard water (hardness 353 mg 1-1 as CaCO3) and soft water (hardness 28 mg 1-1). Analytical results differ greatly with methods of analysis when measuring concentrations of lead in the two types of water. Two static bioassays in hard water gave 96-h LC50's of 1.32 and 1.47 mg 1-1 dissolved lead vs total lead LC50's of 542 and 471 mg 1-1, respectively. In a flow-through bioassay in soft water a 96-h LC50 of 1.17 mg 1-1, expressed as either dissolved or total lead, was obtained. From chronic bioassays, MATC's of lead for rainbow trout in hard water were between 18.2 and 31.7 ug 1-1 dissolved lead vs 120-360 ug 1-1 total lead. In soft water, where exposure to lead was initiated at the eyed egg stage of development, the MATC was between 4.1 and 7.6 ug 1-1. With exposure to lead beginning after hatching and swim-up of fry, the MATC was between 7.2 and 14.6 ug 1-1. Therefore, fish were more sensitive to the effects of lead when exposed as eggs. (Katz)
W76-08781

RIVER POLLUTION BY ANTICHOLINESTERASE AGENTS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
D. L. Coppage, and T. E. Braidech.
Water Research, Vol. 10, p. 19-24, 1976, 1 fig., 5 tab., 31 ref.

Descriptors: *Toxicity, Freshwater fish, *Industrial wastes, *Fish physiology, Animal pathology, *Path of pollutants, *Agricultural chemicals, *Pesticide toxicity, *Carbamate pesticides, *Organophosphorous pesticides, Chemical analysis, *Bioassays, *Carp, On-the-site investigations, Water pollution, *Missouri River, Missouri.
Identifiers: Blue River(Missouri), Kansas City(Missouri), Acetylcholinesterase(AChE), Brain-AChE.

The effects of effluent discharged into the Blue River, near its confluence with the Missouri River in Kansas City, Missouri, by a manufacturer of organophosphate and carbamate pesticides were investigated. Since these pesticides act as nerve poisons by inhibiting the neurotransmitter modulating enzyme acetylcholinesterase (AChE) in the nervous system, poisoning of fishes was diagnosed by measurement of brain-AChE in fishes collected from the Missouri River upstream and downstream from the mouth of the Blue River. Other fish were exposed to diluted effluent in glass jars and their brain-AChE measured to determine combined poisoning potential of compounds present. Fishes immediately downstream repeatedly had lower brain-AChE activity than fishes upstream, and fish exposed to diluted effluent had lower brain-AChE activity than unexposed fish. Chemical analyses showed substantial amounts of AChE-inhibiting pesticides in the effluent relative to their toxicities. These data indicate the effluent relative to their toxicities. These data indicate the effluent is a contributing factor in the reduced brain-AChE activity of Missouri River fishes, and that brain-AChE measurement in fishes is a sensitive and reliable indicator of such pollution. (Katz)
W76-08782

ACUTE AND CHRONIC TOXICITY OF COPPER TO THE FATHEAD MINNOW IN A SURFACE WATER OF VARIABLE QUALITY,
National Water Quality Lab., Cincinnati, Ohio. Newtown Fish Toxicology Lab.
W. A. Brungs, J. R. Geckler, and M. Gast.
Water Research, Vol. 10, p. 37-43, 1976. 7 tab, 17 ref.

Descriptors: *Toxicity, Freshwater fish, *Copper, *Sewage effluents, *Laboratory methods, *Bioassay, *Water quality, *Minnows, *Fish eggs, *Growth stages, Fish physiology, Life cycles, Laboratory tests.
Identifiers: Acute toxicity, Chronic toxicity, *Fathead minnows, Median Tolerance limit, 96-h TL50, Dissolved copper, Maximum Acceptable Toxicant Concentration.

Acute and chronic toxicity tests conducted with the fathead minnow and copper used as the source of dilution water a natural stream to which a sewage treatment plant upstream contributed a variety of materials known to affect acute copper toxicity. Nominal total copper 96-h median tolerance limit values (96-h TL50), determined with static testing procedures, ranged from 1.6 to 21 mg 1-1. Dissolved copper 96-h TL50 values ranged from 0.60 to 0.98 mg 1-1. The maximum acceptable toxicant concentration (MATC) based on survival, growth, reproduction, and hatchability of eggs was between 0.066 and 0.118 mg 1-1. (Katz)
W76-08783

HYPERHALINE ENVIRONMENTS OF THE COMPLEX OF BAGES-SIGEAN, THE LAGOON OF THE DOUL, (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
For primary bibliographic entry see Field 2L.
W76-08784

EFFECTS OF THERMAL CIRCULATION ON PHYTOPLANKTON PHOTOSYNTHESIS,
O. T. Lind.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 1829-1833, 1975, 4 tab., 6 ref.

LIBRARY OF THE UNIVERSITY OF

Descriptors: *Phytoplankton, *Primary productivity, Methodology, Heated water, Electric power plants, Thermal stress, *Photosynthesis, Plankton, Aquatic productivity, *Light, *On-site investigations, *Carbon radioisotopes, Texas, Reservoirs, *Thermal pollution.
Identifiers: *C-14 technique, Tradinghouse Creek Reservoir.

Phytoplankton photosynthesis measurements were made in the intake and thermal discharge of a fossil fueled steam electric station. The maximum temperature achieved and the temperature range are both important. The data obtained suggest that some stimulus encountered in circulation such as changes in pressure and velocity may also be important. There is also a light and heated circulation interaction. (Katz)
W76-08785

ECOLOGY OF AN ANNUAL SAPROLEGNIA SP. (PHYCOMYCETE) OUTBREAK IN WILD BROWN TROUT,
D. A. White.
Verhandlungen Internationale Vereinigung, fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2456-2460, 1975 2 fig., 3 tab., 7 ref.

Descriptors: Environmental effects, *Mortality, *Spawning, Sport fish, *Trout, *Brown trout, *Fish diseases, Water temperature, *Aquatic fungi, Impoundments, Water pollution effects, Utah, Ecology.
Identifiers: *Lower Provo River(Utah), Adult spawners, Zoospores, Terrestrial leaf fall, *Saprolegnia sp.

An annual outbreak of Saprolegnia among wild spawning brown trout in a section of the Lower Provo River below the Deer Creek Dam to the Upper Falls Power Diversion Dam was investigated. The outbreak was attributed to favorable conditions for the fungus created by the higher water temperatures and the accumulated organic matter in the Deer Creek Reservoir. (Katz)
W76-08786

EXPERIMENTS ON THE EFFECTS OF INORGANIC ENRICHMENT OF RIVERS ON PERIPHYTON PRIMARY PRODUCTION,
K. Wuhrmann, and E. Eichenberger.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2028-2034, 1975, 1 fig., 6 tab., 8 ref.

Descriptors: *Primary productivity, *Eutrophication, Aquatic algae, Aquatic productivity, *Sewage, *Nitrogen, *Phosphorous, *Trace elements, Methodology, Running waters, *Periphyton, *Metals, Water pollution effects.
Identifiers: Hoaglund solution(Trace metals), Artificial channels.

Growth experiments were conducted in eight parallel artificial channels of equal gradient. It was observed that trace amounts of sewage enhanced primary production in the channels. The addition of trace metals at low concentrations enhanced productivity. With higher concentrations a tendency to growth inhibition was observed. The role of trace metals in aquatic production should be elucidated. (Katz)
W76-08787

SELECTIVE FISH MORTALITY RESULTING FROM LOW WINTER OXYGEN,
J. M. Casselman, and H. H. Harvey.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2418-2429, 1975, 8 fig., 25 ref.

Descriptors: *Freshwater fish, Fish populations, Cold-water fish, *Oxygen sag, *Dissolved oxygen, *Fish kill, Fish establishment, *Pikes, *Iced lakes, *Mortality, Lake fisheries, Sport fish, Eutrophication, Lake ice, Minnows, Canada, Water pollution effects.
Identifiers: Age composition, Size composition, Esox lucius, Yellow perch, Darters, Pimephales promelas, Manitoulin Island, Ontario, Smoky Hollow Lake.

Intraspecific selective mortalities associated with partial winter kills and low winter oxygen had a profound effect on structure of pike populations. Pike which succumbed were significantly larger than those which survived. Older pike died while only pike of age two and younger survived. Fast growing fish died, while slower growing individuals survived. This was especially true of females. Partial winter kills selected for small, young, slow-growing males. (Katz)
W76-08788

TROUT POPULATION RESPONSES TO STREAMFLOW FLUCTUATION AND HABITAT MANAGEMENT IN BIG ROCHE-A-CRI CREEK, WISCONSIN,
For primary bibliographic entry see Field 4A.
W76-08789

FISH POPULATIONS IN A LARGE GROUP OF ACID-STRESSED LAKES,
H. H. Harvey.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2406-2417, 1975 8 fig, 4 tab, 14 ref.

Descriptors: Lake fisheries, *Fish populations, *Fish reproduction, Fresh-water fish, *Air pollution, *Fallout, *Acidic water, Acids, *Chemical washes, *Lake trout, Cold water fish, Walleye, Bass, *Mineral industry, Minnows, Canada.
Identifiers: *LaCloche Mountains(Ontario), *Species diversity, Population composition, Number of species, pH range, Smelter.

A study was made of fish populations, especially number and diversity, in a group of acid-stressed lakes in the LaCloche Mountains, which are located along the north shore of Georgian Bay and North Channel of Lake Huron. There has been a loss of sport fishes from several of these lakes due in one case to the lack of reproduction. The number of fish species and the species diversity correlates positively with the distance from the nearest and largest smelter. (Katz)
W76-08790

INSHORE EFFECT OF POLLUTION ON THE BIOTA OF THE BALTIC, SOUTHERN FINLAND,
T. L. Melvasalo, R. Pesonen, Varmo, and H. Vuljamaa.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2340-2353, 1975 7 fig., 5 tab., 33 ref.

Descriptors: *Sewage, Seawater, *Primary productivity, *Estuarine environment, *Benthic fauna, *Eutrophication, Zooplankton, Animal grouping, Phytoplankton, Biomass, Surface waters, Primary treatment, Secondary treatment, Phosphorous, Nitrogen, Municipal waste, *Domestic wastes.
Identifiers: Baltic Sea, *Gulf of Finland, *Helsinki(Finland).

The domestic wastes of Helsinki have created changes in the biotic community in the Baltic Sea as a result of the eutrophication stress caused by the coastal pollution. The changes are: (1) Increase in primary production, (2) Decrease in species diversity, (3) Replacement of indigenous species by pollution-tolerant forms, (4) Seasons variability in the biotic component was maximal in the area adjacent to the coast. (Katz)
W76-08791

BIOLOGICAL EFFECTS OF PRIMARY SECONDARY, AND TERTIARY SEWAG TREATMENT IN LOTIC ANALO RECIPIENTS,
Norsk Institutt for Vannforskning, Blindern.
T. S. Traaen.
Verhandlungen, Internationale Vereinigung f Theoretische und Angewandte Limnologie, V 19, p. 2064-2069, 1975 4 tab., 12 ref.

Descriptors: Methodology, *Tertiary treatmer *Biological treatment, *Waste water treatmer *Primary productivity, *Oxygen deman *Benthos, Chlorophyll, Artificial substrate, Mo toring, *Sewage treatment.
Identifiers: *ATP, Artificial channels, Commun respiration, Selenastrum, Zoobenthos, Kjelle Norway, Lotic analogs.

Experiments conducted in outdoor, twelve-ch nel system have shown that experimental chann used as recipient analogs are a sensitive tool detecting biological community response sewage effluent. Until the connection betwe chemical water parameters and biologi response are better understood, recipient ana systems can be useful and effective for efflu monitoring. (Katz)
W76-08792

OBSERVATION AND MONITORING WATER QUALITY BY USE OF EXPERIME TAL BIOLOGICAL METHODS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W76-08793

ALGAL GROWTH POTENTIAL OF SIX NO WEGIAN WATERS RECEIVING PRIMA SECONDARY AND TERTIARY SEWAGE FLUENTS,
T. Kallqvist.
Verhandlungen Internationale Vereinigung Theoretische und Angewadte Limnologie, Vol. p. 2070-2081, 1975. 11 fig., 2 tab., 1 ref.

Descriptors: Sewage treatment, Tertiary tr ment, *Phosphorus, *Nitrogen, Sea water, face water, Waste water treatment, *W chemistry, *Marine algae, Eutrophication, Fjo Identifiers: Oslo, *Norway, Selenastr Phaeodactylum, *Algal growth, Cell yield, Fjord.

Experiments with algal growth in mixtures of t different kinds of treated sewage and six recei waters have shown that the growth potential pends on composition of receiving water as we waste water. With chemically treated waste w the phosphorous concentration of the recei water is critical. Primary wastes have the hi level of nutrients and give the greatest increa growth potential. (Katz)
W76-08794

ASSESSMENT AND ERADICATION OF HE METAL POLLUTION IN A PLANNED UR ENVIRONMENT,
A. H. Weatherley, P. Dawson, and L. Penridge

Descriptors: *Heavy metals, *Copper, *Z *Cadmium, *Rainbow Trout, *Brown Tr Animal pathology, *Mine wastes, On-the-sit vestigation, Metals, Waste dumps, Spoil ba Mineral industry, Reclamation, Project plann Decision making, *Australia, Water pollutio fects, Cities, Urbanization.
Identifiers: Histology, Canberra(Austr Photomicrographs, Optimal strategy, Molo River, *Lake Burley Griffin(Australia).

An ornamental and recreational lake (Lake Bu Griffin, Australia) is polluted by copper and from the tailings of an abondoned mine. The histology of rainbow trout and brown trout i

e is described. The gills are severely damaged. trategy for remedying the problem is outlined. tz)
6-08795

XICITY OF SOME CHEMICAL THERAPEU-S TO THE COMMERCIAL SHRIMP, NAEUS CALIFORNIENSIS,
zona Univ., Tucson, Environmental Research
S. Hanks.
aculture, Vol. 7, p. 293-294, 1976. 1 tab., 2 ref.

criptors: Aquiculture, Diseases, Pathology, assay, *Toxicity, *Commercial shellfish, rimp, *Copper sulfate, Potassium compounds, gicides, Mortality, Laboratory tests, Water ution effects.
ntifiers: Penaeus californiensis, Therapeutics, rine, Malachite Green, Methylene blue.

rmation is presented concerning the toxicity ethylene blue, copper sulfate, cutrine, potas- permanganate, formaline-malachite green, hyamine to Penaeus californiensis. (Katz)
6-08796

ORATORY AND FIELD TESTS OF TEM-ATURE TOLERANCE ON GAMBUSIA A. INIS, THE WESTERN MOSQUITOFISH,
. Gerking, T. Ratcliff, and R. G. Otto.
handlungen, Internationale Vereinigung fur oretische und Angewandte Limnologie, Vol. p. 2498-2503, 1975, 3 fig., 2 tab., 4 ref.

criptors: *Bioassays, *Thermal stress, ated water, *Thermal stress, Mortality, Fresh-r fish, Warm springs, Methodology, Water perature, *Laboratory tests, On-site investiga-s.
ntifiers: *Mosquito fish, Gambusia affinis, lian survival time, Upper incipient lethal ls, Critical thermal maximum.

acclimated to constant temperatures in the ratory and those acclimated to fluctuating peratures in the field yield similar median sur- times, similar upper incipient lethal levels similar critical thermal maxima (CTM). The ess of acclimation is the same under the two of conditions. Exposure to increasingly higher imation temperatures increases median sur- times and CTM at temperatures above or lering on the upper lethal limit. Males, fry and atures are more heat resistant than are adult ales. (Katz)
-08798

LUENCE OF MINERAL FERTILIZATION AKES ON FISH GROWTH,
tut Rybactwa Srodladowego, Olsztyn-Kor- (Poland).
arciak.
handlungen, Internationale Vereinigung fur oretische und Angewandte Limnologie, Vol. . 2582-2588, 1975 5 fig, 4 ref.

criptors: *Eutrophication, Freshwater fish, mercial fish, *Food habits, Fish populations, d chains, Lake fisheries, *Fertilization, wth rates, Minnows, Fish management, Fish , Zooplankton, Benthos, Environmental ef-, Stratification, Lakes.
ifiers: Bream, Roach, Pike-Perch, Growth sment, *Poland, Lake Ozarnakuta, Lake Maly.

species responded differently to the increase utrients in two lakes at various stages of phy and different morphometry. Bream in a , stratified lake had an accelerated growth, in a shallow, highly eutrophic lake the th rate of the same species was diminished. th was correlated with amount and sizes of m organisms and pelagic crustaceans. In both lakes the growth rate of roach decreased and that of pike-perch increased. Decreasing transparency had a different effect on the growth of fishes. (Katz)
W76-08799

PHOSPHORUS AVAILABILITY IN PARTICULATE MATERIALS TRANSPORTED BY URBAN RUNOFF,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5B.
W76-08804

STUDIES ON PHOSPHORYLATION COUPLED WITH DENITRIFICATION AND AEROBIC RESPIRATION IN PSEUDOMONAS DENITRIFICANS,
Nagoya Univ. (Japan). Biological Inst.
H. Terai, and T. Mori.
Botanical Magazine, Vol. 88, No. 1011, p. 231-244, 1975. 5 fig., 7 tab., 31 ref.

Descriptors: *Cytological studies, *Denitrification, *Aerobic conditions, *Phosphates, *Pseudomonas, Respiration, Inhibitors, Biochemistry, Oxidation.
Identifiers: *Phosphorylation, Adenosine triphosphate.

To determine how much, if any, phosphorylation is coupled with denitrification in intact cells or cell-free Pseudomonas denitrificans sysems, the formation of adenosine triphosphate during aerobic respiration and denitrification was measured. In intact cells, adenosine triphosphate formation associated with aerobic respiration when lactate was used as an electron donor. Potassium cyanide, sodium azide, and 2,4-dinitrophenol inhibited the formation of adenosine triphosphate. When ammonium hydroxide, dimethyl-p-phenylenediamine, or tetramethyl-p-phenylenediamine were used as electron donors, no phosphate uptake occurred; however production of nitrous oxide, nitrogen, or nitric oxide from nitrite was accelerated under anaerobic conditions. In cell-free systems, the formation of adenosine triphosphate was shown by using an adenosine triphosphate trapping system with lactate as the substrate. The effects of the various inhibitors were about the same as those observed with intact cells. Dimethyl-p-phenylenediamine or tetramehtyl-p-phenylenediamine together with ascorbate favored adenosine triphosphate formation during aerobic oxidation in a cell-free system; no stimulation of adenosine triphosphate formation was observed during denitrification. (Buchanan-Davidson--Wisconsin).
W76-08823

THE IN VITRO SENSITIVITY OF SOME SPECIES OF CHLOROPHYCEAE TO A SELECTED RANGE OF HERBICIDES,
Saskatchewan Univ., Regina. Dept. of Biology.
D. R. Cullimore.
Weed Research, Vol. 15, No. 6, p. 401-406, 1975. 1 fig., 2 tab., 11 ref.

Descriptors: *Chlorophyta, *Herbicides, *Algicides, *Algal control, Monuron, Paraquat, Diquat, Delapon, 2,4,5-T, Urea pesticides, Phytotoxicity, Inhibitors, Varieties, Resistance, Rates of application.
Identifiers: Phenylalkanoic herbicides, Bromacil, Linuron, 2,4-DB, Barban, Dicamba, Dichlobenil, Picloram, Bromoxynil, 2,3,6-TBA, 2,4-DP, EPTAM.

To obtain an index of potential algicidal activity, commercially available herbicides were routinely scanned against seventeen axenic Chlorophyceae algal species. Algal strains varied in their sensitivity to herbicides. Chlorella ellipsoidea was the only alga resistant to all herbicides studied. Hormidium and Haematococcus were the most sensitive genera. Hormidium barlowi was sensitive to the broadest spectrum of herbicides, but its low sensitivity makes it unacceptable for direct soil assay. Haematococcus lacustris was highly sensitive to a wide spectrum of herbicides and would be suitable for monitoring urea and bipyridyl herbicides. Other herbicides may interfere with bioassay accuracy, since no algal strain was sensitive to a single herbicide. Diuron and bromacil had the broadest spectrum, inhibiting 15 of 17 algal strains, but diuron inhibited growth at lower concentrations. Among urea herbicides, diuron had the broadest, monuron an intermediate, and linuron did not inhibit growth completely at as low concentrations as diuron. Of bipyridyl herbicides, paraquat had a broader spectrum than diquat. Of phenylalkanoic herbicides, 2,4-DB was more inhibitory than 2,4-DP. Herbicides in sequence from most inhibitory to non-inhibitory were diuron>bromacil>paraquat>monuron>diquat>linuron>2,4-DB>barban>dicamba, dichlobenil, dalapon, picloram>bromoxynil, 2,3,6-TBA>2,4-DP,>2,4,5-T and EPTAM. (Buchanan-Davidson--Wisconsin)
W76-08824

BIOMASS PARAMETERS AND PRIMARY PRODUCTION AT A NEARSHORE AND A MIDLAKE STATION OF LAKE ONTARIO DURING IFYGL,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
P. Stadelman, and M. Munawar.
In: International Association Great Lakes Research, Proceedings 17th Conference on Great Lakes Research, p. 109-119, 1974. 1 fig., 8 tab., 17 ref.

Descriptors: *Phytoplankton, *Biomass, *Primary productivity, *Lake Ontario, *Fluctuations, International hydrological decade, Carbon, Organic matter, Photosynthesis, Seasonal, Phosphorus, Chlorophyll, Detritus, Algae, Inorganic compounds, Nitrogen, Lakes.
Identifiers: Adenosine triphosphate.

To compare biomass parameters and the relationships between biomass and photosynthesis rates, seasonal variations in particulate organic carbon and nitrogen, particulate phosphorus, chlorophyll-a, adenosine triphosphate, and phytoplankton biomass were studied at nearshore and midlake stations of Lake Ontario. Photosynthesis rates, using carbon-14, measured on two consecutive days were related to biomass parameters. All nearshore parameters were high in June and July. The midlake station showed a lag in biomass increase in the spring; maxima were observed later in July and September. Detrital carbon exceeded phytoplankton and living carbon. Even during high algal density, detrital carbon was 50%, consequently only 20-25% particulate carbon was bound in algal and living material. Problems in determining various parameters are discussed; each parameter has inherent problems and there is no standard to which a proposed parameter can be compared. If total living biomass determinations are required quickly, adenosine triphosphate can be determined. To describe the conversion of inorganic nutrients to biomass, particulate organic carbon and nitrogen and particulate phosphorus may give a first approximation of biomass if large amounts of detritus are not present. Algal biomass determinations by phytoplankton identification and enumeration can yield biomass estimates, with the added information about algal species composition, and size distribution. (Buchanan-Davidson--Wisconsin)
W76-08825

OBSERVATIONS OF COLONIAL MULTIPLICATION IN A RAPIDLY GROWING ALGA,

LIBRARY U. OF A. ...

GONIUM MULTICOCCUM POCOCK (VOLVOCACEAE),
Hokkaido Univ., Muroran (Japan). Inst. of Algological Research.
S. Saito, and T. Ichimura.
Botanical Magazine, Vol. 88, No. 1011, p. 245-247, 1975. 6 fig., 1 tab., 5 ref.

Descriptors: *Algae, *Growth rates, Growth stages, Period of growth, Photography, Laboratory tests, Cultures, Temperature, Reproduction, Asia, Ponds.
Identifiers: *Gonium multicoccum, *Nepal, Rain pools.

A strain of Gonium multicoccum Pocock was isolated from dried mud collected from a rain water pool in Central Nepal. A microphotographic method was used to estimate the growth rate of this organism when grown on an agar surface. Cultures were incubated at 10-36C under 3500 lux illumination. Due to heterotrophic nature, inoculated colonies grew faster at higher temperatures. At 36C three vegetative generations were observed during 15 hours, while at 14C there was no significant growth. When synchronous cell divisions and daughter colony formations were studied by time-lapse photomicrography, it was observed that each cell in a 16-celled colony divided successively 4 times to form a 16-celled daughter colony. The shortest generation time with respect to colony reproduction was estimated to be approximately 8 hours. If it is assumed that a colony consistently reproduces by a factor of 16 with a generation time of 8 hours; the cellular growth constant K which expresses a number of cell doublings per day was calculated to be 12. This would place this organism among the most rapidly growing algae among those known in laboratory cultures. (Buchanan-Davidson--Wisconsin).
W76-08826

VALYL TRNA'S OF ANACYSTIS NIDULANS,
Magyar Tudomanyos Akademia, Szeged. Novenyelettani Kutato Intezet.
A. Gozdzicka-Jozefiak, D. Labuda, G. Bagi, G. Borbely, and G. L. Farkas.
Phytochemistry, Vol. 14, No. 11, p. 2375-2377, 1975. 2 fig., 25 ref.

Descriptors: *Cytological studies, *Biochemistry, *Cyanophyta, Amino acids, Synthesis, Enzymes, Bacteria.
Identifiers: Aminoacyl synthesis, Ribonucleic acid, *Anacystis nidulans.

Relationships of blue-green algae to bacteria and/or chloroplasts and eukaryotic cells were studied. Conclusions about the relatedness of organisms and/or organelles from which components are derived can be drawn from study of tRNAs and their cognate aminoacyl synthetases. This hypothesis was investigated as Anacystis nidulans valyl-tRNA isoacceptors in homologous and heterologous systems. A. nidulans valyl-carbon-14-aminoacylated-tRNA charges with homologous synthetase separated into three distinct isoacceptor during chromatography. Elution patterns of valyl-carbon-14-tRNAs of the same tRNA preparations charges with aminoacyl synthetase from dark-grown and light-grown barley seedlings or yeast showed that all enzyme preparations aminoacylated the three valyl-tRNA isoacceptors. The extent of individual isoacceptors aminoacylation was different in homologous and heterologous systems; two isoacceptors eluted by lower sodium chloride molarities were less charged in heterologous systems than the isoacceptor eluted with higher sodium chloride concentrations. Elution profiles of all three heterologous systems were similar. The results suggest that an enzyme synthesized other than in the chloroplasts is responsible for charging. A. nidulans aminoacyl synthetase recognized valyl-tRNA isoacceptors from barley root tissues the same way as barley synthetase. There are exceptions to the principle that prokaryotic tRNAs are preferentially recognized by prokaryotic enzymes. (Buchanan-Davidson--Wisconsin).
W76-08827

SUMMER PHYTOPLANKTON PHOTOSYNTHESIS IN A NORTHEASTERN OHIO GLACIAL LAKE,
Akron Univ., Ohio. Dept of Biology.
G. McMurray, and J. H. Olive.
Ohio Journal of Science, Vol. 75, No. 5, p 238-250, 1975. 9 fig., 36 ref.

Descriptors: *Summer, *Phytoplankton, *Photosynthesis, *Limiting factor, *Ohio, Lakes, Autumn, Euglenophyta, Cyanophyta, Chlorophyta, Diatoms, Varieties, Carbon, Euphotic zone, Phosphorus, Toxicity, Hydrogen sulfide, Hypolimnion, Epilimnion.
Identifiers: *Sandy Lake(Ohio).

To analyze relationships between photosynthesis, the summer phytoplankton community composition and selected physical-chemical factors in Sandy Lake, Ohio, were studied. About 50 phytoplankton species were found in the summer and autumn of 1971. Euglenophyta were dominant, often accounting for over 50% of the phytoplankton volume. Blue-green algae, at least 14 green algae species, and 14 diatom species were also present, but usually their cell volumes were small. Ceratium hirundinelle, Glenodinium, and Dinobryon appeared in brief pulses, occasionally accounting for large fractions of the total cell volume. The phytoplankton total volume ranged between 21,500-55,800 cu mm/sq m. Mean cell volumes were 7.3, 6.3, 4.1, and 3.5 cu mm/l at 1,2,4, and 6 m depths, respectively. The average daily rate of integral photosynthesis was 944 mg carbon/sq m. Relative photosynthesis in the upper photic zone was 7.9 micrograms carbon/cu/mm/hr. The most striking feature of the photosynthetic pattern was a sharp decline and prolonged depression in photosynthetic rates after August 23, which was probably due to a reduction in phosphorus supply and toxic conditions caused by hydrogen sulfide diffusion from hypolimnion to epilimnion. (Buchanan-Davidson--Wisconsin)
W76-08828

A RESERVOIR COVE ECOSYSTEM MODEL,
Georgia Univ., Athens. Dept. of Zoology.
B. C. Patten.
Transactions of the American Fisheries Society, Vol. 104, No. 3, p. 596-619, 1975. 17 fig., 3 tab., 16 ref.

Descriptors: *Computer models, *Model study, *Fish management, *Reservoir, *Ecosystems, *Oklahoma, *Texas, Primary productivity, Aquatic plants, Zooplankton, Vertebrates, Fish, Benthic fauna, Invertebrates, Decomposing organic matter, Inorganic compounds, Organic matter, Carnivores, Thermal pollution, Eutrophication.
Identifiers: *Lake Texoma(Texas-Okla), Perturbation effects, Compartment models.

A compartment model or biological description of the reservoir cove ecosystem in Lake Texoma, Texas-Oklahoma, is described. The primary producer submodel consists of nine plant groups aggregated according to size habitat, growth form, taxonomy, and physiology; producer-related processes and factors include photosynthesis, light available for photosynthesis, precipitation, plant metabolism, nitrogen fixation, excretion, mortality, and effects of water level changes. Zooplankton-related processes modeled included feeding, reproduction, metabolism, generation of dissolved and particulate excretory products, and predatory and nonpredatory mortality. Vertebrate (especially fish) compartments are based on taxonomy, feeding, and size; the modeled processes included feeding, breeding, reproduction, growth, metabolism, secretion, excretion, nonpredatory mortality, and harvest. Benthic macroinvertebrates are separated by feeding habits; modele processes include feeding, metabolism, excretion nonpredatory mortality, and emergence. Decom posers were separated into dead organic matte and inorganic element compartments. The fis submodel is emphasized. Nominal, unperturbe annual cycles of selected compartments a presented and results of perturbation experimen by thermal pollution, eutrophication, an piscivore invasion are summarized. Fish influenc the whole ecosystem's structure and function. Th role of top trophic levels in control of ecologic community designs and the status and use of tot ecosystem modeling as tools for fisheries scienc are discussed. (Buchanan-Davidson--Wisconsin)
W76-08830

ZOOPLANKTON OF WESTERN LAKE ER AT PUT-IN-BAY: A QUANTITATIVE STUD APRIL 1973-MARCH 1974,
Ohio State Univ., Put-in-Bay. Center for La Erie Area Research.
V. M. Reutter, and J. M. Reutter.
Ohio Journal of Science, Vol. 75, No. 5, p. 25 262, 1975. 5 fig., 1 tab., 13 ref.

Descriptors: *Zooplankton, *Lake Erie, *Oh Rotifers, Copepods, Crustaceans, Successio Great Lakes.
Identifiers: *Put-in-Bay(Lake Erie), Polyarth Nauplii, Bosmina, Cladocerans, Calan Copepods, Cyclopoid copepods.

In order to study qualitatively and quantitativ the zooplankton of western Lake Erie and co pare current populations with previous studi zooplankton were collected from Put-in-Bay H bor, Ohio, between April 1973-March 1974. For six taxa of zooplankton were collected. Polyarth was the most abundant rotifer, nauplii the m populous copepods, and Bosmina the most co mon cladoceran. In the 117 samples collect rotifer, copepod, and cladoceran populations reached their peaks in June. In addition cladocerans peaked in October. The monthly m rotifer populations were always the largest and cladoceran populations the smallest. By separat the total copepod population into calan copepods, cyclopoid copepods, and nauplii, ferences between calanoid and cyclop copepods were accented and the results were m comparable to earlier studies. Rotifer and nau populations generally showed increases, cyclop copepod populations remained relativ unchanged, and the calanoid copepod cladoceran populations decreased when compa to earlier investigations. The variations in s pling methods and location of sampling stati are considered. The present results may only typical of the near-shore sections of Put-in-B Harbor and may not be comparable to results tained from the open lake. (Buchanan-Davids Wisconsin)
W76-08833

CHANGES IN THE ALGAL FLORA OF E HARBOR, OTTAWA COUNTY, OHIO, SI 1900,
Ohio State Univ., Columbus. Dept. of Botany.
V. R. Frederick.
Ohio Journal of Science, Vol. 75, No. 5, p. 2 237, 1975. 1 fig., 3 tab., 16 ref.

Descriptors: *Algae, *Succession, *Lake E Varieties, *Ohio, Periphyton, Submerged pla Euglenophyta, Chara, Perihyton, Water che try, Dredging, Great Lakes, Lakes.
Identifiers: *East Harbor(Lake Erie), Desm Chlorococcales, Dinophyceae, Myxophyceae.

Algal flora collected from the Lake Erie East bor, Ottawa County, Ohio, were compared collections from 1900 to the present. Only fou ditional algal taxa have been reported from until the present 1974 study. In this study, 161 taxa were identified and compared to 151 taxa

rted in 1971. Of the 265 taxa which have been re-
rted, only 47 taxa (18%) were common to this
d all previous studies. Only 31% of those re-
rted before 1974 were present. Major dif-
rences were observed in the algal flora in the
iphytic taxa, desmids, planktonic chlorococ-
les, Charophyceae, Euglenophyceae,
nophyceae, and several genera of Myx-
hyceae. Few epiphytic algal taxa were found
hough many had been previously reported.
ese differences may be due to natural and man-
luced disturbances; the major impact was due to
edging in 1967, which deepened the harbor,
stroyed much of the submerged vegetation, and
ered the water chemistry. The Euglenophycean
a had increased; they were collected in shallow
ckwater pools in the beach area whichhad been
eated by the dredging and had been filled by
ent high water levels. Deepening and destruc-
n of Chara taxa by the dredging accounted for
recent changes in Charophyceae. (Buchanan-
vidson--Wisconsin)
76-08834

ATOM COMMUNITY RESPONSE TO VARIA-
ONS IN EFFLUENT CONCENTRATION,
verpool Polytechnic (England). Dept. of Biolo-

H. Evans, and E. Marcan.
vironmental Pollution, Vol. 10, No. 2, p. 115-
, 1976. 3 fig., 5 tab., 20 ref.

scriptors: Rivers, *Diatoms, *Water pollution
ects, Sewage effluents, Biological communi-
, *River flow, Succession, Ecological distribu-
n, Varieties, Europe.
ntifiers: *Ribble River(England), Diatoma vul-
e, Achnanthes minutissima, Cymbella ven-
osa, Melosira varians, Fragilaria capucina,
zschia palea, Nitzschia communis, Navicula
mus, Gomphonema parvulum.

er flow conditions were simulated in troughs
taining stones from River Ribble, Settle,
rkshire, England. Flow conditions were main-
ed using 'clean' river water or various propor-
ns of treated sewage effluent (approximately
% dairy waste and 30% domestic sewage). In the
an river water trough, the original diatom com-
nity changed from one dominated by Diatoma
gare, Achnanthes minutissima, and Cymbella
tricosa to one dominated by Achnanthes as-
iated with Melosira varians, Fragilaria capu-
a, and Cymbella ventricosa. In troughs with ef-
ent, the community was dominated by
zschia palea, N. communis, Navicula atomus,
Gomphonema parvulum. Although
nanthes is an indicator of well aerated, clean
er, it was present in the trough containing only
ted effluent. Variations in effluent concentra-
did not change the succession sequence in
om communities; the change was slow, requir-
about a week. Diatom numbers remained fairly
stant, but more species were in the troughs
n cleaner water. It is postulated that a seasonal
d was shown by the increase in diatom num-
. Melosira varians and Diatoma vulgare
wed similar frequencies and trends in all
ghs suggesting that they were indifferent to
effluent. (Buchanan-Davidson--Wisconsin)
6-08835

TRIENT-PRIMARY PRODUCTION RELA-
NSHIPS IN CENTRAL LAKE ERIE: A SIM-
CORRELATION APPROACH,
ada Centre for Inland Waters, Burlinton
tario).
A. Glooschenko.
Journal of Science, Vol. 75, No. 5, p 251-255,
. 2 tab., 15 ref.

criptors: *Nutrients, *Primary productivity,
ke Erie, *Correlation analysis, Phytoplankton,
nass, Chlorophyll, Water temperature,
ogen compounds, Phosphorus, Silica,
onal, Limiting factors, Great Lakes, Lakes.
tifiers: Particulate phosphorus.

Correlation coefficients were determined between primary production, phytoplankton biomass, chlorophyll-a, temperature, nitrogen, phosphorus, and silica in samples obtained from the Central Basin of Lake Erie between April-December 1970. There was no correlation between chlorophyll-a and production until July. In June temperature and soluble reactive, total, and total filtered phosphorus showed significant correlations with the assimilation number. Total filtered and soluble reactive phosphorus showed no correlation with primary production. In the summer soluble reactive phosphorus was almost depleted to a limiting level and correlations were found between carbon-14 uptake and soluble reactive phosphorus; such correlations were lacking in spring and fall. Total phosphorus showed a positive correlation with primary production, except in April and late September. The most significant relationship was between primary production and particulate phosphorus which may be an indicator of biomass. Primary production correlated with nitrates-nitrites from June-late August and ammonium between June-early August, suggesting a possible summer nitrogen limitation. There was a correlation between chlorophyll-a and nitrates-nitrites in August. Silica was non-limiting for diatoms in the spring, may have been limiting in the summer, and showed a negative correlation from late October to mid-December. Primary production was significantly affected by nutrients with temperature of secondary importance. (Buchanan-Davidson-Wisconsin).
W76-08836

ISOLATION AND CHARACTERIZATION OF ACTINOPOLYSPORA HALOPHILA, GEN. ET SP. NOV., AN EXTREMELY HALOPHILIC ACTINOMYCETE,
Ottawa Univ. (Ontario). Dept. of Biology; and Ottawa Univ. (Ontario). Dept. of Biochemistry.
M. B. Gochnauer, G. G. Leppard, P. Komaratat, M. Kates, and T. Novitsky.
Canada Journal of Microbiology, Vol. 21, p 1500-1511, 1975. 16 fig., 5 tab., 43 ref.

Descriptors: *Bacteria, *Salt tolerance, *Actinomycetes, *Systematics, Classification, Plant morphology, Nutrient requirements, Salinity, Pollutant identification.
Identifiers: *Actinopolyspora halophila, Nocardiaceae.

An extremely halophilic actinomycete isolated from a medium containing 25% sodium chloride is classified as Actinopolyspora halophila (ATCC 27976) of the Nocardiaceae family. Its morphological and chemical properties distinguish it from other Nocardiaceae and genera having a type IV cell wall. It requires high sodim chloride concentrations for growth, and grew in saturated salt. In liquid medium the lowest salt concentration permitting growth was 12% and on solid medium, 10%. At lower salt concentrations, colonies develop holes resembling viral plaques. No growth occurred in media containing 30% potassium chloride substituted for sodium chloride. It grew on simple media containing ammonium salts as nitrogen sources and sugars and other compounds as carbon sources. Tweens 20, 40, 60, 80 and casein were hydrolyzed, but urea, xanthine, and starch were not; gelatin was liquified, but nitrates were not reduced. It requires as much salt as extremely halophilic rods and cocci, but contains diaminopimelic acid and is sensitive to lysozyme, which suggests that it has a mucopeptide cell wall. It is resistant to penicillin. It contains some phospholipids common to other actinomycetes but no phytanyl ether linked lipids. Its temperature range is 10-43C; optimum 37C. (Buchanan-Dividson-Wisconsin)
W76-08837

ENVIRONMENTAL EFFECTS OF COOLING SYSTEMS AT NUCLEAR POWER PLANTS,
International Atomic Energy Agency, Vienna (Austria).
Available as STI/PUB/378, from UNIPUB, New York, N. Y. Proceedings of a symposium on the Physical and Biological Effects on the Environment of Cooling Systems and Thermal Discharges at Nuclear Power Stations held in Oslo, August 26-30 1974. CONF-740820, 1975, (832 p).

Descriptors: *Conferences, *Thermal pollution,*Environmental effects, Nuclear power plants, International commissions.

The symposium was organized by the International Atomic Energy Agency with the cooperation of Secretariat of the United Nations Economic Commission for Europe. A total of 49 papers from 15 countries and one international organization are presented in the volume. Areas of interest covered are the introductory papers; heat dissipation, the physical behavior of heated effluents in the atmosphere and various aquatic systems; effects on biota and environment ecosystems, including synergistic effects; criteria for the establishment of thermal release standards; and alternative methods for the management of heated effluents, and possible beneficial uses of waste heat. Among the papers of particular interest were two describing the behavioural responses of fish to a nuclear power plant discharge. (See W76-08849 thru W76-08888) (Chilton-ORNL)
W76-08848

MANAGEMENT OF WASTE HEAT AT NUCLEAR POWER STATIONS, ITS POSSIBLE IMPACT ON THE ENVIRONMENT, AND POSSIBILITIES OF ITS ECONOMIC USE,
Atomic Energy Commission, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08849

ENVIRONMENTAL ASPECTS OF THE COOLING SYSTEMS OF THERMAL POWER STATIONS: REPORT ON THE SEMINAR HELD AT ZURICH, MAY CONCLUSIONS AND RECOMMENDATIONS, (LES ASPECTS D'ENVIRONMENT DES SYSTEMS DE REFROIDISSEMENT DES CENTRALLES THERMIQUES),
Economic Commission for Europe (UN), Geneva (Switzerland). Div. of Energy.
For primary bibliographic entry see Field 6G.
W76-08850

A TWO-DIMENSIONAL HYDRODYNAMIC MODEL FOR COOLING-TOWER PLUMES,
Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen (Switzerland).
For primary bibliographic entry see Field 5B.
W76-08851

COMBINED DRY/WET-COOLING TOWERS: THEIR ENVIRONMENTAL PROMISE AND THEIR PROBLEMS,
Motor-Columbus Consulting Engineers Inc., Baden (Switzerland).
For primary bibliographic entry see Field 5B.
W76-08852

ATMOSPHERIC DISPERSION OF COOLING-TOWER BLOWDOWN,
Environmental Systems Corp., Knoxville, Tenn.
For primary bibliographic entry see Field 5B.
W76-08853

FOG FORMATION AND FOG ELIMINATION,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
For primary bibliographic entry see Field 5G.
W76-08854

COOLING TOWER EXPERIENCE AND THE METEOROLOGICAL CONSEQUENCES OF

LIBRARY OF THE UNIVERSITY OF

THERMAL DISCHARGES FROM NUCLEAR POWER PLANTS IN THE FEDERAL REPUBLIC OF GERMANY,
Deutscher Wetterdienst, Offenbach am Main (West Germany).
For primary bibliographic entry see Field 5G.
W76-08855

TRAPPING OF HEAT IN SILL FJORDS,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
T. Carstens.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820. Proceedings of a symposium held at Oslo, August 26-30, 1974. p 99-112, 11 fig, 7 ref.

Descriptors: *Geomorphology, *Fjords, *Heated water, Temperature, Salinity, Stratification, Topography.

The fjords discussed here have in common a bottom with sills, which are transverse ridges generally of glacial origin. The fjords are strongly stratified with freshwater. The combined effects of topography and layering create bodies of water that are sheltered to a large extent from advective and diffusive processes. The deep basins behind sills are characterized by long residence times and the unconfined water masses above the sill depth have movements that are normal for inshore waters. Annual renewal of the deep water occurs, the exchange cycle being asymmetric and consisting of a rapid gravitational inflow followed by a slower diffusive outflow. Salinity variations are responsible for the gravitational inflow with temperature effects being negligible. Waste heat near a shallow sill may end up at the bottom of a deep basin unless it is mixed into the brackish surface layer. (See also W76-08848) (Chilton-ORNL)
W76-08856

COMPUTATIONS OF THE TEMPERATURE RESPONSE OF STRATIFIED SILL FJORDS TO COOLING-WATER DISCHARGES,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
For primary bibliographic entry see Field 5B.
W76-08857

HEAT DISCHARGES INTO THE SEA AT THE OLKILUOTO SITE: LABORATORY MODEL TEST RESULTS AND REASONS FOR SELECTED ARRANGEMENTS,
Teollisuuden Voima OY Industrins Kraft Ab. Kile (Finland).
For primary bibliographic entry see Field 5B.
W76-08858

HEATING OF ESTUARINE AND COASTAL WATERS BY NUCLEAR POWER STATIONS IN FRANCE, (ECHAUFFEMENT DES EAUX PAR DES CENTRALES NUCLEAIRES EN ESTUAIRE ET BORD DE MER EN FRANCE),
Laboratoire National d'Hydraulique, Chatou (France).
For primary bibliographic entry see Field 5B.
W76-08859

A COMPARISON OF AERIAL INFRA-RED AND IN-SITU THERMAL PLUME MEASUREMENT TECHNIQUES,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5A.
W76-08860

THE CHALK POINT COOLING TOWER PROJECT,
Maryland Dept. of Natural Resources, Annapolis. Power Plant Siting Program.
For primary bibliographic entry see Field 5B.
W76-08861

SEASONAL FEATURE OF THERMAL ABATEMENT OF SHORELINE DISCHARGES AT NUCLEAR SITES,
Bhabha Atomic Research Centre, Bombay (India). Environmental Studies Section.
For primary bibliographic entry see Field 5G.
W76-08862

UNITED KINGDOM EXPERIENCE OF THE PHYSICAL BEHAVIOUR OF HEATED EFFLUENTS IN THE ATMOSPHERE AND IN VARIOUS TYPES OF AQUATIC SYSTEMS,
Central Electricity Generating Board, London (England).
For primary bibliographic entry see Field 5B.
W76-08863

THE SIGNIFICANCE OF ISOMERY IN HYGIENIC STANDARDIZATION OF INDUSTRIAL CONTAMINATIONS OF WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinakii Institut (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5A.
W76-08864

WASTE-HEAT DISPOSAL FROM STEAM ELECTRIC PLANTS WITH REFERENCE TO THE STOCHASTIC NATURE OF SOME ENVIRONMENTAL CONDITIONS AND TO THERMAL POLLUTION CONTROL REGULATIONS,
Energoprojekt, Belgrade, (Yugoslavia).
For primary bibliographic entry see Field 5G.
W76-08865

A MODEL FOR SALT DRIFT DEPOSITION FROM SPRAY PONDS,
Massachusetts Institute of Tech., Cambridge.
For primary bibliographic entry see Field 5B.
W76-08866

THE TOTAL HEAT-EXCHANGE COEFFICIENT OF SURFACE WATERS,
Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
For primary bibliographic entry see Field 5B.
W76-08867

TWO METHODS OF MEASURING THE HEAT DISSIPATION OF DISCHARGED COOLING WATER: A PHENOMENOLOGICAL APPROACH,
Keuring van Electrotechnische Materialen N.V., Arnhem (Netherlands). Environmental Dept. of the Central Lab.
For primary bibliographic entry see Field 5B.
W76-08868

THERMAL DISCHARGE STUDIES ON THE GREAT LAKES-THE CANADIAN EXPERIENCE,
Ontario Hydro, Toronto.
For primary bibliographic entry see Field 5G.
W76-08869

ECOLOGY OF ARTIFICIALLY HEATED STREAMS, SWAMPS AND RESERVOIRS ON THE SAVANNAH RIVER PLANT, THE THERMAL STUDIES PROGRAM OF THE SAVANNAH RIVER ECOLOGY LABORATORY,
Savannah River Ecology Lab. Aiken, S. C.
J. W. Gibbons, R. R. Sharitz, F. G. Howell, and M. H. Smith.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium, Oslo, August 26-30, 1974, p 389-400, 2 fig, 29 ref.

Descriptors: *Thermal pollution, *Environmental effects, Populations, Habitats, Streams, Swamps, Reservoirs, *South Carolina, *Ecology.
Identifiers: Savannah River Plant(SC).

The paper describes studies that have been undertaken in a variety of habitats at the Savannah River Plant. The area provides opportunities to observe thermal habitats with temperatures ranging from normal for the area to above 50 degrees C; post-thermal stream, swamp and lake habitats; and natural areas for use as control environments. The study includes the responses of species populations as well as of individuals to thermal loading. The studies of species diversity and composition show at least two basic patterns of community response to thermal insult. The determining variable appears to be the degree in which the communities are physically related to thermal loading. Aquatic communities can respond only within the limits permitted by the pollutant while terrestrial components are not so tightly bound to the physical restrictions of thermal stress. (See also W76-08848) (Chilton-ORNL)
W76-08870

EFFECTS OF A THERMAL DISCHARGE INTO A RIVER ON THE MOVEMENT OF FISH POPULATIONS, (INCIDENCES D'UN REJET THERMIQUE EN MILIEU FLUVIAL SUR LES MOUVEMENTS DES POPULATIONS ICHTYOLOGIQUES),
Centre Technique du Genie Rural des Eaux et des Forets, Paris (France). Laboratoire des Micropolluants.
G. Leynaud, and J. Allardi.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium, Oslo, August 26-30, 1974. p 401-408, 1 fig, 10 ref.

Descriptors: *Thermal pollution, *Environmental effects, Populations, Varieties, Fish, Seasonal, *Water pollution effects.
Identifiers: Montereau Thermal Power Station(France), Seine River(France).

The study was made at the Montereau Thermal Power Station on the Seine River. Electrofishing and lobster pots were used to make regular catches in the discharge channel of the station. Movements of fish were traced by labelling and subsequent recatching and by the assistance of amateur fishermen. Numbers of fish caught in the discharge ranged from a maximum in the spring and fall to a minimum in the summer and winter. Composition of populations also varied with an increase in the proportion of Cyprinidae during hot periods. Barbels disappeared during hot periods. Black bass populations increased during times of high temperature. Gammaridae also disappeared during the summer months. (See also W76-08848) (Chilton-ORNL)
W76-08871

THERMAL STUDIES ON TROPICAL MARINE ECOSYSTEMS IN PUERTO RICO,
Puerto Rico Nuclear Center, Rio Piedras. Radioecology Div.
S. E. Kolehmainen, F. D. Martin, and P. B. Schroeder.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974, p 409-422, 4 tab, 4 fig, 13 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Tropical regions, *Ecosystems, Marine algae, Marine animals, Marine plants, *Puerto Rice.

In addition to temperatures 10 degrees C above ambient water temperature, organisms in Guayanilla Bay were exposed to hydrocarbon and heavy metal pollution. Results indicated that approximately 95% of zooplankters were killed in condensers and the discharge canal with further mortality occurring within 100 m from the mouth of the discharge canal. Species diversity and

iomass were highest at 1 to 6 degrees above am-
ient temperatures. It was seen that most of the
ortality was due to relatively long exposures to
levated temperatures in the discharge canal
ather than to short exposures in condensers or
echanical damage in the water pumps. The
umber of species in the heated area was 28 com-
ared with 53 in the control area. The species most
olerant to elevated temperatures were bluegreen
lgae, mangrove trees, certain molluscs, crabs and
sh while the most sensitive organisms were red
nd brown algae, coelenterates and echinoderms.
See also W76-08848) (Chilton-ORNL)
/76-08872

NVIRONMENTAL EFFECTS OF THE EATED DISCHARGES FROM BRADWELL UCLEAR POWER STATION, AND OF THE OOLING SYSTEMS OF OTHER STATIONS,
entral Electricity Generating Board, London
England). Planning Dept.
. B. Hawes, J. Coughlan, and J. F. Spencer.
: Environmental Effects of Cooling Systems at
uclear Power Plants, Proceedings of a symposi-
m held at Oslo, August 26-30, 1974. p 423-448, 8
g, 3 tab, 15 ref, 1 append.

escriptors: *Thermal pollution, *Environmental
ffects, Powerplants, Aquatic life, Europe cooling
ater.
lentifiers: Bradwell Nuclear Power Sta-
on(England), River Blackwater(England).

lean monthly increases in temperature resulting
om operation of the power station were found to
e between 0.2 and 1.7 degrees C on the south
ore of River Blackwater near the outfall and less
an 0.7 degree C on the north shore, compared to
annual range of seawater temperature of ap-
roximatley from 4 to 19 degrees C. It was found
at neither the wildfowl nor their food have disap-
eared from the Blackwater. Yachtmen's fears as
marine borers were unfounded. Herrings have
ow extended their spawning to upstream of the
ation in a area known to be warmed by the
scharge. Experiences at other power stations,
oth fossil and nuclear fuelled, are mentioned. The
uthors maintain that to identify all warmed
scharges as thermal pollution is incorrect. Ther-
al discharges can be planned so that the impact is
inimal. (See also W76-08848) (Chilton-ORNL)
/76-08873

NFLUENCE OF HEAT FROM THE GENTILLY UCLEAR POWER STATION ON WATER EMPERATURE AND GASTROPODA, NFLUENCE DE L'APPORT THERMIQUE RIGINAIRE DE LA CENTRALE NUCLEAIRE ENTILLY SUR LA TEMPERATURE DE EAU ET SUR LES GASTEROPODES),
uebec Univ., Trois-Rivieres.
. Vaillancourt, and R. Couture.
: Environmental Effects of Cooling Systems at
uclear Power Plants, Proceedings of a symposi-
n held at Oslo, August 26-30 1974, p 449-459, 2
b, 6 fig.

escriptors: *Thermal pollution, *Environmental
ffects, Mollusks, Aquatic life, Temperature,
ortality, Canada, *Gastropods, *Water tempera-
re, Water pollution effects.
entifiers: Gentilly Nuclear Power Sta-
on(Canada).

he study reports on the effects of increased
ater temperature from the Gentilly Nuclear
ower Station on the physical characteristics of
e environment and on some species of mollusks.
ith the reactor operating at maximum power
ere is an increase of almost 10 degrees C in the
ater temperature. At these temperatures, mor-
ity among the mollusks increases to the point
at they disappear completely. With the reactor
erating at 480 MW(th) the increase in water tem-
rature is 3.5 degrees C in the discharge canal.
ee also W76-08848) (Chilton-ORNL)
76-08874

STUDIES CARRIED OUT IN FRANCE ON THE ECOLOGICAL CONSEQUENCES OF OPEN-CIRCUIT COOLING IN THERMAL POWER STATIONS, (ETUDES REALISEES EN FRANCE SUR LES CONSEQUENCES ECOLOGIQUES DE LA REFRIGERATION DES CENTRALES THERMIQUES EN CIRCUIT OUVERT),
Electricite de France, Chatou. Direction des Etudes et Recherches.
M. Khalanski.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 461-477, 8 fig, 1 tab, 23 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Aquatic life, Nuclear power plants, Water pollution effects.
Identifiers: *France.

The purpose of the work carried out in France under the auspices of Electricite de France to improve the knowledge of the influence of power-plant cooling on organisms in the aquatic environment is summarized. (See also W76-08848) (Chilton-ORNL)
W76-08875

BEHAVIOURAL RESPONSES OF LAKE MICHIGAN FISHES TO A NUCLEAR POWER PLANT DISCHARGE,
Argonne National Lab., Ill.
S. A. Spigarelli.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 479-498, 6 tab, 3 fig, 19 ref.

Descriptors: *Thermal pollution, *Environmental effects, Fish, Salmonids, Smelts, Fish behavior, Temperature, *Lake Michigan, Lakes.

The purpose of this research program was to define the behavior of free-swimming Lake Michigan fishes relative to thermal discharges such that effects studies would be based on actual rather than hypothetical conditions. Using echo location techniques, it was found that except during the spawning season of alewife and smelt when plume densities are higher than reference areas, that mean fish densities are similar in plume and reference areas. Little change in fish density or distribution was noticed during periods of power plant shutdowns. Based on body-temperature studies on trout and salmon, it was concluded that during most of the year, salmonids tended to thermoregulate rather than acclimate to discharge temperatures. Feeding temperatures of salmonids were generally intermediate between intake and discharge temperatures. During spawning seasons, trout and salmon periodically equilibrate to discharge temperatures but do not remain in the flumes for extended periods of time. (See also W76-08848) (Chilton-ORNL)
W76-08876

THERMAL EFFECTS ON MARINE BIOTA IN EXPERIMENTAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
G. Nilsen, and T. Kallqvist.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 499-518, 9 fig, 5 tab, 38 ref.

Descriptors: *Thermal pollution, *Environmental effects, Benthos, Aquatic life, Algae, Productivity, Photosynthesis, Laboratory tests.

The paper consists of two parts; a description of marine benthic communities in artificial channels and the measurement of carbon assimilation of natural phytoplankton at different temperatures in an incubator. A study of marine benthic algae indicated a significant change to green and bluegreen dominated communities with increasing temperatures. The only significant difference in animal species between the channels was that Apherusa bispinosa was common in the unheated channel and not present in the heated channel. The effect of temperature on primary productivity was found to vary throughout the year although a 2.0 degrees C increase in temperature always stimulated production. In winter there was a tendency for productivity to increase with both a 2.0 and 6.0 degree C increase but not with a 4.0 degree C increase. In May and August, a 4.0 degree C increase was associated with higher production. (See also W76-08848) (Chilton-ORNL)
W76-08877

EFFECTS OF TEMPERATURE, COPPER AND CHLORINE ON FISH DURING SIMULATED ENTRAINMENT IN POWER-PLANT CONDENSER COOLING SYSTEMS,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Coastal Fisheries Center.
D. E. Hoss, L. C. Coston, J. P. Baptist, and D. W. Engel.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 519-527, 5 fig, 13 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Water pollution effects, Temperature, *Copper, *Chlorine, Fish, Larval growth stage, Mortality, Laboratory tests.

Entrainment conditions were simulated in the laboratory to investigate the effects of thermal shock alone, the combined effects of thermal shock and copper, and the combined effects of thermal shock and chlorine on the survival of larval fish. A cycling acclimation temperature was found to reduce the effects of thermal shock alone on the larval pinfish. When pinfish were subjected to shock temperatures of 12 to 15 degrees C above acclimation temperature and held in water containing 1.0 ppm of copper for 24 hours prior to thermal shock, the survival was significantly reduced. Striped mullet and flounder survived 5 min exposures to 0.3 ppm chlorine at ambient temperatures. Atlantic menhaden withstood exposures up to 7 min. Reductions in survical of mullet, flounder and menhaden occurred with longer exposures and still further reductions occurred with the addition of heat. In some cases, chlorine concentrations of 0.5 ppm caused still further reductions. The interaction between heat and chlorine appears to be synergistic. (See also W76-08848) (Chilton-ORNL)
W76-08878

EFFECTS OF HEAT ENRICHMENT ON SPECIES SUCCESSION AND PRIMARY PRODUCTION IN FRESH-WATER PLANKTON,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs; and Atomic Energy of Canada Ltd., Chalk River (Ontario). Biology and Health Physics Div.
J. W. McMahon, and A. E. Docherty.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 529-546, 8 fig, 2 tab, 16 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Plankton, Populations, *Primary productivity, Aquatic life, Chrysophyta, Chlorophyta, Diatoms, Rotifers, Oligotrophy, Water pollution effects, Canada.
Identifiers: Species diversity, *Lake Maskinonge(Canada).

Heat-enrichment experiments were carried out in polyethylene columns in temperate, oligotrophic Lake Maskinonge. A maximum temperature increase of 6 degrees C was obtained between the lake and the heated water in the experimental column. Thirty species of phytoplankton and seventeen species of zooplankton were quantitatively studied. In late spring, 3 Chrysophyceae and

LIBRARY U. OF A. UNIVERSITY CAMPUS

2 Diatomae responded negatively to the heated water while 3 Rotifera increased significantly in numbers. In mid-summer a Chlorophyta was found in large numbers in the heated water. It was concluded that thermal enrichment, probably interacting with chemical, biological and physical factors, temporarily influenced the population density of certain species of plankton but there were no indications of permanent changes in diversity of species due to heat enrichment. (See also W76-08848) (Chilton-ORNL)
W76-08879

AQUATIC PHYSIOLOGY OF THERMAL AND CHEMICAL DISCHARGES,
Battelle Pacific Northwest Labs., Richland, Wash.
M. J. Schneider, C. D. Becker, D. H. Fickeisen, T. O. Thatcher, and E. G. Wolf.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 547-561, 8 fig, 2 tab, 14 ref. AT(45-1)-1830.

Descriptors: *Thermal pollution, *Environmental effects, Fish, Thermal stress, Fish behavior, Chemical wastes, Supersaturation, Water pollution effects.
Identifiers: *Environmental impact assessment.

The program is directed at ongoing research necessary for environmental impact assessment. Five areas are discussed; the effects of fatigue on thermal tolerance in fish, the behavioral response of fish influenced by thermal plumes and the effect of thermal experience on fish sensory physiology, the effects of gas supersaturation on fish, the effects of cold shock on fish, and the effects of heat and pollutant chemicals on fish. It was found that under certain combinations of thermal stress following periods of sustained swimming effort fish are significantly more susceptible to thermal stress and small fish are less tolerant than large fish. Evidence indicates that juvenile fish have reduced capacity to avoid predators following exposure at sublethal levels to heated water. Fish were provisionally ranked in the following order of increasing tolerance to gas supersaturation: mountain whitefish, rainbow trout, largescale sucker, channel catfish, black bullhead, bluegill, pumpkinseed, smallmouth bass, carp. Fish were found to be most tolerant to gas supersaturation when the water temperature is near the species optimum. (See also W76-08848) (Chilton-ORNL)
W76-08880

THERMAL ECOLOGY OF DRAGONFLIES IN HABITATS RECEIVING REACTOR EFFLUENT,
Savannah River Ecology Lab., Aiken, S. C.
J. B. Gentry, C. T. Garten, Jr., F. G. Howell, and M. H. Smith.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 563-574, 3 fig, 2 tab, 19 ref. AT(38-1)-310 & AT(38-1-819.

Descriptors: *Thermal pollution, *Environmental effects, *Dragonflies, Mortality, Habitat, Size, Growth stages, Water pollution effects.
Identifiers: Critical thermal maximum, Lethal temperature, Nymphs, Thermal tolerance.

Investigations showed that both the numbers of individuals and species of dragonfly nymphs were reduced when thermal effluent was received by streams and ponds. The only surviving genera belonged to the sub-family Libellulinae. Mortality was attributed directly to the effects of increased heat and indirectly to habitat alterations. Dragonfly nymphs from thermally stressed streams showed a higher thermal tolerance than nymphs from natural streams and this higher thermal tolerance was reflected by a higher critical thermal maximum and a higher lethal temperature at different acclimation temperatures. The significant variables in determining thermal tolerances were acclimation temperature, habitat, and body size. (See also W76-08848) (Chilton-ORNL)
W76-08881

TEMPERATURE SELECTION BY FISH--A FACTOR IN POWER-PLANT IMPACT ASSESSMENTS,
Oak Ridge National Lab., Tenn.
C. C. Coutant.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 575-597, 9 fig, 2 tab, 94 ref.

Descriptors: *Thermal pollution, *Environmental effects, Temperature, Fish, Fish behavior, Laboratory tests, On-site investigations.

This paper summarizes thermal preference and avoidance temperatures from the literature and presents result from field studies. Gizzard shad showed marked attraction in spring to heated effluent. The final preferendum for wild largemouth bass was found to be near 27 degrees C. The paper point out that accurate predictions of fish behavior near thermal discharges requires information on the general principles of fish responses, characteristic preferences exhibited by different species, the degree to which fish behavior in field situations differs from laboratory behavior, and the extent to which other factors modifies thermal preferences. (See also W76-8848) Chilton-ORNL)
W76-08882

PREDICTING THE ECOLOGICAL CONSEQUENCES OF THERMAL POLLUTION FROM OBSERVATIONS ON GEOTHERMAL HABITATS,
Wisconsin Univ. Madison, Dept. of Bacteriology.
T. D. Brock.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 599-622, 3 tab, 39 ref. C00-2161-19.

Descriptors: *Thermal pollution, *Environmental effects, *Geothermal studies, Habitats, Limiting factors, Aquatic life, Temperature, Mortality, Forecasting, Water pollution effects.

Geothermal habitats which are natural, stable and of long duration are used as a basis for deriving a set of general principles for predicting the ecological consequences of thermal pollution. Upper temperature limits for various organisms are given as follows: aquatic vertebrates, 38 C; insects, 45-50 C; protozoa, 50 C; vascular plants, 45 C; mosses, 50 C; eucaryotic algae, 56 C; fungi, 60 C; bluegreen algae, 70-73 C; bacteria, 99 C. Restrictions in species diversity may be seen at temperatures below the upper limits for these organisms. (See also W76-08848) (Chilton-ORNL)
W76-08883

A COMPARISON OF SHORT-TERM EFFECTS OF THERMAL ADDITION ON PHOTOSYNTHESIS AND PLANT-WATER STRESS IN THREE ECOSYSTEMS,
San Diego Univ., Calif. Dept. of Biology.
P. C. Miller.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 623-636, 7 fig, 1 tab, 19 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Photosynthesis, Stress, Mangrove swamps, Tundra, Chaparral, Primary production, Model studies, Ecosystems, Alaska, California, Florida, *Primary productivity.
Identifiers: *Water stress(Plants).

This paper compares some potential short-term responses of primary production and plant water stress to thermal additions in three diverse ecosystems: the coastal arctic tundra near Barrow, Alaska; the chaparral in San Diego County, California; and the red mangroves in southern Florida. A simulation model was used to make the comparisons. Of the three systems studied, the mangroves showed the greatest changes in primary production with changing temperatures but the chaparrral showed the greatest changes in water stress. (See also W76-08848) (Chilton-ORNL)
W76-08884

DEVELOPMENT AND APPLICATION OF CRITERIA FOR MARINE COOLING WATERS,
Environmental Research Lab., Narragansett, R. I.
For primary bibliographic entry see Field 5G.
W76-08885

REGULATIONS AND ENVIRONMENTAL INVESTIGATIONS ASSOCIATED WITH NUCLEAR STATION THERMAL DISCHARGES,
Ente Nazionale per l'Energia Elettrica, Rome (Italy). Direzione della Costruzioni.
For primary bibliographic entry see Field 5G.
W76-08886

CAN THE CRITERIA AND METHODOLOGY USED FOR RADIOACTIVE DISCHARGES BE APPLIED TO THERMAL DISCHARGES. (LES CRITERES ET LA METHODOLOGIE RETENUS POUR LES REJETS RADIOACTIFS SONT-ILS TRANSPOSABLES AUX REJETS THERMIQUES.),
CEA Centre d'Etudes Nucleaires de Fontenay-aux Roses (France). Departement de Protection.
For primary bibliographic entry see Field 5G.
W76-08887

COMPARATIVE EFFECTS OF TWO MODES OF COOLING WATER DISCHARGE ON MISSISSIPPI RIVER BIOTA AND ENVIRONMENTAL ECOSYSTEMS,
Industrial Bio-Test Labs. Northbrook, Ill. Environmental Sciences Div.
H. O. Eiler, and J. J. Delfine.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 685-692, 3 fig, 10 ref.

Descriptors: *Thermal pollution, *Environmental effects, Engineering structures, Cooling water, Mississippi River.
Identifiers: Cooling systems.

The environmental impact of two different modes of once-through cooling systems are assessed. The interim side-jet discharge mode clearly had an adverse impact on a localized, but biologically productive area because of thermal and chemical (chlorine) stresses. The diffuser-pipe system provided an alternative method for discharging heated waste water in this particular river environment. The efficiency of the diffuser-pipe mode of discharge in rapidly mixing the heated effluent with river water relieved the local island ecosystem of thermal and chemical stresses and resulted in a complete recovery of this previously affected area. (See also W76-08848) (Chilton-ORNL)
W76-08888

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN WELL DRILLING OPERATIONS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W76-08889

TOXICITY STUDY - DRILLING FLUID CHEMICALS ON AQUATIC LIFE,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.

C. K. Grantham, and J. P. Sloan.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 103-110, 6 tab, 11 ref.

Descriptors: *Drilling fluids, *Toxicity, Aquatic life, Wells, Water pollution effects.
Identifiers: *Weighting materials, *Barite, Calcite, *Siderite, Mollenisias Latipinna.

Compounds used to weight drilling fluids are naturally occuring minerals found in every living creature. Barite accounts for 98 percent of all weighting agents used worldwide. The high specific gravity (4.2), abundance, and relative chemical inertness makes barite an ideal weighting material. Calcite is in limited use today because of the mineral's low specific gravity (2.7). It is most often used in workover or completion fluids for normally pressured formations. Its complete solubility in hydrochloric acid suits it well for this application. Within the last 2 years, siderite has been introduced as an acid soluble weighting material. Siderite is used with calcite and sometimes as a substitute because of its higher specific gravity (3.8). An analysis of barite, calcite and siderite showed that each was inert and exhibited no appreciable water solubility. Barite, calcite and siderite are routinely used as medicinal compounds for human consumption. Toxicity tests of these three additives were conducted using Mollenisias Latipinna (mollies). Concentrations up to 100,000 parts per million and tests periods up to 96 hours were used. The fish toxicity test concludes that concentrations up to 100,000 parts per million introduced into fresh or sea water do not constitute a toxic environment. Therefore, it can also be concluded that use of these weighting materials in drilling fluids do not constitute the introduction of a toxic substance in the environment. (See also W76-08889) (Heiss-NWWA)
W76-08895

FISH TOXICITY OF DISPERSED CLAY DRILLING MUD DEFLOCCULANTS,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.
J. W. Hollingsworth, and R. A. Lockhart.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 113-123, 3 fig, 1 tab, 4 ref.

Descriptors: *Drilling fluids, *Clays, *Toxins, Fish toxicity, Phosphates, Montorillionite, Lignite.
Identifiers: *Clay deflocculation, Tannins, Lignosulfonates, Mollienisias latipinna.

Thinning agents are used in drilling fluids to deflocculate clay particles and maintain proper gel strengths. Phosphate thinners are limited to low temperatures (below 200 degrees Farenheit) and to fresh water applications because of their tendency to revert to orthophosphates. Tannin compounds are acidic organic substances extracted from certain plants. Tannin agents require a high pH for optimum performance and lack thermal stability; however, their electrolyte contamination tolerance is superior to the phosphate compounds. Lignite for treating drilling mud is high in humic acid content and caustic solubility. Lignite drilling muds demonstrate extreme thermal stability, however, they are also subject to electrolyte sensitivity. Lignosulfonates are the most widely used thinning agents available today due to their excellent electrolyte tolerance, pH range, and thermal stability. Toxicity test of these compounds conducted with Mollienisias Latipinna demonstrated that the tannin class has a considerably lower median tolerance level than any of the other thinners. (See also W76-08889) (Heiss-NWWA)
W76-08896

EFFECT OF DRILLING FLUID COMPONENTS MIXTURES ON PLANTS AND SOILS,
Utah State Univ., Logan. Dept. of Soil Chemistry.
J. W. Miller, and S. Honarvar.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 125-143, 7 tab, 16 ref.

Descriptors: *Drilling fluids, *Toxicity, *Sweet corn, *Beans, Growth rates, Soils, Plant growth.
Identifiers: *Drilling fluid additives.

Thirty-one drilling fluid additives were tested for their effects in reducing plant growth. Greenbeans and sweet corn were used as test plants. The soil was a slightly acidic silt loam. Each component was tested at a high and low concentration rate. The low rates were typical of concentrations used in the field. Bean yield increase resulted from normal (low concentration) use rates of asbestos, VAMA (a copolymer of vinyl acetate and maleic anhydride) and sodium dichromate. No reduction of plant yield occurred in soil at normal use rates with asphalt, barite, bentonite, calcium lignosulfonate, sodium polyacrylate, a modified tannin (Desco), a nonfermenting starch, ethoxylaten monyl phenol (*DME); a filming amine, gilsonite, a xanthan gum, pyrophosphate, sodium carboxymethyl cellulose, sodium hydroxide, a sulfonated tall oil, and a sulfonated triglyceride (Torg-Trim). Significant reduction in yield at normal use concentrations resulted from diesel oil, large alcohol, guargum, a plant-synthetic fiber mix (Kwik-seal), lignite, potassium chloride, pregelatinized starch, a modified asphalt (Soltex) and iron chromeligno sulfonate. When individual components were mixed, slight growth reductions occurred with sodium dichromate and plant fiber mix. Higher application rates had greater reduction of plant growth. However, these rates are not typical of normal use. (See also W76-08889) (Heiss-NWWA)
W76-08897

ACUTE TOXICITY OF WELL-DRILLING TO RAINBOW TROUT,
Environmental Protection Service, Edmonton (Alberta). Aquatic Toxicology Lab.
For primary bibliographic entry see Field 5A.
W76-08899

ENVIRONMENTAL CONDITIONS AND PRODUCTIVITY IN THE TERMINOS LAGOON, CAMPECHE, MEXICO, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-08900

TOXICITY AND ENVIRONMENTAL PROPERTIES OF CHEMICALS USED IN WELL-DRILLING OPERATIONS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
V. Zitko.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 311-326, 1 fig, 9 tab, 31 ref.

Descriptors: *Drilling fluids, *Toxicity, Inorganic compounds, Organic compounds, Aquatic life, Oil wells, Chromium, Surfactants, Polymers, Oysters, Bactericides, Clams, Plankton, Herring.
Identifiers: Barite, Amines, Imidazolines, Seaweed.

Under normal conditions the most pronounced detrimental effects on the environment are caused by the physical action of suspended solids from drilling fluids. High molecular weight organic constituents are relatively nontoxic. The molecular weight constituents have toxicities ranging from high to relatively low and it may be possible to select the chemically satisfactory compounds that are not toxic. The same may be true about surfactants. The effects of high temperature drilling environments on organic additives is still largely unknown. The degradation products of these additives could have higher toxicity than the parent material. The petroleum fractions or tar contained in some drilling fluids have been extensively documented. It is obvious from this literature that discharge of these substances should be as limited as possible. (See also W76-08889) (Heiss-NWWA)
W76-08906

POTENTIAL EFFECTS OF OIL DRILLING AND DUMPING ACTIVITIES ON MARINE BIOTA,
North Carolina Univ. at Wilmington. Inst. of Marine Biomedical Research.
R. Y. George.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 333-355, 7 fig, 3 tab, 27 ref.

Descriptors: *Offshore platforms, *Oil wells, *Environmental effects, Sediment discharge, *Drilling fluids, Marine animals, *Absorption, *Water pollution, Continental shelf, Louisiana, Shrimp, Algae, Turbidity, *Oil spills.
Identifiers: Drilling fluid components, Drilling discharges, Barnacles, Louisiana Continental shelf, Timbalier Bay (La).

There exists a gap in our knowledge on the impact of drilling mud components on marine biota and of the chronic effects of oil spillage on both plants and animals in the marine environment. On the basis of results recently obtained in offshore ecological investigations on the Louisiana Continental Shelf, efforts are being made to evaluate the extent of the effects of drilling activity on the marine ecosystem. Biological implications of the potential effects of drilling discharge are examined under four parameters associated with offshore drilling: (1) the 'burial effect' on the sea floor benthos caused by discharge of drilling mud components, (2) the possible accumulation or magnification in the food chain of discharge drilling mud components, (3) influence of turbidity-plumes of drilling mud on the filter-feeding organisms, (4) the acute and chronic effects of crude oil spillage on marine biota. (See also W76-08889) (Heiss-NWWA)
W76-08907

NOTES ON THE IMPORTANCE OF DISSOLVED AND PARTICULATE ORGANIC MATTER IN MARINE FOOD CHAINS, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
C. Flores.
Lagena. 31. p 27-34. 1973.

Descriptors: *Food chains, Microorganisms, Crustaceans, Gastropods, *Ecosystems, Marine Biology, Chemical properties, Physical properties.

Studies on the formation, physicochemical properties and interrelationships of organic aggregates, fecal materials, detritus, bacteria and protozoa in the complex network of marine food chains are reviewed. Besides microorganisms the role of crustaceans and gastropods as consumers and producers was examined. The threat of environmental pollution to the delicate balance of the marine ecosystem is mentioned.--Copyright 1976, Biological Abstracts, Inc.
W76-08916

PHYSIOLOGICAL EFFECTS OF SUBLETHAL LEVELS OF ACID WATER ON FISH,
West Virginia Univ., Morgantown. Water Research Inst.
W. J. Pegg, and C. R. Jenkins.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 958, $4.50 in paper copy, $2.25 in microfiche. Bulletin 6, (WRI-WVU-76-01), 1976. 47 p, 10 fig, 10 tab, 55 ref. OWRT A-016-WVA(1), 14-31-0001-3049.

Descriptors: *Acid mine water, Fish, *Fish physiology, *Metabolism, *Oxygen requirements,

LIBRARY U. OF I. UNIVERSITY-URBANA

*Respiration, *Water pollution effects, Acidic water, Biochemical oxygen demand, Biochemistry, *Bullheads, Environmental effects, Freshwater fish, Oxygen demand, *Sunfishes, Toxicity, Lethal limit.
Identifiers: Physiological effects, Physiological stress.

Oxygen-consumption rates as milligrams of oxygen per gram of fish per hour (mg 02/g per hr) were measured in a flow-through respirometer for bluegill sunfish, Lepomis macrochirus Rafinesque; pumpkinseed sunfish, Lepomis gibbosus (Linnaeus); and brown bullheads, Ictalurus nebulosus (LeSueur). Non-stress standard oxygen-consumption rates were established using tap water. Oxygen-consumption rates in acid waters were established for I. nebulosus using tap water acidified with sulfuric acid and constituted water acidified with coal-mine drainage. Oxygen-consumption rates in acid waters for L. macrochirus and L. gibbosus were established using constituted water acidified with sulfuric acid or acid-mine drainage. L. macrochirus exhibited a decrease in mean oxygen-consumption rates in acid water - 0.081 mg 02/g per hr compared to 0.111 in tap water. L. gibbosus exhibited increased oxygen-consumption rates in acid water - 0.106 mg 02/g per hr compared to 0.082 in tap water. I. nebulosus exhibited lower oxygen-consumption rates in acid water than in tap water - 0.075 mg 02/g per hr compared to 0.124. In acid water (pH 4.0-3.0), ventilation rates were highly variable and frequently increased to three times the standard resting rate. As an indication of physiological stress, the changes in oxygen-consumption rate in acid waters compared to standard tap water were significant for each fish species.
W76-08927

A METHOD FOR ESTIMATING THE TOXICITY OF CHLORINATED DISCHARGES,
Oak Ridge National Lab., Tenn.
J. S. Mattice.
In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments, EPRI SR-38, Special Report Vol. II, p 142-155, April 1976, 3 fig, 2 tab, 20 ref.

Descriptors: *Environment effects, *Aquatic life, Thermal powerplants, *Chlorine, Mortality, *Pollutant identification, Analytical techniques, *Toxicity, Estimating.

A recently developed procedure is described for site specific analysis of chlorine toxicity both within a facility and its discharge. It involves setting toxicity thresholds and then comparing dose-times, (1) within the plant, and (2) within the discharge, with the thresholds. The data represent 64 species. The thresholds indicated that for concentration greater than 0.0015 mg/l increase in time of exposure generally increases the toxicity of chlorine. For concentrations less than 0.0015 mg/l, toxicity is no longer time-dependent and exposure for infinite time would not result in death from the effects of chlorine. (Chilton-ORNL)
W76-08928

GLYCEROPHOSPHATIDE CONTENT AND COMPOSITION OF TROUT (SALVELINUS FONTINALIS M.) BRAIN,
Toronto Univ. (Ontario). Dept. of Zoology and Erindale Coll. (Ontario).
W. Driedzic, and B. I. Roots.
Journal of Thermal Biology, 1975, Vol. 1, Pergamon Press, p 7-10, 2 tab, 26 ref.

Descriptors: *Biochemistry, Lipids, *Trout, Temperature.
Identifiers: Acclimation temperature, Salvelinus fontinalis M., *Glycerophosphatide.

The amounts and composition of diacylglycerophosphatidyl, alk-l-enylacylglycerophosphatidyl choline, dialcylglycerophosphatidyl ethanolamine and alk-l-enylacylglycerophosphatidyl ethanolamine in the brain of trout which had been acclimated to temperatures of 5 degrees C and 19 degrees C were determined. At both acclimation temperatures the diacylglycerophosphatidyl choline was present in the greatest amount and the alk-l-enylacylglycerophosphatidyl choline in the least amount. Plasmalogen was the same at both acclimation temperatures and all of it was ethanolamine based. An increase in the proportion of long chain polyunsaturated fatty acids was found in the GPE fraction at the lower temperature. (Chilton-ORNL)
W76-08929

THE EFFECT OF THERMAL POLLUTION ON THE DISTRIBUTION OF NAEGLERI FOWLERI,
Louvain Univ. (Belgium). Laboratorie de Hygiene; and Louvain Univ. (Belgium). School of Public Health.
J. De Jonckheere, P. Van Dijick, and H. van de Voorde.
The Journal of Hygiene, Vol 75, No. 1, p 7-13, August, 1975, 1 fig, 1 tab, 17 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Distribution, Microorganisms, Diseases.
Identifiers: Amoebae, *Naegleri fowleri, Meningoincephalitis.

The study investigates the distribution in the environment of Naegleri fowleri, the causative agent of primary amoebic meningoencephalitis. Sampling from two canals, a stream, two lakes, several reservoirs and slow sandfilters of a water supply service and also a water distribution network resulted in the Naegleri fowleri being found in only one of the two thermally polluted canals and being absent from all the other locations. This indicates that factors other than high temperatures are involved in the selective proliferation of N. fowleri. Most of the strains isolated were not virulent for mice, although they showed all the characteristics of the pathogenic strains. Other amoebae able to grow at 42 degrees C were found in the sampling locations. (Chilton-ORNL)
W76-08930

FEEDING BEHAVIOR AND TEMPERATURE AND LIGHT TOLERANCE OF MYSIS RELICTA IN THE LABORATORY,
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
G. M. DeGraeve, and J. B. Reynolds.
Transactions of the American Fisheries Society, Vol. 104, No. 2, p 394-397, 1975. 2 fig, 7 ref.

Descriptors: *Environmental effects, *Temperature, *Light intensity, Laboratory tests, *Shrimp.
Identifiers: Feeding behavior, *Mysis relicta.

The limits of tolerance of the opossum shrimp, Mysis relicta, to light and temperature were studied in the laboratory over a period of one year. As food particles or brine shrimp drifted downward, the mysids moved from 1 to 5 cm horizontally in rapid, jerking motions to intercept them. Individuals in covered containers exhibited the same movement when the cover was removed, whether fed or not. A more continuous and passive method of feeding was that of swimming upside down and gathering floating particles from the surface. Scavenging was frequent in a container from which dead mysids were not removed. Movement and feeding increased noticeably at 15-16 degrees C but stress was not visibly evident until temperatures reached 20-21 degrees C. Data from light tolerance tests showed that, after 38 weeks, survival was 32.5% in continuous full light as compared with 44.6% in subdued light. (Chilton-ORNL)
W76-08931

THE BIOLOGY OF THE LEECH MYZOBDELLA LUGUBRIS INFESTING BLUE CRABS AND CATFISH,
Charleston Coll., S. C. Dept. of Biology; and Charleston Coll., S. C. Grice Marine Biological Lab.
B. A. Daniels, and R. T. Sawyer.
Biological Bulletin, Vol. 148, p 193-198, April, 1975. 1 fig, 1 tab, 16 ref.

Descriptors: *Biological communities, Population, Aquatic populations, Seasonal, Hosts, Fish, Crustacean, *Crabs, *Catfishes.
Identifiers: *Leeches, *Myzobdella lugubris.

To establish the seasonal abundance of M. lugubris, a population was examined at monthly intervals from May, 1972 through April, 1973 in the middle reaches of the Ashley River. The Ashley River is tidal along most of its reach with a salinity range from 0 to 14% and a temperature range from 4 to 29 degrees C. Throughout the year and especially in October and November, leeches were found on the carapace of the blue crab. It appeared that the crab carapace normally served as a site for the deposition of the leech cocoons. The peak of cocoon deposition occurs during the summer months. 70% of the catfish examined were infested with leeches. The seasonality of infestation was corroborated by a strong negative correlation between water temperature and the average number of leeches per catfish as well as the temperature and the catfish infestation rate. The greatest increase in the leech population occurred in December. (Chilton-ORNL)
W76-08932

ENVIRONMENTAL AND INTRINSIC CONTROL OF FILTERING AND FEEDING RATES IN ARCTIC DAPHNIA,
State Univ. of New York at Albany. Dept. of Biological Sciences.
S. W. Chisholm, R. G. Stross, and P. A. Nobbs.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 2, p 219-226, February 1975, 5 fig, 2 tab, 29 ref.

Descriptors: Daphnia, Water pollution effects, *Environmental effects, *Feeding rates, Food abundance, Diurnal, Size, *Alaska, Temperature, Arctic.
Identifiers: Pt. Barrow(Alas).

Filtering rates of the Daphnia middenderffiana population were measured as a function of food concentration at a temperature of 11 degrees C. Feeding rates calculated from the data were found to be a hyperbolic function of food density and filtering rate was characteristically inhibited at the higher densities. Maximum filtering rate was near 12 degrees C for all age-groups. Filtering rate increases with animal length. For animals held under constant conditions the feeding rates were maximum at 1400 and 2400 hours, the time of day when the temperature cycle in natural ponds passes through the mean daily temperature. (Chilton-ORNL)
W76-08933

TEMPERATURE INFLUENCE ON CHEMICAL TOXICITY TO AQUATIC ORGANISMS,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Center for Environmental Studies.
J. Cairns Jr, A. G. Heath, and B. C. Parker.
Journal Water Pollution Control Federation, Vol 47, No. 2, p 267-280, February 1975, 2 fig, 87 ref.
EPA 303657-1 EPA68-01-1817

Descriptors: *Environmental effects, *Water pollution effects, *Temperature, *Toxicity, Fish, Fishkill, Chemical reactions.
Identifiers: Fish toxicity.

General trends on physiological mechanisms in toxicant-temperature interactions are indicated. Survival time of fish in toxic concentrations of ammonia decreases markedly with a rise in tempera

ture. Threshold concentrations for cyanide apparently vary only slightly with temperature changes but a 20 degree C difference in temperature caused a reduction in survival time by a factor of 2 to 7. Data showed that a changing thermal environment, in contrast to a constant one, may magnify effects of trace metal toxicity to fish. Toxicity of pesticides and herbicides vary with individual compounds. Phenols appear to be most damaging under winter conditions. Elevated temperatures that would lower dissolved oxygen and increase the respiratory demand for oxygen would probably increase the toxicity of chlorine to fish. (Chilton-ORNL)
W76-08934

RESEARCH ON THE MARINE FOOD CHAIN.
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
J. Cairns, Jr., A. G. Heath, and B. C. Parker.
UCSD 10 p 20-202, 1975, 912 p. UCSD Progress Report for the period July 1974 - June 1975. AT(11-1)GEN 10, P. A. 20.

Descriptors: *Projects, *Programs, *Food webs, *Food chains, California, Pacific Ocean, Water pollution effects, Eutrophication, Path of pollutants.
Identifiers: Fish toxicity.

Research activity by Food Chain Research Group covers a broad range of interests centered around the study of the organisms comprising the lower levels of the marine pelagic food web and their chemical and physical environments. Part I of the report contains short accounts of projects in progress. Part II consists of reports on completed research in manuscript form. Part III provides narrative accounts of recent cruises where Food Chain Research Group members served as chief scientists. (See W76-08936 thru W76-08961) (Chilton-ORNL)
W76-08935

PHYSIOLOGICAL ECOLOGY OF GONYAULAX POLYEDRA, A RED WATER DINOFLAGELLATE OFF SOUTHERN CALIFORNIA,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. W. Eppley, and W. G. Harrison.
In: Research on the Marine Food Chain, Progress Report UCSD 10P20-202, for the period July 1974-June 1975. p 207-221, 1 fig, 2 tab, 31 ref.

Descriptors: *Red tide, *Dinoflagellates, *Physiological ecology, Thermocline, Upwelling, Nutrients, Migration patterns, Diel migration, Vertical migration, Nuisance algae.
Identifiers: Gonyaulax polyedra.

Physiological measurements of Gonyaulax polyedra, a dominant species in red tides off the coast of southern California, have been carried out since the 1950's. These measurements include studies of bioluminescence and the periodicity of cell division, diel vertical migration, proximate chemical composition, and nitrogen assimilation. Nutrient enrichment from upwelling appears to be the causative mechanism in the California red tides. Dinoflagellate blooms are associated with steep, shallow thermoclines, a nutrient-depleted, shallow mixed layer but with nutrient-rich water below the shallow thermocline and within the depth range of the diurnal verticle migration of the dinoflagellates. When these physical conditions prevail, the vertical migration along with certain idiosyncracies in their metabolism of nitrogen provide an advantage for the dinoflagellates over other species. (See also W76-08935) (Chilton-ORNL)
W76-08936

TWO BLOOMS OF GYMNODINIUM SPLENDENS (LEBOUR). A LARGE NAKED DINOFLAGELLATE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
D. A. Kiefer, and R. Lasker.
In: Research on the Marine Food Chain, Progress Report UCSD 10P20-202, for the period July 1974-June 1975. p 223-235, 2 fig, 1 tab, 17 ref.

Descriptors: *Dinoflagellates, *Aquatic algae, *Eutrophication, Coasts, California, Distribution patterns, *Food chains.
Identifiers: Bahia Consepcion, Southern California Bight.

Two blooms of Gymnodinium splendens (Lebour) were observed, one in Coyote Bay of Bahia Concepcion and the other along the coast of the Southern California Bight. In Coyote Bay chemical and physical observations were made while the ship was at anchor in 20 m of water. The depth distribution of the phytoplankton was recorded at regular intervals. Surface seas were calm and the thermal character of the water column remained constant. At sunset, the cells began a downward migration at a rate of approximately 1.7 m/hr. Before sunrise the next day, G. Splendens began an upward movement from a depth of 15 to 18 m. Information on the steady state doubling time for the species was determined to be 2.3 days. In the observation in the Southern California Bight, the G. splendens were most abundant at depths of 15 to 20 m. The subsurface layer formed a narrow, inshore band which appeared to extend over 100 km along the coast. Feeding experiments have indicated that G. splendens provide an ideal food source for marine herbivores. (See also W76-08935) (Chilton-ORNL)
W76-08937

PHOSPHATE UTILIZATION BY AN OCEANIC DIATOM IN PHOSPHORUS-LIMITED CHEMOSTAT CULTURE AND IN THE OLIGOTROPHIC WATERS OF THE CENTRAL NORTH PACIFIC,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. J. Perry.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975. UCSD 10P20-202, p 237-300, 8 fig, 9 tab, 79 ref.

Descriptors: *Phytoplankton, *Phosphates, Cultures, Nitrogen, Oligotrophy, Pacific Ocean, Nutrient requirements, Deficient elements, *Diatoms.
Identifiers: Thalassiosira pseudonana.

Cells of Thalassiosira pseudonana were grown in a phosphorus-limited chemostat culture and in a nitrogen-limited chemostat culture and the chemical composition of the cells, expressed as ratios, were compared. These ratios varied in excess of a factor of 5 between the two systems and emerged as diagnostic indicators of phosphorus-starvation vs. nitrogen-deficiency. The data suggests that nitrogen is more limiting to marine phytoplankton growth rate than phosphorus. However, results indicate that phosphorus is involved with nitrogen in controlling the growth rate of the phytoplankton in the Central North Pacific Ocean. (See also W76-08935) (Chilton-ORNL)
W76-08938

DYNAMICS OF PHOSPHORUS CYCLING IN THE EUPHOTIC WATERS OF THE CENTRAL NORTH PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. J. Perry, and R. W. Eppley.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202. p 301-352, 1 fig, 12 tab, 67 ref.

Descriptors: *Nutrient requirements, *Phytoplankton, *Phosphorus, Nitrogen, Growth rates, Productivity, Pacific Ocean, Euphotic zone, Phosphates, *Cycling nutrients.

Phosphorus utilization by phytoplankton was assessed from P 33-phosphate uptake measurements with attention being given to the role of arsenate, the effect of low ambient levels of nitrogenous nutrients, and the size distribution of organisms taking up phosphate. The assimilation ratios of phosphate, carbon and ammonium- and urea-nitrogen deviated from predicted ratios for balanced growth but did not conform to expected values for either phosphorus-limited or nitrogen-limited growth. The ratios reflected aspects of both phosphorus and nitrogen limitation. The complementarity observed between nitrogen and phosphorus with respect to turnover times of the external pools, growth rates and nutrient budgets suggests that the growth rate and production are not limited by a single nutrient but rather that phosphorus and nitrogen together regulate growth rate and production and cycle through the food web as a balanced couple. (See also W76-08935) (Chilton-ORNL)
W76-08939

PHOTOSYNTHETIC MEASUREMENTS IN THE CENTRAL NORTH PACIFIC: THE DARK LOSS OF CARBON IN 24-HOUR INCUBATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. W. Eppley, and J. H. Sharp.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 353-379, 3 fig, 4 tab, 26 ref.

Descriptors: *Photosynthesis, *Phytoplankton, *Pacific Ocean, Growth rates, Respiration, Primary productivity, Measuremment.

Half-day and 24 hour incubations of phytoplankton with C 14 labelled bicarbonate gave similar values for net primary production in the central gyre of the North Pacific. Phytoplankton specific growth rates are much higher in cultures and coastal waters. Comparisons of half-or full-light day with 24 hour C 14 incubations provided estimates of the nightime C 14 loss. Phytoplankton respiration appears to be a principal source of the dark C 14 less, partly due to the lack of isotopic equilibrium expected if incubations are only 24 hours and phytoplankton doubling times are several days. The authors conclude that the 24 hour C 14 measurements represent not only phytoplankton uptake and respiration of C 14 but also the grazing and subsequent respiration of herbivores included in the samples. The phytoplankton would be expected to suffer some non-grazing mortality resulting in their mineralization by bacteria and other saprophytic heterotrophs. (See also W76-08935) (Chilton-ORNL)
W76-08940

SILICIC ACID UPTAKE AND INCORPORATION BY NATURAL MARINE PHYTOPLANKTON POPULATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
F. Azam, and S. W. Chilholm.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 381-405, 5 fig, 32 ref.

Descriptors: *Photosynthesis, *Nutrient requirements, *Phytoplankton, Pacific Ocean, Silica, Diatoms, Gulfs, Mexico.
Identifiers: *Gulf of California.

Ge68-Germanic acid was used as a tracer to study the uptake and incorporation of silicic acid by natural phytoplankton in the Gulf of California. The technique allowed very small silicic acid incorporation rates to be measured. The incorporation was light dependent with the rate of incor-

LIBRARY U. OF A. Univ. Center, Comm.

poration in the dark being only 44% of that at light saturation. In some cases, enrichment with silicic acid caused stimulation of photosynthetic carbon fixation. The techniques presented should facilitate investigations on the dynamics of diatom distribution patterns and species succession. (See also W76-08935) (Chilton-ORNL)
W76-08941

PRIMARY PRODUCTION AND THE FACTORS CONTROLLING PHYTOPLANKTON GROWTH IN THE ANTARCTIC SEAS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
O. Holm-Hansen, S. Z. El-Sayed, G. A. Franceschimi, and R. Cuhel.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10p20-202, p 407-471, 20 fig, 5 tab, 44 ref.

Descriptors: *Food chains, *Primary productivity, *Growth rates, *Phytoplankton, *Antarctic Ocean, Algae, Temperature, Nutrient requirements, Light, Respiration, Photosynthesis, *Plant growth.

The rate of primary production and the factors controlling phytoplankton growth rates were investigated on a north-to-south transect in subtropical, subantarctic polar front and antarctic water mass. Observed algal growth rates in Antarctic waters were 0.05 to 0.33 doublings per day as compared to some temperate or tropical phytoplankton with measured growth rates of over 1.0 doubling per day. In each of the north-south transects there were many variables to be considered in regard to phytoplankton growth rates. These parameters include temperature, nutrients, light intensity, respiratory rates, settling rates of cells, water column stability, and losses due to zooplankton grazing. (See also W76-08935) (Chilton-ORNL)
W76-08942

ASSAY OF NITRATE REDUCTASE FROM PLASMOLYZED MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
W. G. Harrison.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10p20-202, p 473-483, 1 tab, 6 ref.

Descriptors: *Food chains, *Analytical techniques, *Enzymes, Assay, Separation techniques, *Pollutant identification, *Bioassay.

Conventional techniques for nitrate reductase assays involve extraction by some form of mechanical cell distribution. The plasmolysis technique averaged over 5 times the values obtained by conventional methods. The plasmolysis procedure is most valuable in laboratory culture work and particularly for selected species where recovery of the enzyme is very high. The procedure has advantages of requiring only a fraction of the material needed for extraction procedures, it requires less work and equipment, and can be run in 1/3 the time. Considerable variation in plasmolysis/extraction enzyme activity ratios may limit the utility of the plasmolysis assay in studies of nitrate reductase for natural seawater samples with mixed populations. (See also W76-08935) (Chilton-ORNL)
W76-08943

A THERMODYNAMIC MODEL FOR STEADY STATE METABOLISM OF PHYTOPLANKTON, PART I. THEORY,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
D. A. Kiefer, E. Stewart, and T. Enns.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10p20-202, p 487-510, 2 fig, 2 tab, 19 ref.

Descriptors: *Model studies, *Metabolism, *Phytoplankton, Biochemistry, Mathematical models, *Chlorella.
Identifiers: Thermodynamic model(Phytoplankton).

A model of photoautotrophic growth of phytoplankton is presented and utilizes principles of nonequilibrium thermodynamics. The many biochemical reactions of the cell are classified into two pairs of coupled reactions; one describing primary photochemistry and the other describing all remaining biochemical reactions. By assuming steady state conditions and the applicability of phenomenological equations it was possible to quantitatively describe the rates of the two pairs of coupled reactions in terms of the chemical affinities of the reaction and their conductivity coefficients. By combining the equations with observation on optimal growth in Chlorella, it was possible to estimate the efficiency of energy conversion and the degree of coupling for both pairs of coupled reactions. (See also W76-08935) (Chilton-ORNL)
W76-08944

A THERMODYNAMIC MODEL FOR STEADY STATE METABOLISM OF PHYTOPLANKTON, PART II. LIGHT AND CARBON LIMITED GROWTH,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
D. A. Kiefer.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10p20-202. p 511-535, 8 fig, 17 ref.

Descriptors: *Model studies, *Photosynthsis, *Phytoplankton, Metabolism, Light, Carbon, Growth rates, *Chlorella.
Identifiers: Thermodynamic model(Phytoplankton).

A thermodynamic model of photosynthetic growth is applied to metabolic regulation in light and carbon limited phytoplankton. The model predicts responses in growth rate, cellular chlorophyll content, in vivo enzymatic activity and quantum efficiency of photosynthesis. The model assumes that the biochemical system is near equilibrium and reversible, that the basic pathways leading to cell growth are characterized by degrees of coupling which remain constant at different rates of steady state growth, and that the biochemical system is regulated so that the overall efficiency of conversion is maximal. Predictions compared favorably with observed regulation by Chlorella in the case of light limitation. (See also W76-08935) (Chilton-ORNL)
W76-08945

CHLORINE REACTIONS WITH SEAWATER CONSTITUENTS AND THE INHIBITION ON PHOTOSYNTHESIS OF NATURAL MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. W. Eppley, E. H. Renger, and P. M. Williams.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 537-574, 8 fig, 6 tab, 25 ref.

Descriptors: *Environmental effects, *Photosynthesis, *Phytoplankton, Sea water, Chlorine, Inhibition, Inhibitors, Chemistry.

Hypochlorite was added to seawater in the laboratory and in field samples collected adjacent to an open coast marine outfall of an electric generating station. Concentrations required for 50% phytoplankton photosynthesis inhibition varied with exposure time. 24 hour incubations required concentrations of about 10 ppb residual chlorine. There was no recovery of photosynthetic activity after chlorine had fallen to undetectable levels. Hypochlorite reacts rapidly with the bromide ion in seawater to form hypobromous acid and hypobromite and it is thought that these compounds along with residual bromine are the physiologically active substances formed on the chlorinating of seawater. (See also W76-08935) (Chilton-ORNL)
W76-08946

EFFECTS OF COPPER ON NATURAL MARINE PHYTOPLANKTON COMMUNITIES,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
O. Holm-Hansen, W. H. Thomas, D. L. R. Seibert, and M. Takahashi.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 575-591, 5 fig, 13 ref.

Descriptors: *Environmental effects, *Biological communities, *Phytoplankton, *Copper, Diatoms, Trophic levels, Populations, Water pollution effects.
Identifiers: Flagellates.

Data showed that concentrations of 10 and 50 ppb Cu added to phytoplankton communities in experimental enclosures caused a rapid decrease in the phytoplankton concentration. After 2-3 weeks, the phytoplankton biomass was comparable to that in control enclosures but the species composition was radically altered from a predominately diatom drop (Chaetoceros sp.) to one of microflagellates ranging in size from 1 to 10 micron in diameter. Such alterations in the phytoplankton crop can be expected to have important consequences in regard to other trophic levels. It has been noted that there is a large increase in bacterial numbers concomitant with the loss of the Chaetoceros sp. shortly after the addition of Cu. The change in species composition from diatoms to small flagellated cells may also have significant effects on the zooplankton populations. (See also W76-08935) (Chilton-ORNL)
W76-08947

THE REPLICATION OF BIOLOGICAL EVENTS IN ENCLOSED WATER COLUMNS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. Takahashi, W. H. Thomas, D. L. R. Seibert, J. R. Beers, and P. Koeller.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 593-623, 10 fig, 27 ref, 2 tab.

Descriptors: *Ecology, *Marine biology, Aquatic life, Water, Sea water, Water pollution effects.

The purpose of the experiments was to study the life history of large columns (70 tons) of water when they are separated from the normal forces of advection and turbulence. Data showed that the four containers behaved biologically in a very similar manner and that their ecology was essentially the same as that found in the outside environment. These experiments suggest that such containers can be used by marine ecologists concerned with the total interaction of organisms in their natural state or under the influence of perturbations such as may be caused by pollutants. (See also W76-08935) (Chilton-ORNL)
W76-08948

MICROPLANKTON OF THE NORTH PACIFIC CENTRAL GYRE. I. POPULATION STRUCTURE AND ABUNDANCE, JUNE 1973,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
J. R. Beers, F. M. H. Reid, and G. L. Stewart.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 625-694, 9 fig, 3 tab, 72 ref.

Descriptors: *Populations, Census, Aquatic life, Biomass, Phytoplankton, Pacific Ocean.

A quantitative description was made of the populations of living organisms in the approximate size range of 2-200 micrometers from the upper 200 m of the water column at six sites on a 20 mi by 20 mi grid. Total abundance of the organisms averaged over the six locations decreased from 450000 to 80000 individuals per liter in the upper and middle levels of the euphotic zone to 68000 individuals/l at 80-200 m. Organisms in the net plankton size range were less than 1% of the total numbers at all depths but they accounted for fractions of the biomass carbon increasing from approximately 1/6 in the upper waters to 1/3 in the lower depths examined. The dominant taxa in terms of both numbers and biomass were small monads and flagellates and non-thecate dinoflagellates. (See also W76-08935) (Chilton-ORNL)
W76-08949

NUTRIENT REGENERATION BY OCEANIC ZOOPLANKTON: A COMPARISON OF METHODS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. M. Mullin, M. J. Perry, E. H. Renger, and P. M. Evans.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975. UCSD 10P20-202, p 695-709, 2 fig, 1 tab, 13 ref.

Descriptors: *Nutrients, *Energy balance, Nitrogen, Phosphates, Sea water, *Zooplankton, Aquatic animals, Methodology, Cycling nutrients.
Identifiers: *Nutrient regeneration.

In stratified surface waters with no upwelling, excretion by zooplankton is the most important means of regenerating nutrient elements, notably nitrogen and phosphorus. The rate of regeneration of phosphate and ammonium by zooplankton in the mixed layer was estimated directly from the release of these nutrients by unsorted catches, and indirectly from the rates of release by selected animals ranging widely in size. Direct estimates from unsorted catches resulted in a higher estimate of regeneration than did the indirect estimates from selected animals. This difference may have been due to release of nutrients by injured or killed animals in the unsorted catches. (See also W76-08935) (Chilton-ORNL)
W76-08950

DISTRIBUTION, MORPHOMETRY, AND SEASONAL BIOLOGY OF THE PLANKTONIC COPEPODS, NEOCALANUS ROBUSTIOR AND N. GRACILIS, IN THE PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. M. Mullin, and P. M. Evans.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975. UCSD 10P20-202. p 711-738, 5 fig, 2 tab, 26 ref.

Descriptors: *Ecology, Aquatic animals, *Copepods, *Distribution patterns, Biology, *Seasonal, Size, *Pacific Ocean.

The study concerns a pair of sibling species differing mainly in size. Both species are reported from the Pacific, Atlantic, and Indian Oceans. They are among the 20 numerically most important species of large copepods in the central gyre of the North Pacific. Neocalanus gracilis has a wider geographical range to the north and south. Both species are most abundant in the upper 200 m. The center of distribution of N. gracilis is generally deeper than that of N. robustior during the day. The copepodite stages of the two species are distinguishable by bodily size. Both species probably breed throughout the year in the eastern Central North Pacific and there was no evidence that the seasonal patterns of abundance of the two species differed. (See also W76-08935) (Chilton-ORNL)
W76-08951

VITAMINS IN THE SOUTH POLAR SEAS, I. DISTRIBUTION AND SIGNIFICANCE OF DISSOLVED AND PARTICULATE VITAMIN B 12, THIAMINE, AND BIOTIN IN THE SOUTHERN INDIAN OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
A. F. Carlucci, and R. L. Cuhel.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975. UCSD 10P20-202. p 741-765, 5 fig, 2 tab, 16 ref.

Descriptors: *Biochemistry, *Vitamins, Vitamin B, Distribution, Sea water, Pacific Ocean, *Indian Ocean.

Concentration of dissolved B12 in the upper 75 m waters averaged 0.2 ng B12/l; most samples containing considerable amounts of B12 were from the more southerly stations. Particulate B12 ranged from 0.003 to 0.26 ng/l with the higher concentrations being found in the upper 75 m waters. Dissolved thiamine concentrations ranged from undetectable amounts to 7 ng/l, but only 7% of the samples contained detectable thiamine. Particulate thiamine concentrations varied from undetectable to 10.50 ng/l with most of the thiamine being found in the upper 75 m waters. Dissolved biotin was present in 64% of the samples and ranged from undetectable to 4.3 ng/l. Particulate biotin was present in all samples and ranged from 0.01 to 1.44 ng/l. Comparison of B12 with ATP, particulate organic carbon, and inorganic nutrient data indicated that biological uptake was responsible for the low amounts of B12 for at least 13 of the 16 stations studied. (See also W76-08935) (Chilton-ORNL)
W76-08952

LEUCOTHRIX: ABSENCE OF DEMONSTRABLE FIXATION OF N2,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
T. H. Mague, and R. A. Lewin.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975. UCSD 10P20-202. p 767-773, 8 ref.

Descriptors: *Biochemistry, *Nitrogen fixation, Aquatic algae, Analytical techniques, *Bioassay, Analytical techniques, Pollutant identification.
Identifiers: *Leucothrix mucor.

A possible affinity with blue-green algae suggested that Leucothrix might be able to fix N2. This was tested by the acetylene reduction assay for nitrogenase activity. Acetylene reduction was not detected under aerobic, microaerophilic, or anaerobic conditions in any of the samples tested. This lack of demonstrable nitrogenase activity, corroborating the severely limited growth of filaments in nitrogen-free medium, provides strong evidence that this organism is unable to fix N2. (See also W76-08935) (Chilton-ORNL)
W76-08953

COCCOLITH SEDIMENTATION BY FECAL PELLETS: LABORATORY EXPERIMENTS AND FIELD OBSERVATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
P. H. Roth, W. H. Berger, and M. M. Mullin.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202. p 775-793, 3 fig, 28 ref.

Descriptors: *Sedimentation, Geochemistry, Laboratory tests, On-site investigations, Copepods.
Identifiers: *Coccoliths, *Fecal pellets.

Experiments showed that cocclithophorids are readily ingested by at least some copepods, pass their guts relatively unharmed, and occur in large numbers in fecal pellets. Some mechanical breakage occurs, especially among delicate forms. There are indications that etching is unimportant as compared to breakage during passage through the copepod guts. Fecal pellet transport of coccoliths is a feasible mechanism of sedimentation. The paleontological, sedimentological, and geochemical implications of such transfer could be of great importance. (See also W76-08935) (Chilton-ORNL)
W76-08954

AMINO ACID UPTAKE AND RESPIRATION BY MARINE HETEROTROPHS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
P. J. leB. Williams, T. Berman, and O. Holm-Hansen.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 795-813, 1 fig, 3 tab, 15 ref.

Descriptors: *Photosynthesis, Aquatic animals, Respiration, *Amino acids, Turnovers, Marine animals.
Identifiers: *Marine heterotrophs.

The concentration and turnover of dissolved free amino acids was measured at a station six miles off the California coast from depths of 25 and 100 m on three occasions. The ambient concentration of individual amino acids in the water varied from undetectable to 3 micrograms/l, with the total amino acid concentration ranging from 1.8 to 8.5 micrograms/l. The predominant amino acids were serine, lysine, aspartate, glutamate, and alanine. The rate of heterotrophic turnover of the ten individual amino acids studied ranged from undetectable to 1.2 micrograms/l. day. Total calculated amino acid turnover varied from 0.015 to 3.16 micrograms/l. day. The rates were 15-50 times higher in samples taken from 25 meters than those from 100 meters. The amino acid flux amounted to 1-10% of photosynthetic carbon dioxide fixation and was in some cases comparable to the total rate of release of soluble photosynthetic products. (See also W76-08935) (Chilton-ORNL)
W76-08955

CYCLING OF ORGANIC CARBON IN THE OCEAN: USE OF NATURALLY-OCCURRING RADIOCARBON AS A LONG AND SHORT TERM TRACER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
P. M. Williams, and T. W. Linick.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 815-837, 5 tab, 36 ref.

Descriptors: *Water pollution, Organic matter, Carbon, *Carbon cycle, Aquatic animals, *Path of pollutants, Cycles, Carbon radioisotopes, *Cycling nutrients.

The paper presents data on the natural radiocarbon activity of surface, bathypelagic and benthic marine organisms, and for the C14 activity of the dissolved inorganic carbon in surface waters. The results are interpreted with respect to the overall mechanisms operating in the oceans in the cycling and removal of organic matter over short and long time periods (months to decades). It was concluded that organic pollutants such as halogenated hydrocarbons and biphenyls, crude oil residues, toxic organometallic compounds, and as yet undefined anthropogenic organic material which enters the marine food chains by various mechanisms may persist in the deep sea for long periods or be removed from the oceans in a relatively short time depending on the specific pathway it follows. (See also W76-08935) (Chilton-ORNL)
W76-08956

LIBRARY OF THE UNIVERSITY OF

NUTRIENT CYCLING BETWEEN THE WATER COLUMN AND A MARINE SEDIMENT. I. ORGANIC CARBON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
E. O. Hartwig.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 839-870, 8 fig, 35 ref.

Descriptors: *Photosynthesis, Nutrients, Organic matter, Carbon, Cycling, Sediments, Aquatic life, Benthos, Sea water, *Cycling nutrients.

The carbon flow was determined through sediments at a station in 18.3 m of water off the San Diego County coast. The parameters investigated and their mean rates of input or output to the benthos were macro-detritus, fallout of particulate matter, benthic net photosynthesis during daylight hours, burial, benthic night time respiration, and resuspension. Resuspension of sediment appears to have a controlling effect on the sediment organic carbon content. Benthic photosynthesis was found to provide 79% of the organic carbon required by the benthos for respiration during the daylight hours. (See also W76-08935) (Chilton-ORNL)
W76-08957

IMPROVED METHODOLOGY FOR ATP DETERMINATION IN MARINE ENVIRONMENTS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. E. Hodson, O. Holm-Hansen, and F. Azam.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 871-888, 3 fig, 1 tab, 20 ref.

Descriptors: *Analytical techniques, Separation techniques, Sea water, Aquatic environment, Methodology, *Pollutant identification.
Identifiers: *Adenosine triphosphate.

Three procedures; Tris extraction, conventional acid extraction, and charcoal adsorption method, for extraction of ATP from marine sediments were evaluated. It was found that the charcoal column procedure was suitable since it extracts with high efficiency, removes inhibitory substances, and permits ATP to be concentrated many fold from large volumes of dilute extract. (See also W76-08935) (Chilton-ORNL)
W76-08958

COPEPOD SLICK IN THE NORTHWEST PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. F. Lee, and P. M. Williams.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 889-896, 1 tab, 17 ref.

Descriptors: *Water pollution, Mortality, *Copepods, *Pacific Ocean, Pollutant identification.
Identifiers: Calanus sp.

Crewmen aboard the U.S. Coast Guard Cutter Minnetonka observed an extensive red slick located between Honolulu and Japan on April 7, 1971. The slick extended in all directions and was observed during a 2 week period along a 10-60 mile grid. Sampling showed that the organisms making up the slick were copepod remnants identified as a species of Calanus. Analysis of the sample showed 55% lipid with the remainder protein and chitin. A high mercury content was also found in the samples. It was hypothesized that the kill may have occurred as a result of pollution of terrestrial origin. (See also W76-08935) (Chilton-ORNL)
W76-08959

CRUISE SUMMARY, A. SOUTHERN CALIFORNIA BIGHT STUDIES (SCBS).
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 899-902.

Descriptors: *Cruises, *On-site investigations, Populations, Plankton, Chemistry, Primary production, Sea water, California, Coasts.
Identifiers: *South California Bight.

A series of quarterly cruises was initiated in September of 1974 in the Southern California Bight. The program has three goals: (1) to investigate local effects of the San Onofre generating station operations on plankton population dynamics and sea water chemistry, (2) to measure standing stocks and production of plankton by season with respect to water circulation and nutrient chemistry, and (3) to provide opportunities for personnel to carry out studies of ecologically significant problems. (See also W76-08935) (Chilton-ORNL)
W76-08960

CRUISE SUMMARY, B. GULF OF CALIFORNIA PHOTOBIOLOGY CRUISE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 903-912.

Descriptors: *Cruises, Physiological ecology, Biology, Light, Phytoplankton, Photosynthesis, Respiration, Inhibition, Nutrients, Gulf, Mexico.
Identifiers: *Gulf of California.

The primary purpose of the expedition was to investigate the effects of light duration and intensity on phytoplankton photosynthesis, photorespiration, photoinhibition, chlorophyll flourescence, and on inorganic nutrient uptake. 18 cruise report titles are given. The sampling program included the entire euphotic zone but particular attention was given to surface water where light intensity was highest and to the lower portions of the euphotic zone where the light intensity was 0.1 to 1.0% of surface light intensity. Many of the physiological reactions being studied were dependent on the species composition of the phytoplankton crop, water temperature, and nutrient concentrations. (See also W76-08935) (Chilton-ORNL)
W76-08961

BEHAVIORAL IMPAIRMENT PRODUCED BY EXPOSURE TO SUBCLINICAL AMOUNTS OF METHYLMERCURY CHLORIDE,
Virginia Polytechnic Inst. and State Univ. Blacksburg.
R. Hughes, R. Belser, and C. W. Brett.
Environmental Research, Vol. 10, p. 54-58, 1975 1 tab, 11 ref.

Descriptors: *Animal physiology, *Animal behavior, *Mercury, *Toxicity.
Identifiers: *Methlmercury chloride, *Behavior impairment.

Rats exposed to small amounts of methylmercury at age 28, 35, and 42 days were impaired in their ability to learn an active avoidance response on tests conducted when they reached adulthood. The amount of methylmercury to which the animals were exposed did not affect food or water intake, body weight, brain weight, or adrenal weight. While adult rats did not exhibit behavior impairment when exposed to an equivalent amount of methylmercury, data shown that postnatal exposure as well as in utero exposure leads to behavior defects. The possibility of an inverse relationship between behavior impairment produced by exposure to methylmercury and the age at which exposure occurs is indicated. Therefore, behavioral indices provide a more sensitive index of the toxic effects of methylmercury than clinical indices. (Hoyle-Vanderbilt)
W76-09037

THE EFFECT OF LEAD ON MOUSE BRAIN DEVELOPMENT,
Mount Sinai School of Medicine, New York.
H. S. Maker, G. M. Lehrer, and D. J. Silides.
Environmental Research Vol. 10, p. 76-91, 1975, 6 fig., 4 tab, 18 ref.

Descriptors: *Heavy metals, *Lead, *Toxicity, Pathology, Biology, *Animal physiology, Animal behavior, Growth stages, Reproduction, Laboratory animals, Rodents, Water pollution effects, Pollutant identification.
Identifiers: Mouse brain development, *Neurological retardation, Swiss-Webster albino mice.

Nursing C57 black or Swiss-Webster albino mother mice were given lead carbonate in food pellets or lead acetate in drinking water in doses ranging from 0.08 to 2.0% lead, and the pups were maintained on the lead diet through 60 days. The highly inbred C57 mice only rarely raised their litter if given 0.8% lead but the less inbred albino mice accepted up to 2% lead. A dose-related retardation as high as 50% of controls in body growth, brain development, and sexual and behavioral maturation was found. Retardation at the various lead doses was better correlated with lead concentration in the diet than with food consumption, therefore, undernutrition is apparently not the major cause of the retardation. (Hoyle-Vanderbilt)
W76-09038

SEDIMENT LOADING, ITS EFFECT ON A SOUTHERN ARIZONA LAKE AND THE EMERGING SPRING ZOOPLANKTON COMMUNITY,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2J.
W76-09073

EXPERIMENTAL STUDY OF THE EFFECT OF TEMPERATURE AND DEGREE OF OXYGEN SATURATION ON THE DESTRUCTION RATE OF SOLUBLE PROTEINS IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. K. Ryabov, B. I. Nabivanets, G. N. Oleinik, T. Y. Smikun, and L. V. Podgaevskaya.
Gidrobiol Zh. 10(5); p 15-25, 1974.

Descriptors: Proteins, Microorganisms, *Oxygen, *Temperature, Solubility, Natural waters, Water quality.
Identifiers: Destruction rate, Oxygen saturation.

Elevation of temperature and a rise in O2 content result in an increase in the destruction rate, which is connected chiefly with intensification of microorganism activity. The rate constants and activation energy values of the destruction process vary within 0.002-0.38 day-1 and 7-15 kcal/mol degree. When water is saturated with O2 up to 50%, the number of microorganisms sharply increases, which results in a deterioration of the water sanitary state. Rate constants and the activation energy of protein destruction under different conditions are determined.–Copyright 1976, Biological Abstracts, Inc.
W76-09078

INVESTIGATIONS ON THE PHYTOPLANKTON AND SOME ENVIRONMENTAL PARAMETERS OF THE SHATTAL-ARAB (IRAQ), (IN GERMAN)
Rostock Univ. (East Germany). Dept. of Biology.
For primary bibliographic entry see Field 2L.
W76-09084

STUDY OF ALGOFLORA OF CONTAMINATED WATER BODIES, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
N. S. Vodop'yan.
Ukr Bot Zh. 31(2), p 179-184, 1974.

Descriptors: *Algae, Water pollution effects, Canals, *Chlorophyta, Chrysophyta, *Cyanophyta, *Industrial wastes, Pyrrophyta, Toxicity, Englenophyta, Seasonal.
Identifiers: *Bacillariophyta.

The algoflora was studied in a canal into which industrial wastes flow. During the 1971 vegetation period 143 taxons (Chrysophyta, 2 spp., Pyrrophyta, 1 sp.; Euglenophyta, 3 spp.; Chlorophyta, 63 spp., 7 varieties, 2 forms; Bacillariophyta, 39 spp., 3 varieties; Cyanophyta, 22 spp.) were found. Algal development underwent seasonal changes and showed a dependence on main hydrochemical indices of the wastewater. Water quality should be determined mainly by toxic contamination.--Copyright 1976, Biological Abstracts, Inc.
W76-09093

DIGESTIVE ACTIVITIES OF CARP AS A MAJOR CONTRIBUTOR TO THE NUTRIENT LOADING OF LAKES,
V. A. Lamarra, Jr.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2461-2468, 1975. 5 fig., 5 tab., 11 ref.

Descriptors: *Benthos, *Carp, Freshwater fish, *Bottom fish, Aquatic productivity, Surface waters, Ponds, *Phosphorous compound, *Cycling nutrients, Minnesota, Lakes.
Identifiers: *Orthophosphates, *Nutrient loading, Fish feeding.

Studies in a series of Minnesota ponds indicate the fish species, carp, that are bottom feeders, can circulate phosphorous from the bottom organisms into the pond waters. Discrepancies between nutrient loading and lake conditions, especially observed in shallow lakes with high productivity, may be due to bottom feeding fish. (Katz)
W76-09103

PHOSPHOROUS FLUX THROUGH FISHES,
J. F. Kitchell, J. F. Koonce, and P. S. Tennis.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2478-2484, 1975. 4 fig., 3 tab., 25 ref.

Descriptors: *Phosphorous, Freshwater fishes, Fish physiology, *Eutrophication, Lakes, *Sunfishes, Biology, Number fish per acre, Fish populations, *Mortality, Aquatic productivity, *Nutrient, *Lake sediments, Fish reproduction, Fish kill, Lake fishery, *Wisconsin.
Identifiers: *Lake Wingra(Wis), Bluegill sunfish, Lepomis macrochirus, Phosphorous budgets.

In Lake Wingra, fish biomas represents 870 kg of phosphorous to the lake. Fish production processes 60-70% of the annual phosphorous input; 30-35% of the input is lost to sediment as fish bones and scales. Remineralization of dead post-spawning fish amounts to 150 kg of phosphorous during the late spring and early summer, thus affording a continuing source to planktonic production. Excretory release phosphorous by fishes seems quantitatively less important but may help stabilize planktonic cycles. (Katz)
W76-09104

CHANGES IN THE COMPOSITION OF THE PLANKTON OF THE RIVERS RHINE AND MEUSE IN THE NETHERLANDS DURING THE LAST FIFTY FIVE YEARS,
R. Peelen.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 1997-2009, 1975. 5 fig., 5 tab., 3 ref.

Descriptors: *Phytoplankton, *Water quality, *Bioindicators, *Plankton, Aquatic algae, *Eutrophication, Monitoring, *Phosphorous, *Dissolved oxygen, Biological communities, Rivers, Europe, Water pollution effects.
Identifiers: *Rhine River, *Meuse River, Saprobic index, Microcystis, Oscillatoria, Aphanizomenon, *Netherlands.

Substantial changes took place in the physical-chemical environment of the Rivers Rhine and Meuse in the past fifty-five years. Increased eutrophication of the Rhine backwaters brought beta-mesosaprobic organisms as far downstream as the Dutch frontier. No change in the saprobic grade of plankton of the Dutch part of both rivers took part in the last 55 years. Compared to 1916 an increase in total numbers took place. (Katz)
W76-09105

ALGAL COMMUNITIES IN POLLUTED RIVERS OF SOUTH WALES,
K. Benson-Evans, P. F. Williams, R. O. McLean, and N. Prance.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2010-2019, 1975 3 fig., 4 tab., 11 ref.

Descriptors: *Bioindicators, *Sessile algae, *Diatoms, Sewage, Industrial wastes, Water pollution sources, Water quality, Biological communities, Environmental gradient, *Ecological distribution, Methodology, *Statistical methods, Rivers.
Identifiers: *Biotic indices, Factor analysis, Tolerant organisms, Non-tolerant organisms, *South Wales, Biological analyses.

Studies on the rivers of South Wales indicate that numerical biotic indices are a satisfactory method of biological appraisal, particularly when applied to individual river systems. The weakness of such indices is their lack of species or genera identity. Autoecological studies have indicated the complexity of factors affecting even single species. Biotic indices involving species are more effective when devised for a particular type of river or even for specific types of pollution. Two such indices applied to rivers of the South Wales region appeared to have reflected water quality successfully, whereas indices or schemes devised for other areas have not proved so successful. (Katz)
W76-09107

THE CRUSTACEAN PLANKTON OF AN ACID RESERVOIR,
J. DeCosta.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 1805-1813, 1975. 10 fig., 4 tab., 15 ref.

Descriptors: *Zooplankton, Crustaceans, *Copepods, *Daphnia, *Mine drainage, Acid mine water, Water quality, Surface waters, Hydrogen ion concentration, Biological communities, *Dominant organisms, Oligotrophy, West Virginia, Reservoirs, Pennsylvania.
Identifiers: *Cheat Lake(WVa-Penn), *Bosmina, *Cyclops, *Mesocyclops, Diaphanosoma.

The Cheat Lake crustacean zooplankton assemblage is a very simple community characterized by extreme dominance and extreme oligotrophy. There is no significant effect at the more acid lake stations on the quantity of zooplankton. There are significant qualitative differences between the more acid lake stations and the more neutral backwater stations. (Katz)
W76-09109

LABORATORY EXPERIMENTS TO DETERMINE THE LIMITS OF TOLERANCE OF FLAGELLATES TO SOME ABIOTIC FACTORS,
R. Bretthauer.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2043-2050, 1975. 3 fig., 2 tab., 18 ref.

Descriptors: Methodology, *Heat resistance, *Acidic water, *Hydrogen ion concentration, *Phytoplankton, *Ochromonas, Plant populations, Growth rate, Growth chamber, Laboratory tests, Thermal pollution, Water pollution effects.
Identifiers: *Ochromonas sociabilis, *Flagellates.

The ecological limits of tolerance of Ochromonas sociabilis to various pH values and temperatures were investigated in culture experiments. This species prefers acidic media and could be cultured for more than two weeks at pH 4 to 8. Maximal growth was at pH 6. The lower limit of temperature tolerance is the freezing point of the growth medium; the upper limit is 35C, while the highest population density was observed at 30C. These findings were confirmed by experiments in which various pH-temperature combinations were investigated. (Katz)
W76-09110

MERCURY UPTAKE IN ROOTED HIGHER AQUATIC PLANTS; LABORATORY STUDIES,
C. Eriksson, and D. C. Mortimer.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2087-2093, 1975. 4 fig., 3 tab., 7 ref.

Descriptors: *Mercury, Methodology, *Plant growth, Aquatic plants, Marsh plants, *Rooted aquatic plants, Plant physiology, Submerged plants, Soil-water-plant relationships, Cultures, Water pollution effects, Laboratory tests, *Canada, *Absorption, Rivers.
Identifiers: Ottawa River, *Sagittaria latifolia, *Scirpus cyperinus.

In an experiment it was shown that mercury did not seem to affect the growth of Sagittaria or Scirpus. Plants were active in the uptake of mercury. The higher the concentration in the water, the more is accumulated in the shoot and this is independent of the concentration level in the soil. Submersed parts retained more mercury than emersed parts. Roots were able to take up mercury where such is present in the surrounding medium. In Scirpus, mercury was found at a higher level than in Sagittaria. (Katz)
W76-09111

FISHES IN OXYGEN-MINIMUM ZONES: BLOOD OXYGENATION CHARACTERISTICS,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Biology.
E. L. Douglas, W. A. Friedl, and G. V. Pickwell.
Science, Vol. 1191 No 4230, p 957-959, 1976 1 tab., 23 ref.

Descriptors: *Fish physiology, *Marine fish, *Analytical techniques, *Oxygen requirements, *Anaerobic conditions, Dissolved oxygen, *Respiration, Marine biology, Oceans, Adaptation, *Oxygenation.
Identifiers: Mid-water Pelagic fish, *Blood oxygen capacity, Oxygen dissociation curves, Swim bladder oxygen, Myctophidae, Melaphaide, Gonostomatidae.

Teleosts living in some mid-water pelagic regions of the Pacific are hypoxic or anaerobic during most of the day and become aerobic only during their diurnal migrations to and from the sea surface. The blood oxygen capacities of these fishes are among the lowest ever reported, and the oxygen dissociation curves show a very low affinity for oxygen. (Katz)
W76-09112

EFFECTS OF COPPER ON THE CORAL REEF ECHINOID ECHINOMETRA MATHAEI,
Guam Univ., Agana. Marine Lab.
G. A. Heslinga.

LIBRARY U. OF A. MARINE LABORATORY

Marine Biology, Vol. 35, p 155-160, 1976. 6 fig, 11 ref.

Descriptors: *Copper, Sea water, Marine animals, Reefs, Coral, *Reproduction, *Metals, *Embryonic growth stage, Aquatic life, Toxicity, Bioassay, Fertilization, Pollutant identification.
Identifiers: *Coral-reef Echinoid, Fertilization success, Echinometra mathaei, Early cleavage, Larval skeletal development, 96-h TL50.

The effects of copper-enriched seawater on fertilization success, early cleavage, larval skeletal development, and survivorship of adults of the coral-reef echinoid Echinometra mathaei (de Blainville) were tested. Fifty percent reduction of fertilization success and cleavage success to the 8-cell stage occurred in 0.18 and 0.42 mg added Cu++/l, respectively. Adults had respective 48- and 96-h TL50 values of 0.54 and 0.30 mg/l. Larval skeletal development was suppressed in 0.02 mg/l. The latter process appears to be very sensitive and may be the most suitable for assessing effects of stress on this species. (Katz)
W76-09113

INTERACTIVE EFFECTS OF PREDATION PRESSURE AND INSECTICIDE (TEMEFOS) TOXICITY ON POPULATIONS OF THE MARSH FIDDLER CRAB UCA PUGNAX,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Entomology and Economic Zoology.
D. V. Ward, B. L. Howes, and D. F. Ludwig.
Marine Biology, Vol. 35, p 119-126, 1976 3 fig., 17 ref.

Descriptors: Crustaceans, *Pesticides, *Crabs, Aquatic animals, *Toxicity, *Mortality, *Organophosphorous pesticides, Animal populations, On-the site studies, Shore birds, *Predation, Water pollution effects.
Identifiers: *Marsh birds, Predation, *Temefos, Temefos population density, Marsh fiddler crab, Uca pugnax, Arian predation.

The interactions of predation pressure with lethal and sublethal effects of temefos (Abate), an organophosphorous insecticide, were studied in field populations of Uca pugnax. Changes in fiddler crab population densities were followed in open-marsh temefos-treated and untreated test plots and in treated and untreated plots which were caged over to reduce predation by marsh birds. Temefos significantly reduced the population density of U. pugnax in the open test plots but not in the caged plots. These results indicate that temefos has a primarily sublethal effect on the crabs, the effect becoming lethal only after interaction with avian predation. Evidence from the presence of a time-lag effect in the population decrease, from a calculated predation index, and from laboratory studies reported elsewhere of behavioral alteration by temefos also supports the conclusion that temefos primarily impairs the escape response of U. pugnax: this leads to increased predation and subsequently to a decreased fiddler crab population. (Katz)
W76-09114

TOXICITY OF MINE DRAINAGE TO EMBRYONIC AND LARVAL BOREAL TOADS (BUFONIDAE: BUFO BOREAS),
Denver Univ., Colo. Dept. of Biological Sciences.
K. R. Porter, and D. E. Hakanson.
Copeia, Vol. 2, p. 327-331, 1976. 1 tab., 24 ref.

Descriptors: Iron, Copper, Zinc, Hydrogen ion concentration, *Toxicity, *Bioassay, *Mine wastes, Mine water, Water pollution effects, Chemical analysis, *Toads, Colorado, Pollutant identification, *Mine drainage.
Identifiers: *Boreal toads, Bufo boreas, Clear Creek County(Colo), Toad larvae.

Chemical analyses and bioassays of mine drainage were made to determine if it could be a factor accounting for the absence of amphibians from Clear Creek County, Colorado. The concentrations of hydrogen ion, iron, copper and zinc in the drainage were all individually much greater than the tolerance levels of premetamorphic toads. The lethality of the drainage was of such a magnitude that it required diluting approximately one thousand times before larvae could survive in it. Boreal toad (Bufo boreas) larvae are more resistant to acidity than most fish but are very similar to other anuran larvae and salmonids in their sensitivity to copper and zinc. (Katz)
W76-09115

PRE-IMPOUNDMENT SITE PREPARATION: A STUDY OF THE EFFECTS OF TOPSOIL STRIPPING ON RESERVOIR WATER QUALITY,
For primary bibliographic entry see Field 4C.
W76-09117

THE AVAILABILITY OF 137-CS TO FISHES FROM INGESTED CLAYS,
L. D. Eyman, and J. T. Kitchings.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2504-2509, 1975. 1 fig., 2 tab., 11 ref.

Descriptors: Freshwater fish, *Sediments, *Radioactive wastes, Environmental effects, *Cesium, *Channel catfish, *Sunfishes, Radioactivity, Aquatic life, Fish management, Kaolinite, Illite, Montmorillonite, *Clays, Water pollution effects, *Absorption.
Identifiers: Fish feeding.

Studies suggest that under certain conditions 137-Cs accumulations in fish can be greatly influenced by (1) the passive ingestion of sediment clays containing radioactive cesium and (2) the availability of the nuclides for assimilation as determined by the binding capabilities of the clay fraction. (Katz)
W76-09118

ENVIRONMENTAL CHANGES IN A PORTION OF LAKE ONTARIO FOLLOWING POLLUTION ABATEMENT,
J. H. Judd, and J. G. Bocsor.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 1984-1989, 1975. 1 fig., 2 tab., 28 ref.

Descriptors: Biological communities, Industrial wastes, Pulp and paper industry, *Lake Ontario, Lake shores, *Succession, *Benthos, *Pulp wastes, Amphipoda, Diptera, Oligochaetes, Gastropoda, *Benthic fauna, *Environmental effects, Water pollution effects, *Pollution abatement, New York.
Identifiers: *Gammarus, Cricotopus, Diversity values, Taxonomic listings, Oswego(NY).

Following abatement of effluent discharge of a paper mill into Lake Ontario, the affected littoral zone returned rapidly to conditions normally found along that region of the lake. Biological diversity values at station 1 were similar to that at station 3 (control). New species present were indicative of clean water. (Katz)
W76-09119

EFFECT OF CONSTANT AND VARYING TEMPERATURE ON EGG PRODUCTION OF LYMNAEA OBRUSSA SAY (MOLLUSCA: GASTROPODA),
J. S. Mattice.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 3174-3178, 1975. 3 fig., 10 ref.

Descriptors: *Gastropods, *Snails, *Reproduction, *Fecundity, Methodology, *Water temperature, *Thermoperiodism, Mollusks, Seasonal.
Identifiers: *Lymnaea obrussa, Constant temperature, Seasonal temperature variation, Diurnal temperature variation, *Snail egg production.

Laboratory and concurrent field observations indicate an inaccuracy in extrapolating data on egg production in the laboratory at constant temperatures, to field conditions with seasonal or diurnal fluctuations. As compared to egg production rates at constant temperature, seasonal temperature variation caused a decrease while seasonal plus diurnal temperature variation caused increase in egg production. (Katz)
W76-09120

AXENIC CULTURES OF TETRAHYMENA PYRIFORMIS AS TOXICOLOGICAL TOOLS,
For primary bibliographic entry see Field 5A.
W76-09121

ENDRIN TOXICITY AND DISTRIBUTION IN FRESHWATER: A REVIEW,
Bureau of Sport Fisheries and Wildlife, Marion, Ala. Southeastern Fish Cultural Lab.
B. F. Grant.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 3 p. 283-292, 1976. 40 ref.

Descriptors: *Reviews, *Bibliographies, Data collections, *Endrin, Water quality control, *Toxicity, *Absorption, Environmental effects, Chlorinated hydrocarbon pesticides, Pesticides, Insecticides, Lethal limit, Crustacea, Fish, Invertebrates, *Path of pollutants, Public health, Water pollution effects, Distribution.
Identifiers: Bioaccumulation.

Forty-nine reports containing information about endrin are summarized. This review should assist in evaluating potential consequences of continued endrin use and its impact as an aquatic pollutant. These and other investigations are the basis for recommended maximal amounts of 2 pptr endrin in water for the protection of aquatic organisms. (Katz)
W76-09122

RESPONSES OF ARCTIC MARINE CRUSTACEANS TO CRUDE OIL AND OIL-TAINTED FOOD,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
J. A. Percy.
Environmental Pollution, Vol. 10, p 155-162, 1976. 3 tab, 13 ref.

Descriptors: *Crustaceans, *Oil wastes, Water pollution effects, Arctic, Foods, *Animal behavior, *Amphipods, *Isopods, Environmental effects, Laboratory tests, Behavior, Oil pollution, *Oil spills, Oily water, Invertebrates, Mortality, Water pollution effects.
Identifiers: *Crude oil, *Arctic marine crustaceans, Avoidance.

The responses of several arctic marine crustaceans to oil masses and oil-tainted food have been investigated. None of the species was attracted to crude oil. Amphipods tended to avoid oil masses; however, the response was significantly diminished if the oil was weathered or if the animals were pre-exposed to light crude oil emulsions. Untainted food was preferentially selected over oil-tainted food. In contrast, an isopod was generally neutral to the presence of oil masses and consumed oil-tainted food as readily as untainted material. (Katz)
W76-09123

AN INVESTIGATION OF ANTIBIOTIC AND DRUG RESIDUES IN FISH,
Veterinary Research Labs., Belfast (Northern Ireland).
A. McCracken, S. Fidgeon, J. J. O'Brien, and D. Anderson.

The Journal of Applied Bacteriology, Vol. 40, No. 1, 2 fig., 3 tab., 7 ref.p. 61-66, 1976.

Descriptors: Pest control, *Rainbow trout, *Biocontrol, *Antibiotics(Pesticides), *Bactericides, *Bioassay, Public health, Fish farming, Aquaculture, *Pesticide residues, Fish management, Temperature, Methodology, Water pollution effects.
Identifiers: *Drug residues, Tissue analysis, Chloramphenicol, Oxytetracycline, Framycetin, Sulphadiazine.

Young rainbow trout were given intraperitoneal injections of either chloramphenicol, framycetin, oxytetracycline or sulphadiazine/trimethoprin and muscle tissue was examined by microbiological assay over a period of weeks for the presence of active residues. Chloramphenicol and framycetin could not be detected in fish muscle 7 days after intraperitoneal injection. Oxytetracycline residues could not be detected after 28 days but trimethoprim residues were present in muscle 77 days after injection. Test results show a rapid build-up of antibiotics in fish muscle after oral dosage and indicate that the administration period of 10 or 14 days is unnecessary and that increased levels of either oxytetracycline or trimethoprim for 3 or 4 days may be a more satisfactory method of combating disease outbreaks. (Katz)
W76-09124

RESILIENCE OF A ROCKY INTERTIDAL FISH COMMUNITY IN A PHYSICALLY UNSTABLE ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Ecology and Evolutionary Biology.
D. A. Thomson, and C. E. Lehner.
Journal of Experimental Marine Biology and Ecology, Vol. 22, p. 1-29, 1976. 7 fig., 8 tab., 45 ref.

Descriptors: Marine fish, *Intertidal areas, *Water level fluctuations, *Tides, Shallow water, High water mark, Low water mark, Biological communities, *Bottom fish, *Water temperature, Succession, Water pollution effects.
Identifiers: *Tide pools, Fish communities, Tropical fish, Temperate fish, Low water temperature, *Gulf of California, Fish census, Species diversity.

A 7-year census of intertidal fishes has been made by repeated defaunation of tide pools in the northern Gulf of California. The intertidal fish community showed long-term resilience, and hence stability, under a rigorous, unstable physical environment. Although the majority of fishes have tropical affinities (76%), warm temperate species (24%) constitute 33% of total numbers and 69% of total biomass of the entire intertidal fish community. Short-term seasonal fluctuations in species diversity and population numbers of temperate fishes were in better synchrony with the annual light regime and sea temperature cycles than those of tropical species. A winterkill due to abnormally low sea temperatures in January, 1971, exerted faunal selection by killing several tropical fishes. Warm temperate species tolerated these low temperatures both experimentally and during the 1971 winterkill. Low sea temperatures were judged to be more limiting to diversity than high sea temperatures. The seasonal tidal pattern in the northern Gulf of California moderates summer heating but accentuates winter cooling thus favoring winterkills. This intertidal fish community, dominated by reselected species, is more physically controlled than biologically accomodated. The temperate species play an important role in regulating the stability of this fish assemblage. (Katz)
W76-09126

CIRCULATORY ADAPTATIONS TO THE OXYGEN MINIMUM LAYER IN THE BATHYPELAGIC MYSID GNATHOPHAUSIA INGENS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
B. W. Belman, and J. J. Childress.
Biological Bulletin, Vol. 150, p. 15-37, February, 1976. 7 fig., 4 tab., 49 ref.

Descriptors: *Monitoring, Crustacenas, Animal physiology, Analytical techniques, Circulation, *Oxygen requirements, *Respiration, Dissolved oxygen, Environmental effects, Oxygen, Laboratory tests, Water pollution effects, *Pollutant identification.
Identifiers: Gnathophausia ingens, *Mysids, Cardiac output, Blood pressure, Anatomy.

Blood pressure and velocity were monitored in order to analyze the circulatory dynamics of Gnathophausia ingens a mysid which can survive in water containing less than 0.5 ml/l oxygen. The anatomy of the circulatory system varies from other crustacea in that the heart and arterial channels are proportionately larger. Gill surface areas of G. ingens range from 5-15 square centimeters per gram wet body weight, which is as large as the gill surface area of much larger crustaceans. The circulation of blood in G. ingens, when compared to other crustaceans on the basis of minute volume, cardiac output and turnover time, is highly effective. This effectiveness explains the unique ability to remove large percentages of the available oxygen while moving large volumes of water over the gills. (Katz)
W76-09128

MACROSCOPIC BENTHIC FAUNA OF THREE TIDAL CREEKS ADJOINING THE RHODE RIVER, MARYLAND,
Geological Survey, Edgewater, Md.
For primary bibliographic entry see Field 5B.
W76-09143

RESULTS OF PHYTOPLANKTON SAMPLING AT NATIONAL STREAM QUALITY ACCOUNTING NETWORK STATIONS IN MONTANA--1975 WATER YEAR,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 5A.
W76-09146

IDENTIFICATION OF NITROGEN AS A GROWTH-LIMITING NUTRIENT IN WASTEWATERS AND COASTAL MARINE WATERS THROUGH CONTINUOUS CULTURE ALGAL ASSAYS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-09195

PERSISTENCE OF FECAL COLIFORM INDICATOR BACTERIA ON ALFALFA IRRIGATED WITH MUNICIPAL SEWAGE LAGOON EFFLUENT,
Department of Agriculture, Lethbridge (Alberta). Research Station.
R. G. Bell.
Journal of Environmental Quality, Vol. 5, No. 1, p 39-42, January/March, 1976. 3 tab, 13 ref.

Descriptors: *Coliforms, *Fertilization, *Waste disposal, Sewage disposal, Irrigation, Alfalfa, Bacteria, Lagoons, Municipal wastes, Bioindicators, Water pollution effects.
Identifiers: *Land application.

A study to determine the survival time of fecal coliforms on alfalfa fertilized with sewage was undertaken. Alfalfa in a test plot was irrigated with sewage, and the populations of fecal coliforms found in the alfalfa samples were determined in the laboratory. Ten hours of bright sunlight completely destroyed the fecal coliforms. Their numbers did not decrease under damp, cool, overcast conditions. If sewage treatment failures occurred while sewage effluent was being used to irrigate alfalfa, two sunny days between irrigation and consumption of forage would adequately protect livestock from possible infection. (Snyder-FIRL)
W76-09217

HEPATITIS ATTRIBUTED TO POLLUTED STREAM,
Pierce County Health Dept., Tacoma, Wash.
L. Chapman.
Journal of Environmental Health, Vol. 38, No. 4, p 238-241, January-February, 1976. 1 fig.

Descriptors: *Epidemiology, *Public health, Diseases, Environmental sanitation, Water pollution, Water pollution sources, Water pollution effects, Storm sewers, Washington, *Human diseases.
Identifiers: *Hepatitis.

Various epidemiological factors were studied in connection with an outbreak of Hepatitis-A in Salishan, Washington. The most affected group was schoolchildren; the second most affected was adults 25 to 34 years of age. Food sources, water supply, and rodent control at the local elementary school were investigated. The area was compared to two control tracts and another subsidized housing area. Water samples from a local stream were analyzed. No sources were found at the school itself. The incidence of hepatitis was much less in the control tracts, and the youngest case in the control tracts was 18 yr of age. No widespread hepatitis outbreaks were known to have occurred in other subsidized housing areas. Therefore poor hygienic conditions alone did not appear to have caused the outbreak. Water samples indicated pollution with coliform bacteria, and the ratio of coliform to strep bacteria suggested human sewage. The concentration of hepatitis cases along the drainage area of the stream and the popularity of the stream among children as a play area further helped to identify the stream as the source of infection. Storm drains empty into the stream, and it is believed that the stream becomes contaminated during periods of heavy runoff when runoff water is contaminated with sewage that cannot be absorbed by the soil. Immediate measures recommended include public notice of the polluted nature of the stream and a personal hygiene campaign at the local elementary school. Sewers should be constructed in the area, and storm sewer runoffh should be treated along with other sewage. (Snyder-FIRL)
W76-09220

THE APPLICATION OF THE SCANNING ELECTRON MICROSCOPE TO FRESHWATER PHYTOPLANKTON TAXONOMY AND MORPHOLOGY,
Max-Planck-Institut fuer Limnologie zu Ploen (West Germany).
For primary bibliographic entry see Field 5A.
W76-09225

THE REPLICATION OF BIOLOGICAL EVENTS IN ENCLOSED WATER COLUMNS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
M. Takahashi, W. H. Thomas, D. L. R. Seibert, J. Beers, and P. Koeller.
Archiv fur Hydrobiologie, Vol. 76, No. 1, p. 5-23, 1975. 10 fig., 2 tab., 27 ref.

Descriptors: *Marine algae, *Spatial distribution, *Biological communities, *Life history studies, Water analysis, Canada, Time series analysis, Productivity, Biomass, On-site tests, Population, Bays.
Identifiers: *Patricia Bay(British Columbia).

In an attempt to explain the patchiness of plankton in oceans life histories of water columns separated from normal advection and turbulence, four

LIBRARY U. OF F. ORANGE-JONES ...

seventy-ton water columns were isolated in plastic containers in Patricia Bay, Vancouver, B.C. These containers permitted simultaneous examination of herbivorous and carnivorous autotrophs, heterotrophs, and small phagotrophs. Their biology followed a similar sequence of events for thirty days and was similar to events in the water outside. Although absolute parameter values differed on a particular date at a particular depth, useful information was obtained from time sequence data. Species and biomasses changed due to temporal succession and did not show temporal heterogeneity. The indication is that small-scale patchiness in the ocean is due to physical processes. Seasonal trends in oceans are only valid if observations are made over periods 2-3 times the generation time of the organism studied. Changes in primary and secondary producers were more significant than differences in absolute production. Most nutrients decreased in and out of the containers, but ammonia increased within the containers. Phytoplankton populations were dominated first by microflagellates, then by Thallassiosira, and later flagellates. In neritic waters Thalassiosira was important in the biomass, but dominance was shared by other diatoms. Containers can be used to study interaction of organisms in their natural state or the effects of perturbations. (Buchanan-Davidson--Wisconsin).
W76-09226

PHASE I: AREA DESCRIPTION,
Gulf Coast Research Lab., Ocean Springs, Miss. Fisheries Section.
For primary bibliographic entry see Field 2L.
W76-09239

PHASE IV: BIOLOGY,
Gulf Coast Research Lab., Ocean Springs. Miss. Fisheries Section.
For primary bibliographic entry see Field 2L.
W76-09242

TEMPERATURE, OXYGEN, AND NUTRIENT DISTRIBUTION PATTERNS IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-09262

OXYGEN DEPLETION IN THE CENTRAL AND EASTERN BASINS OF LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 512-519, March 1976. 1 fig, 2 tab, 10 ref.

Descriptors: *Dissolved oxygen, *Lake Erie, *Oxygen, *Model studies, *Great Lakes, Density stratification, Mixing, Self-purification, Thermocline, Biochemical oxygen demand, Water quality, Phosphorus, Nutrients, Surface waters, Lakes, Hydrodynamics, Reaeration, Heat budget.
Identifiers: *Oxygen depletion rate, Oxygen transport, Mesolimnion erosion model, Mesolimnion exchange model, Anoxic conditions.

The hypolimnetic oxygen depletion rate is required to be measured to an accuracy of approximately 3% if major changes in the trophic state of Lake Erie are to be documented within about 5 yr of the change commencing. Depletion rate measurements of this level of accuracy require a knowledge of the reoxygenation of the Central and Eastern basin hypolimnia and the transport of oxygen between the hypolimnia. A model was described here that enables an estimate of the degree of hypolimnetic reoxygenation to be made. The transport of oxygen between the hypolimnia was estimated by means of a hydrodynamic model. The resultant calculations gave areal hypolimnetic depletion rate values of 0.43 and 0.87 g 02/sq m/day for the Central and Eastern basins, respectively, and volumetric depletion rates of 0.13 and 0.057 g 02/cu m/day, respectively, for these basins during 1970. (Henley-ISWS)
W76-09263

HEAVY METALS IN THE AQUATIC ENVIRONMENT.
For primary bibliographic entry see Field 5B.
W76-09272

WOOD PRESERVATIVES: THEIR DEPLETION AS FUNGICIDES AND FATE IN THE ENVIRONMENT,
Canadian Forest Service, Ottawa (Ontario). Eastern Forest Products Lab.
For primary bibliographic entry see Field 5B.
W76-09275

STUDY TO DEFINE CHANGES IN PULP MILL EFFLUENT-CONTRIBUTED COLOR IN RECEIVING WATERS DETECTABLE BY HUMAN OBSERVERS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. C. Whittemore, and J. J. McKeown.
NCASI Stream Improvement Technical Bulletin no. 283, 160 p, December, 1975. 18 fig, 125 ref, 100 tab.

Descriptors: *Color, *Natural streams, *Pulp wastes, *Water pollution effects, Water pollution sources, Wastes, Industrial wastes, Water quality, Physical properties, Water analysis, Organoleptic properties, Water pollution, Water properties.

The ability of human observers to detect changes in the color of natural waters due to kraft mill effluents was studied. Factors affecting the perception of color changes included the baseline color, illumination intensity, the direction of color change, and the sensitivity and color memory of the observer. In general, increases of 20 and 40 color units in the field were perceived by 50 and 90% of the observers, respectively. The ability to detect decreasing changes was somewhat less. Subjects for further research are discussed. (Buchanan-IPC)
W76-09276

ACUTE TOXICITY TO JUVENILE RAINBOW TROUT (SALMO GAIRDNERI) OF NATURALLY OCCURRING INSECT JUVENILE HORMONE ANALOGUES,
B. C. Research Ltd., Vancouver.
J. M. Leach, A. N. Thakore, and J. F. Manville.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 12, p 2556-2559, December, 1975. 1 fig, 9 ref, 2 tab.

Descriptors: *Rainbow trout, *Toxicity, *Insect attractants, Water pollution effects, Bioassay, Fish, Aquatic animals, Juvenile fish, Pollutants, Lethal limit, Poisons.
Identifiers: Delta(4')-dehydrojuvabione, Juvabione, Hormones.

Median lethal concentrations (LC50) of four insect juvenile hormone analogues for juvenile rainbow trout were measured in bioassays with 4-hr solution renewal. The most toxic compound tested was delta(4')-dehydrojuvabione, with a 48-hr LC50 of 1.4 mg/liter and an estimated 96-hr LC sub 50 of approximately 0.8 mg/liter. Juvabione, epimeric mixtures of dihydrojuvabiones, and epimeric mixtures of juvabiols had 96-hr LC sub 50's of 1.5, 1.8, and 2.0 mg/liter, respectively. All fish, including those that survived for 96 hr, became lethargic soon after exposure to solutions of the insect juvenile hormone analogues, and their skins darkened. The toxicants were unstable in aqueous solution. (Witt-IPC)
W76-09282

THE BENTHOS OF PICTOU HARBOR AND NORTHUMBERLAND STRAIT, CANADA -- A MEASURE OF THE IMPACT OF TREATED KRAFT PULP MILL EFFLUENT,
Institute of Paper Chemistry, Appleton, Wis.
D. L. Rades.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P. Q.), p 39-44. 9 fig, 10 ref, 1 tab.

Descriptors: *Benthos, *Pulp wastes, *Water pollution effects, Industrial wastes, Wastes, Water pollution sources, Aquatic environment, Waste disposal, Waste water disposal.
Identifiers: *Pictou Harbor(Canada), *Northumberland Strait(Canada), *Kraft mills, East River(Canada).

Biological studies of Pictou Harbor and Northumberland Strait were conducted before and after a 600 ton/day bleached kraft pulp mill was constructed by Scott Maritimes Pulp Ltd. at Abercrombie Point. Premill studies indicated a poor environmental quality in the upper East River, an intermediate quality in the lower East River and in Pictou Harbor, and a high quality environment in Pictou Road and Northumberland Strait. Through six annual studies the discharge of treated pulp mill effluent was found not to impair environmental quality. (Witt-IPC)
W76-09294

CHEMICAL CHARACTERISTICS, ACUTE TOXICITY AND DETOXIFICATION OF FOAM IN TWO AERATED LAGOONS,
International Pacific Salmon Fisheries Commission, Cultus Lake (British Columbia). Sweltzer Creek Salmon Research Lab.
J. A. Servizi, R. W. Gordon, I. H. Rogers, and H. W. Mahood.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P. Q.), p 45-52. 3 fig, 26 ref, 7 tab.

Descriptors: *Pulp wastes, *Foam fractionation, *Toxicity, *Sockeye salmon, Biological treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution, Fish, Fishkill, Aerated lagoons, Water quality, Water chemistry, Water pollution effects.
Identifiers: *Kraft mills, Resin acids, Diterpenes, Dispersants, Wood extractives.

Foam from two aerated lagoons treating bleached kraft mill effluents was highly toxic to juvenile sockeye salmon (Oncorhynchus nerka). Chemical fractionation of one foam revealed large amounts of resin acids and neutral diterpenes. In the other foam, toxicity was related to a pitch dispersant and unidentified substances. Neither foam was readily detoxified by biological treatment. (Witt-IPC)
W76-09295

EFFECTS OF COLOR AND TOXIC CONSTITUENTS OF BLEACHED KRAFT MILL EFFLUENT ON ALGAL GROWTH,
B. C. Research Ltd., Vancouver.
R. N. Soniassy, J. C. Mueller, and C. C. Walden.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975. Preprinted Proceedings (Montreal, P.Q.), p 85-91. 8 fig, 16 ref, 2 tab.

Descriptors: *Pulp wastes, *Color, *Toxicity, *Algae, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Hydrogen ion concentration, Activated sludge, Microorganisms, Algal poisoning, Biological treatment.
Identifiers: *Kraft mills, Abietic acid.

Bleached kraft mill effluent was either adjusted to pH 7.5 and filtered through a glass fiber filter or was adjusted to pH 7.0 and centrifuged at 10,000

rpm for 15 minutes, to remove suspended solids. Biotreatment involved 24 hr retention in an activated sludge system. Using an incubation system where the effects due to color and to toxic substances could be separated, it was found that the color of bleached kraft mill effluent significantly reduced the light energy and consequently lowered algal (Selenastrum capricornutum) growth rates and productivity. Reduction of the light intensity by 40%, from 260 to 155 ft-candles, reduced the maximum productivity by 79%. There are unidentified substances other than color in the effluent, which even after 50-fold dilution, still inhibit algal growth. Reductions of up to 30% in productivity were observed on addition of 2% effluent to algal growth substrates. These toxicants are resistant to biodegradation and are not removed by biotreatment. Abietic acid was not responsible for the toxic effect of the effluent. Its toxic threshold to the alga is about 5 mg/liter, a level unlikely to occur in receiving water systems. (Witt-IPC)
W76-09300

ECOLOGICAL EFFECTS OF OFFSHORE CONSTRUCTION,
Marine Science Inst., Bayou La Batre, Ala.
For primary bibliographic entry see Field 6G.
W76-09307

PROCEEDINGS OF JOINT CONFERENCE ON PREVENTION AND CONTROL OF OIL SPILLS, MARCH 13-15, 1973, WASHINGTON, D.C.,
American Petroleum Inst., Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-09312

PETROLEUM RESIDUES IN THE SARGASSO SEA AND ON BERMUDA BEACHES,
Bermuda Biological Station for Research, St. George's West.
B. F. Morris, and J. N. Butler.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D. C., March 13-15, 1973. p 521-529, 8 fig, 1 tab, 29 ref.

Descriptors: *Continental Shelf, *Oil spills, *Oil pollution, *Water pollution effects, *Environmental effects, Beaches, Fossil fuels, Assessments, Atlantic Ocean, Water pollution sources.
Identifiers: *Outer Continental Shelf, *Petroleum, Tar lumps, Tar balls, Environmental impact, Tankers, Residues, Sargasso Sea, Bermuda.

Petroleum residues ('tar lumps') are found throughout the Atlantic Ocean. An estimate of the current standing stock of tar in the Northwest Atlantic is 86,000 metric tons, of which 66,000 tons are found in the Sargasso Sea. Although there are wide seasonal variations, the amount observed near Bermuda has not increased significantly from 1971 to 1972. Beach deposits also undergo wide variations (4g/m to 1700 g/m), and seem to act, on the average, as collectors of tar from a strip of water about 20 km wide. Chemical characteristics of tar lumps (analyzed by gas chromatography) vary widely, but almost all have distinctive paraffinic wax components in the C30 to C40 range, implying that their origin is in crude oil sludge from tanker washings. The standing stock is probably between 20 to 50 percent of the total annual influx of petroleum from this source. Degradation of tar lumps at sea, after rapid losses by evaporation and dissolution, takes times of the order of years, probably because of their substantial content of high-melting point waxes and asphaltenes. This paper presents new quantitative results for the amounts of tar in the Sargasso Sea and the Northwestern Atlantic Ocean, a quantitative assessment of tar on representative beaches in Bermuda over a period of nearly a year, and information on the chemical and physical characteristics of the tar found both at sea and on the beaches, suggesting the principal source of these residues. (See also W76-09312) (Sinha-OEIS)
W76-09315

SIMULATION OF MOVEMENT OF OIL SLICKS IN THE STRAIT OF GEORGIA USING SIMPLE ATMOSPHERE AND OCEAN DYNAMICS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
T. S. Murty, and M. L. Khandekar.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973, p 541-546, 4 fig, 1 tab.

Descriptors: *Continental shelf, *Oil spills, *Oil pollution, *Water pollution effects, *Environmental effects, Straits, Currents(Water), Wind, Tidal effects.
Identifiers: *Outer Continental Shelf, *Environmental effect, Tankers, Oil slicks, Groundings, Collisions, Canada West Coast, Strait of Georgia.

The Strait of Georgia is a complex water body on the west coast of Canada. The location shown as Cherry Point is on a tanker route and it is estimated that about 1.2 million tons of crude oil would be transported along this route during 1972-74 and this figure could increase to an annual eight million tons by 1975. There already have been a few minor oil spills in this large water body due to either grounding or collision and should a large spill occur, it will be a formidable task to predict its movement. Hydrodynamical techniques were used to investigate the movement of oil slicks in the Strait of Georgia by assuming that the oil moves with the current and not with the wind. The divergence of the isobaths near Alden Bank probably makes the current branch while that southeast of Pt. Roberts narrows and intensifies the current. The effect of mutual interaction among several slicks both with and without a steering current such as a tidal or wind-generated current is found to be important in determining their trajectories. For oils with large viscosities, an oscillatory tidal current could give rise to an unstable situation in which the oil spreads in the form of long lines radiating out from the spill similar to the spokes in a bicycle wheel. Stratification of the water causes the oil plume to bifurcate and due to this phenomena, even if one branch of the plume carrying the oil goes away from the coast, the second branch carries oil to the coast. (See also W76-09312) (Sinha-OEIS)
W76-09316

TOXICITY AND AVOIDANCE TESTS WITH PRUDHOE BAY OIL AND PINK SALMON FRY,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab.
S. D. Rice.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 667-670, 2 fig, 1 tab, 7 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, *Water resources, *Environmental effects, Continental shelf, Toxicity, Salmon, Migration, Resources development, Alaska.
Identifiers: *Outer Continental Shelf, Prudhoe Bay(AK), Pink salmon fry, Onchorhynchus gorbuscha, Terminals, Crude oil, Environmental impact.

The development of the oil industry at Prudhoe Bay, Alaska, could adversely affect the State's fishery resources through pollution. The fry of pink salmon (Onchorhynchus gorbuscha) from several streams pass through Port Valdez and on through Prince William Sound on their oceanward migration. To provide a basis for predicting some of the potential effects of oil pollution to the fry (and ultimately to the salmon stocks) during this migration, the author determined the acute toxicity of Prudhoe Bay crude oil to pink salmon fry and also the concentrations of the oil that the fry would avoid in both fresh water and seawater. The tests were conducted at the National Marine Fisheries Service Auke Bay Fisheries Laboratory. Bioassays indicate that older pink salmon fry held in seawater at high temperatures are more susceptible to oil toxicity than younger fry held at lower temperatures. Laboratory avoidance experiments show that pink salmon fry are able to detect low sublethal concentrations of oil. It is not known what the effect of sublethal concentrations of oil on salmon migrations will be, but the potential for harm is clear. (See also W76-09312) (Sinha-OEIS)
W76-09317

A SALT MARSH MICROCOSM: AN EXPERIMENTAL UNIT FOR MARINE POLLUTION STUDIES,
Edison Water Quality Research Lab., N.J.
R. J. Nadeau, and T. H. Roush.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 671-683, 15 fig, 15 ref.

Descriptors: *Salt marshes, *Water pollution effects, *Water quality, *Grasses, *Oil spills, *Oil pollution, Environmental effects, Resources development, Coasts, Continental shelf, Ecosystems, Invertebrates.
Identifiers: *Outer continental shelf, Microcosm, Spartina alterniflora, Spartina patens, Distichlis spicata, Hydrocarbons, Environmental impact.

A salt marsh microcosm was established and monitored to assess its applicability as a water pollution research tool toward determining the impact of oil spills upon coastal salt marshes. Growth of the major grass species was a measure of similarity between a nearby native salt marsh and the microcosm. No significant differences in growth were observed in low (Spartina alterniflora) high marsh (Spartina patens and Distichlis spicata) species during most of the growing season. Gas chromatography, ultraviolet and fluorescent spectrophotometry were used to monitor the fate of oil released into one side of the microcosm. High boiling range hydrocarbons probably of biogenic origin, interfered with quantification by ultraviolet and fluorescent spectroscopy, but could be separated by gas chromatography for qualitative examination. Salt marsh microcosms can be easily used for studying the fate and effects of pollutants through a program of careful observation and monitoring. (See also W76-09312) (Sinha-OEIS)
W76-09318

MICROBIAL ECOLOGY OF PETROLEUM UTILIZATION IN CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, and R. R. Colwell.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 685-690, 2 fig, 5 tab, 35 ref.

Descriptors: *Oil pollution, *Oil spills, *Water pollution effects, *Environmental effects, Continental shelf, Ecology, Actinomycetes, Microbial degradation, Chesapeake Bay, Microorganisms, Assessments.
Identifiers: *Outer Continental Shelf, *Superports, Tankers, Terminals offshore technology, Petroleum, Baltimore Harbor, Hydrocarbons, Substrates, Baseline data, Cladosporium resinae, Environmental impact.

Chesapeake Bay is the largest and most important estuary, with respect to aquatic fauna, in the mid-Atlantic coastal area. Since 90% of the pollution of water and waterways is, in fact, oil pollution and because construction of superports for oil tankers is being considered for Chesapeake Bay, assessment of the microbial potential for degradation of

LIBRARY U. OF A. ARKANSAS-LITTLE ROCK

petroleum in Chesapeake Bay is both important and timely. Baseline data on the natural microbial flora are necessary if and when effects of oil on biological communities are to be determined. Analysis of water and sediments collected at two stations in Chesapeake Bay demonstrated four to five times the concentration of petroleum in an oil polluted site in Baltimore Harbor compared with the station in Eastern Bay which served as a control. The numbers of petroleum-degrading microorganisms, measured by direct and replica plating, in the water and sediment samples were related to the concentration of oil in each sample. Total yields of petroleum-degrading microorganisms grown on an oil substrate were greater for those organisms exposed to oil in the natural environment. Microorganisms isolated from an oil-contaminated environment produced cell yields under 'natural' conditions, i.e., laboratory simulation of growth conditions in the natural environment, which equaled the yields of microorganisms which had not been previously exposed to oil and were grown under optimum conditions. Microorganisms isolated from water and sediment samples collected in Baltimore Harbor grew on substrate representative of the aliphatic, aromatic and refractory hydrocarbons. (See also W76-09312) (Sinha-OEIS)
W76-09319

EFFECTS OF SEAWATER EXTRACTS OF CRUDE OIL ON CARBON BUDGETS IN TWO SPECIES OF MUSSELS,
Massachusetts Univ., Gloucester.
E. S. Gilfillan.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 691-695, 6 fig, 7 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Assessments, *Environmental effects, Continental shelf, Mussels, Mollusks, Salinity.
Identifiers: *Outer continental shelf, Environmental impact, Crude oil, Carbon budgets, Filter feeders, Hydrocarbons, Blue mussle, Mytilus edulis, Marsh mussel, Modiolus demissus.

The combined effects of crude oil and salinity stress on the carbon budget of two common filter feeding molluscs, Mytilus edulis (the blue mussel) and Modiolus demissus (the marsh mussel) are reported. Carbon budgets have been calculated for each species under a variety of combination of oil content and salinity. Both reduced salinity and crude oil tend to decrease the net carbon balance for each species; stresses from each source were additive in their effects on experimental animals. Although similar responses to oil were shown by each species, Mytilus appeared to be somewhat more resistant to oil than Modiolus. (See also W76-09312) (Sinha-OEIS)
W76-09320

THE TOXICITY OF CRUDE OIL AND ITS COMPONENTS TO FRESHWATER ALGAE,
Toronto Univ. (Ontario). Dept. of Botany; and Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
P. Kauss, T. C. Hutchinson, C. Sota, J. Hellebust, and M. Griffiths.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 703-714, 11 fig, 6 tab, 23 ref.

Descriptors: *Algae, *Phytoplankton, *Toxicity, *Oil spills, *Oil pollution, *Water pollution effects, *Environmental effects, Continental Shelf, Freshwater, Photosynthesis.
Identifiers: *Outer Continental Shelf, Crude oil, Naphthalene Hydrocarbons, Environmental impact, Chlorella vulgaris, Chlamydomonas angulosa.

Field and laboratory experiments were conducted to determine the toxicity of crude oil to freshwater algae. In the field, experiments were continued for a two year period and changes in the abundance and species composition of phytoplankton tabulated. Species were found to differ markedly in their response to an oil spill--varying from considerable suppression of growth to stimulation. In the laboratory, the effects of aqueous extracts of seven crude oils on a selected test species, Chlorella vulgaris, were determined. Marked differences in toxicity, as indicated by reduced growth, were found to exist between oils. Work with oil extracts of different ages suggests that the short-term toxicity of oils is due to the rapid loss of volatile compounds. Differences in the toxicity of selected aromatic components of crude oils--benzene, toluene, o-xylene and naphthalene--were observed and are believed to relate to an increase in methylation. Aqueous crude oil and naphthalene depressed the 14C-NaHC03 uptake (i.e. photosnythesis) of Chlamydomonas angulosa. 14C-naphthalene was rapidly taken up by Chlamydomonas cells. However, release of this compound was much slower, and in unwashed cells, seemingly dependent upon cell division. Possible mechanisms of crude oil toxicity are discussed. (See also W76-09312) (Sinha - OEIS)
W76-09321

BIOLOGICAL EFFECTS OF REFINERY EFFLUENTS,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
J. M. Baker.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 715-723, 3 fig, 3 tab, 26 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Environmental effects, *Toxicity, Continental Shelf, Ecosystems, Oil industry, Assessments, Bioassay.
Identifiers: *Outer Continental Shelf, *Refinery wastes, Oil refineries, Biological effects, Environmental impact.

Refinery effluents contribute an estimated 300,000 tons of oil per year to the sea, but the biological effects of continuous but low concentrations of oil and other compounds are not well known. Different approaches to the problem are described, and field and laboratory results summarized. Different ecosystems differ in their capacity to receive and degrade effluents, and speed of dispersion and dilution is a major factor determining amount of biological damage. Changes in distribution and abundance of species are often very localized and in some cases may result from behavioural responses rather than direct toxic effects; areas of influence in terms of sub-lethal absorption of oil or other effluent constituents are not yet known. Biologically acceptable limits for effluents will vary considerably between sites and do not necessaryily correspond with the present somewhat arbitrary restrictions. (See also W76-09312) (Sinha - OEIS)
W76-09322

RESPIRATORY RESPONSE OF JUVENILE CHINOOK SALMON AND STRIPED BASS EXPOSED TO BENZENE, A WATER-SOLUBLE COMPONENT OF CRUDE OIL,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Fisheries Lab.
R. W. Brocksen, and H. T. Bailey.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 783-791, 7 fig, 2 tab, 17 ref.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution effects, *Toxicity, Respiration, Fish, Salmon, Bass, Continental Shelf.
Identifiers: *Outer Continental Shelf, Benzene, Crude oil, Hydrocarbons, Aromatic hydrocarbons, Narcosis, Chinook salmon, Oncorhynchus tshawytscha, Striped bass, Morone saxatilis.

Interest surrounding the potential effects of crude oil on aquatic organisms has increased in recent years due to the incidence of accidental oil spills. There are few experimental results reported, however, dealing with the effect on aquatic species of water-soluble aromatic hydrocarbons contained in crude oil. Such compounds are highly toxic to mammals. Experiments were conducted using juvenile chinook salmon, Oncorhynchus tshawytscha, and striped bass, Morone saxatilis. The fish were exposed to sub-lethal concentrations of the aromatic hydrocarbon benzene, for periods ranging from 1-96 hours. Prior to exposure, and after exposure to the benzene, respiration rates of individual fish were measured. Results show increases in respiratory rate up to 115 percent above that of control fish after exposure periods of 24 hours for striped bass and 48 hours for chinook salmon. Fish exposed to benzene concentrations of 10 ppm for periods longer than those listed exhibited a narcosis that caused a decrease in respiratory rate. The narcotic state induced by exposure to benzene was shown to be reversible when the fish were placed in fresh water and kept for periods longer than 6 days. Possible biochemical mechanisms leading to this response are hypothesized. (See also W76-09312) (Sinha - OEIS)
W76-09323

INTERAGENCY INVESTIGATIONS OF A PERSISTENT OIL SPILL ON THE WASHINGTON COAST. ANIMAL POPULATION STUDIES, HYDROCARBON UPTAKE BY MARINE ORGANISMS, AND ALGAE RESPONSE FOLLOWING THE GROUNDING OF THE TROOPSHIP GENERAL M.C. MEIGS,
National Marine Fisheries Service, Seattle, Wash.
R. C. Clark,Jr., J. S. Finley, B. G. Patten, D. F. Stefani, and E. E. DeNike.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 793-808, 12 fig, 5 tab, 18 ref.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution effects, Continental Shelf, Washington, Algae, Coasts, Crabs, Biota, Fossil fuels.
Identifiers: *Outer Continental Shelf, *Environmental impact, Groundings, Intertidal communities, Uptake, Hydrocarbons, Urchins, Strongylocentrotus purpuratus, Barnacles, Mitella polymerus, Hemigrapsus nudus, Fucus gardneri, General M.C.Meigs.

An interagency team of biologists, chemists, oceanographers and engineers investigated the long-term effects of oil spilled by the grounding of the troopship GENERAL M.C. MEIGS January 6, 1972, on an ocean coast intertidal community of plants and animals. Oil has continuously been released from the 440,000 liters of Navy Special Fuel Oil carried by the vessel. The team assessed biological damage by making surveys of abundance and physiological conditions of animals; qualitative evaluation of obvious damage to plants, and measurements of the hydrocarbon uptake in both plants and animals. A series of sites, forming a vertical profile of the rocky shelf area from the upper intertidal zone to the lowest low tide level in Wreck Cove, have been studied. This report describes the preliminary findings of the first ten months (January-October, 1972) of the investigation. Abnormal and dead urchins (Strongylocentrotus purpuratus) indicated that this species was affected. Loss of fronds and bleached thalli not evident in control areas were observed in the plant community in the immediate vicinity of the hulk. Petroleum hydrocarbons were taken up in the intertidal community. The normal paraffin hydrocarbon patterns and content over the range n-C14H30 to nC37H76 of healthy-appearing goose barnacles (Mitella polymerus), crabs

(Hemigrapsusnudus) and an alga (Fucus gardneri) display the same basic characteristics as the fuel oil which had been lost from the GENERAL M.C. MEIGS. (See also W76-09312) (Sinha - OEIS)
W76-09324

EFFECTS OF WATER SOLUBLE EXTRACTS OF OIL ON PHYTOPLANKTON,
New York Ocean Science Lab., Montauk.
R. Nuzzi.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p. 809-813, 3 fig, 2 tab, 14 ref.

Descriptors: *Environmental effects, *Water resources, *Water pollution effects, *Oil pollution, Phytoplankton, Toxicity, Continental Shelf.
Identifiers: *Outer Continental Shelf, Exenic cultures, New York Bight, Environmental impact.

Methods routinely employed in the cleanup of oil spills generally are intended to remove the oil to the level of invisibility, at which point it has been considered by many to be harmless or its effects negligible. This paper presents evidence indicating that soluble constituents of No. 2 fuel oil are toxic to phytoplankton cultured axenically and also exert an effect on natural phytoplankton populations. Although there has been a good deal of work investigating the effects of oil and oil products on organisms such as benthic invertebrates, finfish and birds, there have been few papers dealing with the effects of oil on phytoplankton. Most papers on this topic refer to the combined effects of oil and oil dispersing agents. With this in mind, the author attempted to determine the effects of water soluble materials from various types of oil on the growth of marine phytoplankton, without the addition of emulsifying agents. (See also W76-09312) (Sinha - OEIS)
W76-09325

EFFECT OF A BUNKER FUEL ON THE BEACH BACTERIAL FLORA,
California Univ., Berkeley. School of Public Health.
A. B. Cobet, and H. E. Guard.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D.C., March 13-15, 1973. p 815-819, 4 tab, 9 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Oil pollution, Beaches, Flora, Bacteria, Continental Shelf.
Identifiers: *Outer Continental Shelf, Bunker fuel, Petroleum, San Francisco Bay, Bacterial flora.

Following the Chevron bunker fuel spill in San Francisco Bay in January 1971, a study to follow the fate and effect of the residual oil was undertaken. The primary removal process of the fuel was by standard cleanup operations using straw and sand removal from the beaches. However, an unknown quantity of the fuel remained dispersed within the beach sand. It is this remaining portion of the fuel that was studied and its effect on the beach bacterial flora described. Studies at four sampling locations on three beaches in the San Francisco area affected by oil from an 840,000 gallon spill have shown that the size of the bacterial population and distribution of bacterial genera within the beach was unaffected by the petroleum hydrocarbons remaining in the beach sand after completion of the cleanup operation. Only 15 percent of the beach bacteria were affected by a variety of petroleum components including the pentane soluble fraction of the bunker fuel. (See also W76-09312) (Sinha-OEIS)
W76-09326

MICROBIAL PETROLEUM DEGRADATION: THE ROLE OF CLADOSPORIUM RESINAE,
Dayton Univ., Ohio. Dept. of Biology.
J. D. Walker, L. Cofone, Jr., and J. J. Cooney.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D.C., March 13-15, 1973. p 821-825, 2 fig, 2 tab, 16 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Oil pollution, *Microbial degradation, Fungi, Pesticides, Continental Shelf.
Identifiers: *Outer Continental Shelf, Hydrocarbons, Petroleum, Aromatic hydrocarbons, Aliphatic hydrocarbons, Cladosporium resinae.

Cladosporium resinae is probably the most prevalent hydrocarbon-utilizing fungus. It has been isolated in fresh water and marine environments. It utilizes aliphatic and aromatic hydrocarbons, as well as alcohols and acids. Growth on aliphatic hydrocarbons is slow, and yields are lower than for cells cultured on acids. However, degradation of hydrocarbons is not slow, since most of the hydrocarbon is mineralized (converted to CO2) and not assimilated to cellular carbon. Growth of the fungus was not supported by organo-phosphorus, chlorinated hydrocarbon, or natural pesticides as sole carbon source. However, the fungus was resistant to or stimulated by high concentrations of these pesticides when cultured on hydrocarbons. This suggests that high concentrations of pesticides occurring in oil slicks would not inhibit oil degradation by Cladosporium resinae. Comparison of hydrocarbon oxidation by whole cells and cell-free preparations revealed the presence of an efficient cell-free oxidizing system. The pathway of hydrocarbon oxidation has been reported for hydrocarbon-utilizing bacteria and yeasts but not for fungi. Temperature, pH and coenzyme requirements were determined for the oxidation of hydrocarbons by C. resinae. Isolation of intermediates and results of experiments utilizing electron transport inhibitors support the conclusion that in C. resinae alkanes are oxidized to their homologous alcohol, aldehyde and acid. The range of hydrocarbon substrates degraded by constitutive enzymes of Cladosporium resinae coupled with the ability to degrade hydrocarbons in the presence of high concentrations of pesticides suggests that C. resinae may be one of the most important microorganisms capable of degrading oil in the natural environment. (See also W76-09312) (Sinha-OEIS)
W76-09327

THE FATE OF A BUNKER FUEL IN BEACH SAND,
California Univ., Berkeley. School of Public Health.
H. E. Guard, and A. B. Cobet.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D.C., March 13-15, 1973. p 827-834, 7 fig, 2 tab, 7 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Oil pollution, *Oil spills, Beaches, Continental Shelf, Bacteria, Sands.
Identifiers: *Outer Continental Shelf, Bunker fuel, San Francisco Bay, Tankers, Collisions, Petroleum.

The dispersed oil concentrations in sand from three San Francisco area beaches have been measured over a 143 day period following an 840,000 gallon bunker fuel spill in San Francisco Bay. The dispersed oil remaining within the beaches after cleanup was extensively weathered while visible oil globules exhibited only minor weathering. Elevated levels of chloroform-extractable material were observed at two sampling locations following the spill. The background levels of chloroform-extractable materials determined from log-normal distribution analysis were ten-fold higher on bay beaches than on ocean beaches. Laboratory experiments indicated that in a beach system evaporation, dissolution, and microbial degradation combine to remove the lower molecular weight fractions of bunker fuel. A major effect of the beach is to disperse the oil. This dispersal has been shown to greatly enhance the effect of dissolution on the composition of bunker fuel. While the effect of exposure to water on the composition of a bunker fuel slick is minimal, significant amounts of the lower ends of bunker fuel (which is highly dispersed) in a sand column are removed by dissolution. (See also W76-09312) (Sinha-OEIS)
W76-09328

SIXTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 6-8, 1974, HOUSTON, TEXAS. PREPRINTS, VOLUME II,
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09333

BEACH-OFFSHORE DREDGING: SOME ENVIRONMENTAL CONSEQUENCES,
London Univ. (England).
For primary bibliographic entry see Field 5G.
W76-09335

ENVIRONMENTAL STUDIES FOR MAJOR OFFSHORE DEVELOPMENTS,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09336

ON SPENT SEMICHEMICAL PULPING LIQUORS. (4) XYLAN IN NEUTRAL SULFITE SEMICHEMICAL SPENT LIQUOR (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood Chemistry Lab.
O. Inada, K. Sameshima, and T. Kondo.
Japan Tappi, Vol. 29, No. 11, p 589-595, November, 1975. 6 fig, 14 ref, 7 tab. English summary.

Descriptors: *Sulfite liquors, *Pulp wastes, *Toxicity, *Fishkill, Suspended solids, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Lignins, *Water pollution effects, Water pollution, Hardwoods, Organic compounds, Carbohydrates, *Pollutant identification, Fish.
Identifiers: *Xylan, Xylose, Hemicellulose, Spent pulping liquors, Semichemical pulp mills, NSSC(Neutral sulfite semichemical) pulping, Polysaccharides.

An earlier study attributed the fishkill characteristics of spent NSSC liquor to the toxicity of suspended solids which, on hydrolysis, gave xylose and apparently originated in hardwood xylan. A further study was made of the fractional composition of this xylan-rich substance. Japanese birch, beech, hornbeam, and kapur (Dryobalanops) were cooked at 120-180 C with a liquor containing 12% sodium sulfite and 5% sodium carbonate (based on oven-dry chip weight) at a 3:1 liquor ratio. The spent liquor was evaporated to half its volume, allowed to stand for a day, then centrifuged, and the precipitate washed three times with ethanol and once with acetone. The resulting precipitate contained most of the toxic material and showed linear relations not only with the pentosan content of the chips but also with the organic content of the spent liquor and with the dwell time at maximum cooking temperature. The precipitate contained lignin in addition to xylan, whereas a similar precipitate obtained from white lauan consisted largely of lignin. Only about 50% of the xylan dissolved during NSSC cooks could be accounted for; the rest is probably converted to other substances difficult to determine by Somogyi's method. (Brown-IPC)
W76-09338

A LAKE POPULATION: THE INTHA OF LAKE INLE. (SOUTHERN SHAN STATES, BURMA), (IN FRENCH),
Ecole Pratique des Hautes Etudes, Paris (France).
For primary bibliographic entry see Field 2H.

LIBRARY U. OF A. ...

W76-09361

EFFECTS OF SELECTED HERBICIDES ON BACTERIAL POPULATIONS IN NONTREATED AND TREATED WATER,
Clemson Univ., S. C. Dept. of Biochemistry; and Clemson Univ., S. C. Dept. of Botany.
O. Yazar, J. M. Shively, and N. D. Camper.
Water Resources Bulletin, Vol. 11, No. 2, p 294-299, April 1975. 1 fig, 3 tab, 4 ref.

Descriptors: *Bacteria, *Herbicides, Water supply, Water pollution, Water pollution effects, Water treatment, Eutrophication, Lakes.
Identifiers: Bacterial populations, *Diuron, *Dichlobenil, *Diquat.

Bacterial populations in nontreated and herbicide-treated waters were subjected to three different herbicides. Diuron, dichlobenil, and diquat were added (100 mg/l) to water samples from two fresh water lakes and two herbicide-treated ponds. Total numbers of bacteria were monitored. Bacterial populations in fresh lake water decreased after herbicide additions; however, final populations were significantly greater than the controls. Similar observations were recorded for bacteria in dichlobenil- and diuron-treated waters. Selective enrichment is probably expressed in these experiments. (Skogerboe -Colorado State)
W76-09369

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME III.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09374

EVALUATION OF MULTI-PURPOSE INDUSTRIAL-PORT ISLANDS: SEA ISLAND STRUCTURE ENGINEERING RESEARCH STUDY,
Harris (Frederick R.), Inc., New York.
For primary bibliographic entry see Field 5G.
W76-09375

OFFSHORE MULTI-USE PORT ISLANDS AND THEIR ENVIRONMENT,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5G.
W76-09376

EVALUATION OF SEISMICITY AND EARTHQUAKE SHAKING AT OFFSHORE SITES,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5G.
W76-09379

COMPARISON OF TWO METHODS FOR DETERMINATION OF PRIMARY PRODUCTIVITY ON COASTAL WATERS OF THE GULF OF MEXICO, (IN SPANISH),
Universidad Nacional Autonoma de Mexico City. Instituto de Biologia.
For primary bibliographic entry see Field 5A.
W76-09391

DISTRIBUTION, CIRCULATION AND EVOLUTION OF NUTRIENTS, PARTICULARLY INORGANIC PHOSPHORUS IN LAKE ETANG DEBERRE: INFLUENCE OF RIVER DURANCE WATERS, (IN FRENCH),
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Oceanographie.
For primary bibliographic entry see Field 5B.
W76-09393

DEGRADATION OF BUNKER C OIL UNDER DIFFERENT COASTAL ENVIRONMENTS OF CHEDABUCTO BAY, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia)
For primary bibliographic entry see Field 5B.
W76-09394

SELF-PURIFICATION OF SMALL FRESHWATER STREAMS: PHOSPHATE, NITRATE, AND AMMONIA REMOVAL,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.; and Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
For primary bibliographic entry see Field 5G.
W76-09398

MICROBIOLOGICAL AND ALGOLOGICAL SURVEY OF A PRIMARY STAGE OF EUTROPHICATION IN A STREAM, (IN FRENCH),
Nancy Univ. (France).
J. F. Pierre, and G. Kilbertus.
Bull Soc Bot Fr. 120(7/8), p 293-302, 1974.

Descriptors: *Microbiology, *Diatoms, *Eutrophication, Surveys, Bioassay, Oil, Pseudomonas, Bacteria, Algae, Streams.
Identifiers: *Algological, *Surveys, Bacillus.

A study was made of the consequences of a low level of petroleum on the quantity and quality of bacterial and algal flora. The presence in spots of some species of Pseudomonadaceae and Bacillus and various diatoms seems to be related to eutrophication by traces of petroleum.--Copyright 1975, Biological Abstracts, Inc.
W76-09399

LIMNOPLANKTON OF SOME INLAND WATERS OF DACCA CITY,
Dacca Univ. (Bangladesh). Dept. of Zoology.
N. G. Das, and A. L. Bhuiyan.
Bangladesh J Zool. 2(1), p 27-42, 1974.

Descriptors: *Plankton, *Ponds, *Lakes, Asia, Productivity, Correlation analysis, Rotifers, Copepoda, Crustaceans.
Identifiers: *Bangladesh, Dacca, Ostracod.

Species of planktonic organisms (57) including 25 rotifers, 14 cladocerans, 10 copepods and 8 ostracods were recorded from 2 ponds and 2 lakes of Dacca city Bangladesh. Identification keys to these plankters were prepared, of which 37 were identified up to species and 20 were identified up to genus. The greatest abundance of plankton was observed in the mo. of April-May and Oct., and the greatest depletion was observed in the mo. of Aug. and Jan.-Feb. A correlation of productivity and some of the physicochemical factors which influence productivity was studied.--Copyright 1975, Biological Abstracts, Inc.
W76-09400

5D. Waste Treatment Processes

BIOLOGICAL EFFECTS OF PRIMARY, SECONDARY, AND TERTIARY SEWAGE TREATMENT IN LOTIC ANALOG RECIPIENTS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5C.
W76-08792

ALGAL GROWTH POTENTIAL OF SIX NORWEGIAN WATERS RECEIVING PRIMARY, SECONDARY AND TERTIARY SEWAGE EFFLUENTS,
For primary bibliographic entry see Field 5C.
W76-08794

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
V. B. Youngner, T. E. Williams, and L. P. Green.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 770, $5.50 in paper copy, $2.25 in microfiche. California Water Resources Center, Davis, Contribution No. 157, April 1976. 104 p, 25 fig, 33 tab, 52 ref. (California Water Resources Center Projects UCAL-WRC-W-236/374). OWRT B-161-CAL (2), B-090-CAL (4), B-119-CAL (3), B-134-CAL (3) and B-158-CAL (2).

Descriptors: *Irrigation, *Physiological ecology, *Sewage effluents, Forest fires, *Water reuse, Recycling, *Nutrient cycling, Vegetation establishment, *Plant growth, *Vegetation regrowth, Water quality, Monitoring, *California, Brush, Fescues, Grasses, Soil analysis, Chaparral.
Identifiers: Maloney Canyon(Calif), *Greenbelt irrigation, Mullein.

Secondary treated sewage effluent was applied to uncleared, brush cleared, and type converted grass plots in a mountain chaparral ecosystem. The objectives were to investigate effluent effects on vegetation types in the selection of suitable species for greenbelt establishment and to determine effluent renovation and nutrient recycling characteristics of vegetation types and mountain soils. Results indicated that native brush (Ceanothus Greggii) under 3 1/2 inches per week irrigation had high fuel moisture but produced excessive growth. Under lesser irrigation, growth was reduced but fuel moisture levels were generally inadequate. Regrowth on brush cleared plots under the heavy irrigation was altered by mullein (Verbascum thapsus) proliferation. Introduced Alta fescue (Festuca arundinacea) flourished under high irrigation providing the best features of high fuel moisture with a low growing plant cover. Suction lysimeter monitoring of the soil solution at a 4-foot depth beneath irrigated grass plots indicated 42 to 99% removal of all effluent constituents except Ca, Mg, and Cl which increased in late season. Analysis of grass tissue indicated substantial removal of N, P, K, Cl, and S. Na, Cl, P, and B accumulated in the soil at the highest rates. No toxic buildup was evident. Stream and well monitoring within and surrounding the application site showed no indication of water quality degradation or contamination.(Snyder-California-Davis)
W76-08840

AVAILABILITY OF ALUMINUM PHOSPHATE FROM ALUM-TREATED WASTEWATER FOR ALGAL GROWTH,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. E. Francisco, B. A. Dempsey, and J. C. Matheson, III.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 797 $5.00 in paper copy $2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Report No. 111, May 1976. 82 p., 27 fig, 12 tab, 64 ref. OWRT A-075-NC(3), 14-31-0001-4033.

Descriptors: Phosphorus, *Nutrient removal, *Flocculation, *Coagulation, *Waste water treatment, Aquatic algae, Phosphorus compounds, Eutrophication, North Carolina, *Phosphates.
Identifiers: Alum-flocculated phosphate, *Phosphorus removal, *Algal growth, *Alum-treated wastewater, Aluminum phosphate.

For phosphorus removal from wastewater, alum coagulation-precipitation is often the removal method of choice. Typically, alum is added ahead of the final settling tank in a ratio of 1.8 aluminum to 1 phosphorus. At this ratio phosphorus precipitates as an AlPO4 complex associated with coagulated Al(OH)n species. While most (80-90%) of the phosphorus is removed by settling, some

carries over into the effluent. Only 10% of the carryover phosphorus is filterable; therefore 90% is in a particulate form. This research explored the availability of this particulate phosphorus in a pure chemical system, an open-channel, mixed-culture system (stream channel study), and a unialgal, batch-culture system (bioassay study). Results indicate that the amount of alum-flocculated phosphorus which becomes available nutrient is dependent upon pH, concentration, and dilution. As pH was increased the degree of undersaturation with respect to A1PO4 also increased. In all cases the concentration of total phosphorus was much greater than that of dissolved phosphorus but enough to allow excessive algal growth. Growth of the test alga, Selenastrum capricornutum was not inhibited by A1+3. When the concentration of total phosphorus (in alum-flocculated form) was 0.5 mg/1, growth was equivalent to that with an equivalent concentration as K2HPO4. However, when the total phosphorus (as alum-flocculated phosphate) was 0.186 mg/1 growth was less than that with an equivalent amount as K2HPO4. (Stewart - North Carolina State)
W76-08842

KINETICS AND MECHANISMS OF THE OXIDATIVE DEGRADATION OF NITRILOTRIACETIC ACID (NTA) IN AQUEOUS SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-08843

THE EFFECTS OF A SYNTHETIC CHILI WASTE ON BIOLOGICAL SEWAGE TREATMENT PLANT OPERATIONS,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
J. L. Gabbard, and W. A. Barkley.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 774 $4.50 in paper copy, $2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 069, April 1976. 54 p., 11 fig., 5 tab., 6 ref. OWRT A-050-NMEX(1).

Descriptors: *Activated sludge, *Aerobic bacteria, Aerobic treatment, *Biological treatment, Sewage bacteria, *Sewage treatment, Sludge treatment, *Waste water treatment, *New Mexico, Industrial wastes, Chemical oxygen demand.
Identifiers: *Chili wastes, Shock loading.

The effect of chili waste on a completely mixed activated sludge waste water treatment process was determined. A bench scale model of a completely mixed activated sludge system was used. The system consisted of a primary clarifier, a completely mixed activated sludge unit, and a secondary clarifier. The activated sludge unit was rectangular with effluent flow over a single weir. Aeration and mixing were accomplished by compressed air injection. The system performance was evaluated with sewage and chili waste influents while attempting to hold all other operation parameters constant. The mode of system evaluation was efficiency of COD removal by secondary treatment. Chili waste is highly degradable by aerobic microorganisms and is at least as susceptible to treatment by activated sludge as sewage. A completely mixed activated sludge system suffers only a mild upset from shock loading with chili waste and has a quick recovery from the upset. (Hain - New Mexico State)
W76-08845

ENVIRONMENTAL EFFECTS OF COOLING SYSTEMS AT NUCLEAR POWER PLANTS,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-08848

TREATMENT AND DISPOSAL OF WASTE FLUIDS FROM ONSHORE DRILLING SITES,
Wilson Mud Service, Ltd., Edmonton (Alberta).
G. A. Specken.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 451-462, 3 tab.

Descriptors: *Waste storage, *Waste disposal, *Waste treatment, Drilling fluids, Cost analysis, Oil wells, Industrial wastes, Canada, Trout, Bioassay.
Identifiers: *Waste sumps, *Drilling fluid disposal, Sump fluid purification, Trout bioassay, Alberta(Canada).

The storage of oil well drilling fluid waste materials in open earthen pits (sumps) is of environmental concern. Volumes up to approximately 100,000 barrels of waste fluids may accumulate at drilling site. Disposal of these sump fluids is a problem where regulatory laws prohibit simple dumping of the fluids into the environment. Western Canada demands that clarified water from drilling site sumps must meet certain quality standards, primarily the passing of a trout bioassy before it can be disposed of. An in situ process has been developed where a major portion of the total fluid volume is generated as clarified, detoxified water. The remaining volume is left as a wet sludge in the bottom of the sump pit. This residue is usually buried. The overall cost of this process averages approximately 30 cents per barrel of sump fluid, although cost can range as high as 50 cents and as low as 20 cents per barrel. (See also W76-08889) (Heiss-NWWA)
W76-08910

THE TOXICITY OF DRILLING FLUIDS, THEIR TESTING AND DISPOSAL,
Alberta Energy Resources Conservation Board, Edmonton.
D. R. Shaw.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 463-471, 2 ref.

Descriptors: *Drilling fluids, *Toxicity, *Waste treatment, *Waste disposal, Wells.
Identifiers: *Drilling fluid additives, Drilling sumps, Synergistic effects, Fluid disposal standards, Subsurface disposal permits.

The complex additives of drilling fluids are often toxic. Single additives may be moderately toxic but in combination, the toxicity greatly increases. These toxic additives ultimately find their way to the sump, where their disposal becomes a problem. Sump fluid disposal standards have been developed by the Canadian Energy Resources Conservation Board. These standards outline procedures for the operator and government agencies to insure fluid disposal methods affect the environment as little as possible. (See also W76-08889) (Heiss-NWWA)
W76-08911

THE HANDLING AND TREATING OF WATER-BASED DRILLING MUDS,
Sun Oil Co., Richardson, Tex. Production Service Lab.
R. B. Allred.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 491-502, 6 fig, 7 ref.

Descriptors: *Drilling fluids, *Emulsions, *Drilling equipment, Waste treatment, Waste storage, Waste disposal, Wells, Separation techniques.
Identifiers: *Thixotropic colloidal suspension, Fluid circulation, Solids separation, Gas separation, Liquid separation.

Drilling fluids used in the drilling of most oil wells are usually forms of a thixotropic colloidal suspension with water. The purpose of these fluids is to remove cuttings from the borehole. A constant circulation is maintained down the hole and back into surface tanks where the fluid is reconditioned for further use. The reconditioning process consists of removing unwanted solids, liquids and gases. Discharged solid and liquids are either stored in holding tanks or reserve pits. Gases are disposed of at the well site. Drilling fluid contaminants and physical defects are chemically treated so as to recondition the fluid for re-use. Normally drilling fluids are not toxic to personnel. The use of high pH and toxic fluids are governed by special procedures to insure the safety of personnel and protection of the environment. (See also W76-08889) (Heiss-NWWA)
W76-08912

WASTE WATER BASE DRILLING FLUID DISPOSAL,
Dresser Industries, Inc., Houston, Tex. Oilfield Products Div.
L. R. Louden, and R. E. McGlothlin.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 515 - 522, 4 tab, 2 ref.

Descriptors: *Waste treatment, *Waste disposal, *Drilling fluids.
Identifiers: *Water-based drilling fluids, Environmentally safe disposal process.

Mud solidification is a new disposal process developed for disposal of water-based drilling fluids and cuttings that result in non-toxic environmentally safe material. The process is based on a reaction between soluble silicates and silicate setting agents, which are introduced at controlled rates to solidify the drilling fluid and cuttings. The pseudo-clay material resulting from crystaline growth, encapsulation and dehydration can be used for a variety of applications, including reclamation landfill and for treating a large variety of industrial wastes. Studies by an independent agronomist indicate that seed germination was not affected in garden soil which contained up to 40 percent solidified mud and germination was retarded only a few days in soils containing up to 80 percent. The process costs approximately 3 dollars per barrel and portable systems capable of processing 1,000 barrels a day are available. (See also W76-08889) (Heiss-NWWA)
W76-08914

DISPOSAL OF DRILLING FLUIDS AND DRILLED-UP SOLIDS IN OFFSHORE DRILLING OPERATIONS,
Texas A and M Univ., College Station. Dept. of Petroleum Engineering.
W. J. McGuire.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 523-530, 1 fig, 4 ref.

Descriptors: *Waste disposal, Drilling fluids, Water pollution sources, Regulation.
Identifiers: Water-based drilling fluids, Oil-based drilling fluids, Waste disposal regulations.

Offshore oil drilling operations usually utilize water-based drilling fluids. Oil-based fluids are only used where special drilling problems are encountered. The Outer Continental Shelf (OCS) Order No. 1, issued on August 28, 1969, directs that drilling fluids containing oil be disposed of on land. Most oil coated solids are also disposed of in this manner. Recently, some attempts to clean well cuttings for offshore disposal have succeeded. Disposal of drilled solids is usually stipulated in offshore lease agreement. These leases dictate that the drilled solids be discharged at a distance no greater than a designated distance from bottom (usually 20 feet). These stipulations are imposed in estauries and near reefs. (See also W76-08889) (Heiss-NWWA)
W76-08915

LIBRARY U. OF A. ...

DIMENSIONING OF UNDERGROUND SEWER PIPELINES MADE OF PLASTIC TUBES (RASCHET PODZEMNYKH KANALIZATSIONNYKH TRUBOPROVODOV IZ POLIMERNYKH TRUB),
For primary bibliographic entry see Field 8B.
W76-08962

GIANT MOLE TO DIG SANITARY DISTRICT TUNNELS,
Midwest Engineer, Vol. 28, No. 6, p 4-7, March, 1976.

Descriptors: *Tunnels, *Sewers, *Waste water treatment, *Flow, Lake Michigan, Water pollution control, Excavation, Costs, Illinois.
Identifiers: Combined sewers, Chicago(Ill), Pilot studies.

An extensive project, the Tunnel and Reservoir Plan of the Metropolitan Sanitary District of Greater Chicago (MSDGC), has been designed to control the flow of sewage during wet weather periods from a metropolitan area of the city served by combined sewers. During storms, these sewers receive 10 times the dry weather flow or more. While common practice was to allow the peak flows to be diverted to rivers, in Chicago the water quality of the Chicago River, the Des Plaines River and the Calumet River Systems are seriously impaired by this practice. In order to control water pollution to these areas and to improve the quality of Lake Michigan waters, the MSDGC plans to construct over 125 miles of large diameter tunnels in rock beneath the waterways of metropolitan Chicago, at depths between 150 and 300 feet. During wet weather, combined sewer flow will be diverted to the tunnels and stored in holding reservoirs under aeration. Between storms, during dry weather, the captured flow will be pumped to treatment facilities, with increased pumping during periods when flow is normally low. Tunnel diameters will be between 15 and 35 feet. A large boring machine or 'mole' has been used at three pilot excavation projects and will be applied to the new plan in order to quickly and economically prepare the tunnels. (Kramer-FIRL)
W76-08963

FIBERGLASS FIGHTS SO3 ATTACK ON SEWERS,
For primary bibliographic entry see Field 8G.
W76-08964

PENNSYLVANIA SEWER PLACED IN CROWDED DITCH,
For primary bibliographic entry see Field 8F.
W76-08965

STORM SEWER PIPE JOINTS TIGHT AFTER TEN YEARS,
Domingue, Szabo and Associates, Inc., Lafayette, La.
For primary bibliographic entry see Field 8G.
W76-08966

WATER CONTROL SOLVES TOUGH SEWER PROBLEM,
For primary bibliographic entry see Field 8B.
W76-08967

PROBLEM: LOW HEADROOM, SOLUTION: PIPE ARCH,
For primary bibliographic entry see Field 8G.
W76-08968

BELLEVILLE PLANT USES 15 PUMPS IN FOUR STATIONS,
For primary bibliographic entry see Field 8C.
W76-08969

PIPELAYING 'HORSE' PREASSEMBLES AND HELPS INSTALL OCEAN OUTFALL,
For primary bibliographic entry see Field 8F.
W76-08970

BIOLOGICAL PURIFICATION OF WASTE WATERS,
Australian Patent 468,494. Issued January 15, 1976. Official Journal of Patents, Trade Marks and Designs, Vol. 45, No. 49, p 5442, January, 1976.

Descriptors: *Waste water treatment, *Activated sludge, *Patents, *Aeration, Equipment, Sludge treatment, *Biological treatment, Tanks.
Identifiers: *Clarification.

A patent has been granted for equipment to treat waste water using activated sludge. At least two clarifier tanks are in communication with an aeration tank by means of openings in a wall or partition. Provision is made for recycling sediment from the clarification tanks to the aeration tanks. Air lift type pumps discharge into the aeration tank from each of the clarifiers. These clarifiers are fed with a pulsating intermittent flow of air, which subsequently causes a pulsating recirculation of the settled sludge into the aerator. (Kramer-FIRL)
W76-08971

WASTE WATER PURIFICATION,
P. V. Knopp, and W. B. Gitchel.
Canadian Patent 981,815. Issued January 13, 1976. Patent Office Record, Vol. 104, No. 2, p 93, January, 1976.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Nitrification, Aerobic treatment, *Activated sludge, Activated carbon, Adsorption, *Denitrification, Anaerobic conditions.

A patent has been issued for a process to treat sewage. A combination of activated sludge for nitrification with an adsorbent such as powdered activated carbon is employed. This is followed by a denitrification step in the presence of additional adsorbent under anaerobic conditions. (Kramer-FIRL)
W76-08972

MOBILE SEWER CLEANING MACHINE,
For primary bibliographic entry see Field 8C.
W76-08973

PHOSPHORUS REMOVAL FROM WASTE WATER,
M. J. Bykowski.
Canadian Patent 983,632. Issued February 10, 1976. Patent Office Record, Vol. 104, No. 6, p 97, February, 1976.

Descriptors: *Chemical precipitation, *Iron, *Nutrient removal, *Phosphorus, *Patents, *Waste water treatment, Aerobic conditions, Anaerobic treatment, Separation techniques.

A patent has been granted for a process to reduce the phosphorus content of waste water. Part of the separated solids are recycled through part of the primary treatment process in order to first contact the waste water with products of an aqueous reaction with elemental iron. The mixture is then treated under aerobic and anaerobic conditions and the suspended solids fraction which contains the major portion of the influent phosphorus in a solid stable form is concentrated. A relatively clear liquid fraction may thus be separated from the effluent. (Kramer-FIRL)
W76-08975

METHOD AND APPARATUS FOR CHEMICALLY PURIFYING SEWAGE,
K. Tofaute.
Canadian Patent 984,528. Issued February 24, 1976. Patent Office Record, Vol. 104, No. 8, p 95, February, 1976.

Descriptors: *Patents, *Chemical precipitation, *Waste water treatment, *Sewage treatment, Mixing, Nutrient removal, Flocculation, Sedimentation.
Identifiers: Chemical treatment.

A chemical precipitation method for purifying sewage has been patented. This method is especially useful for the removal of phosphorus. The sewage to be treated and the precipitating agent are mixed in a zone located in the upper region of a basin. After complete mixing, the liquid is passed downward through a flocculation zone into a sedimentation zone. Water freed from the flocculant sludge is conveyed upward into a clear water zone, which is separated from the mixing and flocculation zones by a partition wall. (Kramer-FIRL)
W76-08976

WASTE WATER TREATMENT PLANT,
A. Adjouri, and R. Cyr.
Canadian Patent 984,526. Issued February 24, 1976. Patent Office Record, Vol. 104, No. 8, p 95, February, 1976.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Treatment facilities, *Sludge treatment, Aeration, Sedimentation, Equipment, Flow characteristics, Mixing.
Identifiers: Complete mix principle.

A waste water treatment facility which uses the complete mix principle to produce biological sludge and clarified water has been patented. The plant consists of an aeration chamber, a settling chamber and a partition between the two chambers. The partition include several panel units, each with a baffle, an opening for the transfer of mixed liquor from the aeration chamber to the settling chamber, and a pair of recirculation ducts, secured against their baffle to form a framework. These ducts may be actuated by a controlled air flow and are situated so as to minimize the difficulties in plant flow characteristics. (Kramer-FIRL)
W76-08977

WASTE TREATMENT PROCESS,
J. S. Jeris, C. Beer, and J. A. Mueller.
Canadian Patent 986,239. Issued March 23, 1976. Patent Office Record, Vol. 104, No. 12, p 87, March, 1976.

Descriptors: *Waste water treatment, *Denitrification, *Patents, Carbon, Biological treatment, Bacteria.
Identifiers: Fluidized beds.

A patent has been issued for a waste water treatment process involving denitrification. A fluidized bed containing denitrifying biota is generated on a particulate carrier. A carbon source is then metered into the waste water. Excess bacterial growth is mechanically removed from the carrier at predetermined intervals. (Kramer-FIRL)
W76-08978

WASTE-WATER PURIFICATION,
Australian Patent 467,690. Issued December 11, 1975. Official Journal of Patents, Trade Marks and Designs, Vol. 45, No. 46, p 5063, December, 1975.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Organic compounds, Oxidation, Nitrogen removal, Anaerobic treatment, Aerobic treatment, Sludge treatment, Separation techniques, Ammonia.

A newly patented process for treating waste waters by simultaneously removing organic carbonaceous material and biologically oxidizing the

reduced nitrogenous forms is described. This procedure is followed by reduction of the oxidized nitrogen to elemental nitrogen. An aqueous suspension of adsorbent is introduced to the effluent while a non-condensible oxygen-containing gas is added to a vessel containing waste water, developing an active biomass with a sludge age of at least three days. Aerobic conditions are maintained for a period to oxidize ammoniacal nitrogen to nitrate or nitrate nitrogen. The adsorbent is settled and separated and associated adsorbed organic material and biological slids are returned to the vessel. The liquid phase is then passed to an anaerobic zone where further adsorbent and a source of organic carbon are added, reducing the oxidized forms to elemental nitrogen. Finally, the mixture is passed to a quiescent zone where the adsorbent and associated organic material may be removed from the waste water. (Kramer-FIRL)
W76-08979

ACTIVATED SLUDGE PLANT,
R. H. Uden.
Canadian Patent 982,283. Issued January 20, 1976. Patent Office Record, Vol. 104, No. 3, p 95, January, 1976.

Descriptors: *Patents, *Activated sludge, *Treatment facilities, *Sewage treatment, Waste water treatment, Aerobic digestion, Tanks, Equipment.

A patent has been issued for an activated sludge treatment facility which is adapted to handle sewage loading. Raw sewage influent passes through the activated sludge process and is discharged as purified water. The plant has been designed for aerobic decomposition of raw sewage. In series, the influent is treated in a digester tank, several aeration tanks, a settling tank, and a final aeration tank. (Kramer-FIRL)
W76-08980

AEROBIC SEWAGE TREATMENT SYSTEM,
K. J. Yost.
Canadian Patent 980,923. Issued December 30, 1975. Patent Office Record, Vol. 103, No. 52, p 93, December, 1975.

Descriptors: Domestic wastes, *Patents, *Sewage treatment, *Aerobic digestion, Sedimentation, Tanks, Equipment, Flow, Chlorine, *Waste water treatment, Settling basins.

Liquid sewage from an individual residence is treated in a large, flat and shallow aerobic settlement tank by a patented method. This exposes a large surface area of the sewage per unit volume. Air is circulated over the surface in a spiral direction, thus effecting circulation or turbulence of the sewage within the tank and diffusion of air into the liquid. The liquid is then directed into an aerobic digestor and clarifier tank, which similarly circulates the treated liquid and diffuses the air in response to a spiral air flow created by a chimney draft. The second tank, therefore, is an annular clarifier chamber which receives the treated liquid before it is discharged. Discharged effluent is directed through a chlorinator and chlorine crystals are pushed downward into the path of effluent by a combined weight and valve. This will stop the flow of treated liquid whenever additional chlorine crystals have not been added to the supply. (Kramer-FIRL)
W76-08982

UP-FLOW SEPARATOR,
T. R. Westfall.
Canadian Patent 982,492. Issued January 27, 1976. Patent Office Record, Vol. 104, No. 4, p 44, January, 1976.

Descriptors: *Patents, *Sewer systems, *Combined sewers, *Waste water treatment, *Separation techniques, Screens, Flow rates, Cleaning, Waste disposal.
Identifiers: *Up-flow separators.

Equipment and methodology for screening and concentrating waste water overflow from combined sewer systems have been patented. Such equipment includes a separator employing a substantially cylindrical rotating screen. Influent is piped upwardly into the system and deflected out toward the inner surface of the screen, thus achieving the desired flow rate and flow pattern of the influent onto the screen. Flow rate is controlled with several substantially discrete inclined streams. The screen is rotated at the correct speed to achieve the desired centrifugal force. A description of the handling of the influent, effluent, concentrate, and backsplash is provided, and the manner in which the influent is screened to achieve a fluid concentrate pumpable to other treatment equipment for ultimate disposal is also detailed. (Kramer-FIRL)
W76-08983

PROCESS FOR TREATING SEWAGE SLUDGE AND FERTILIZER PRODUCTS THEREOF,
Orgonics, Inc., Slatersville, R.I. (Assignee).
J. M. O'Donnell.
United States Patent 3,942,970. Issued March 9, 1976. Official Gazette of the United States Patent Office, Vol. 944, No. 2, p 809, March, 1976. 1 fig.

Descriptors: *Sludge treatment, *Dewatering, *Patents, *Waste water treatment, Sewage sludge, Fertilizer, Filtration, Odor.
Identifiers: *Sludge filter cake.

Sludge filter cake may be treated with a newly patented process. The sludge filter cake is reduced to a particle size of about 1/8th inch or less and the moisture content of the reduced sludge is decreased to between 30 and 50%, providing a partially dried sludge. In a reactor, an acid is added to the partially dried sludge, giving a pH of between 3 and 5. An alkaline N-methylol-urea aqueous prepolymer solution is prepared by the reaction of from about 1.1 to about 2.0 moles of urea per mole of formaldehyde. The prepolymer solution is immediately reacted with the partially dried sludge in a second section of the reactor, while continuously moving the sludge from the inlet to the outlet of the reactor at a temperature of from 30 to 80 C and a pH of 3 to 5. The sludge particles in the first and second sections of the reactor are vigorously mixed for a sufficient time to complete the reaction and conversion of the prepolymer. The reaction product is dried at a temperature of less than 95 C to a moisture content of about 3 to 10%, thus producing a granular, high-nitrogen, odorless fertilizer product. (Kramer-FIRL)
W76-08984

APPARATUS FOR TREATMENT OF WATER, PARTICULARLY WASTE WATER,
E. J. Bosshard.
Canadian Patent 982,780. Issued February 3, 1976. Patent Office Record, Vol. 104, No. 5, p 7, February, 1976.

Descriptors: *Patents, *Waste water treatment, *Microorganisms, *Irradiation, *Gamma rays, Liquids, Disinfection.

An invention for treating microorganism-containing waste water is described. The liquid is forced to circulate in a closed loop, flowing at least twice past one radiation source. Sufficient gamma radiation to destroy at least some of the microorganisms is employed. (Kramer-FIRL)
W76-08985

CENTRIFUGE PREVENTING AIR ADMISSION DURING SLUDGE DISCHARGE,
De Laval Separator Co., Poughkeepsie, N. Y. (Assignee).
K. Nelson.
United States Patent 3,390,609. Issued January 6, 1976. Official Gazette of the United States Patent Office, Vol. 942, No. 1, p 305, January, 1976. 1 fig.

Descriptors: *Waste water treatment, *Sludge treatment, *Centrifugation, Equipment, *Patents, Separation techniques.

A centrifuge design for sludge treatment has been patented. The special feature of this equipment is that air admission during sludge discharge is prevented. The sludge centrifuge comprises a centrifugal bowl rotating about an axis which forms a separating chamber with an inlet for a mixture of liquid and solids. The bowl also forms a paring chamber, connected to the separating chamber, where the liquid separated as a relatively light component from the liquid/solids mixture is collected. The separating chamber has an outer sludge space for receiving solids separated from the mixture as a relatively heavy sludge component. Means are provided to alternately open and close the outer edges of the bowl to discharge sludge intermittently from the sludge space. A stationary paring disk in the paring chamber discharges separated liquid from the bowl while its outer periphery is closed to maintain a normal liquid level in the bowl. This liquid level moves radially outward from the bowl axis in response to opening of the bowl's outer periphery. An air passage at the radially inner portion of the paring chamber provides a means for discharging air from the bowl to the atmosphere while the liquid is at the normal level. A dam rotating with the bowl limits the outward movement of the liquid level in the paring chamber, thus maintaining a minimum liquid level in the paring chamber during sludge discharge. Means in the paring chamber which are operable at the minimum liquid level prevent air from being pulled into the bowl through the air passage during sludge discharge. (Orr-FIRL)
W76-08990

SEWAGE TREATMENT SYSTEM,
G. E. Wilson.
Canadian Patent 980,924. Issued December 30, 1975. Patent Office Record, Vol. 103, No. 52, p 93, December, 1975.

Descriptors: *Patents, *Sewage treatment, *Flocculation, *Polymers, *Waste water treatment, Aeration, Microorganisms.

A sewage treatment process using a high polymer ratio flocculation agent, biologically produced on site to flocculate the colloidal suspended solids upstream of the primary clarifier, has been patented. The flocculation agent is produced by subjecting microorganisms which are capable of generating polymeric material to a high food content in an aeration tank. Supernatant from the primary clarifier is passed into this tank. The microorganisms are then subjected to a low food content environment, thus generating polymeric material through the extracellular activity of the microorganisms. (Kramer-FIRL)
W76-08992

METHOD AND APPARATUS FOR TREATING A CONTINUOUS FLOW OF FLUID WASTE PRODUCTS AND OTHER MATERIALS,
Adrian Construction Co., Dayton, Ohio. (Assignee).
F. T. Varani.
United States Patent 3,946,679. Issued March 30, 1976. Official Gazette of the United States Patent Office, Vol. 944, No. 5, p 2233, March, 1976.

Descriptors: *Patents, *Waste treatment, *Organic compounds, *Waste disposal, Burning, Equipment, *Incineration, *Drying.

A patent has been granted for a method to dry or burn a continuous flow of organic waste material. The material is pumped through an elongated rigid porous tube, forcing a gas radially inward through

LIBRARY U. OF A. ORGANIC-SOIL ...

the pores of the tube, and into the material flowing through the tube. This creates a turbulence which disintegrates the material into fine particles and accelerates the flow of particles within the tube. The accelerated particles are then discharged from the tube and into a heating chamber where they expand. A flame is directed into the material, with air introduced into the disintegrated material after it is discharged, before being contacted with the flame. (Kramer-FIRL)
W76-08993

PHOSPHORUS REMOVAL FROM WASTEWATER,
G. L. Shell, and D. E. Burns.
Canadian Patent 985,805. Issued March 16, 1975. Patent Office Record, Vol. 104, No. 11, p 78, March, 1976.

Descriptors: *Patents, *Phosphorus, *Nutrient removal, *Waste water treatment, Liquid wastes, Cations, Sludge treatment, Effluents.

A patent has been issued for a method to reduce the soluble phosphorus content of a phosphorus-containing liquid waste. A multi-zoned countercurrent reaction system is employed, including a final reaction zone and at least one preceding reaction zone. A metallic cation is added to the liquid waste as it enters the final reaction zone. An adsorptive sludge and an effluent containing a low residual phosphorus content are thereby produced. Effluent is discharged for further treatment or use and the sludge is removed from the final reaction zone and introduced into the preceding reaction zone containing the phosphorus-bearing liquid. Effluent from this zone is combined with a chemical and continuously fed into the final reaction zone. Thus, a chemical equilibrium may be maintained between the phosphorus present in the solid phase of adsorptive sludge and the residual soluble phosphorus present in the liquid phase of the effluent. (Kramer-FIRL)
W76-08994

BIOLOGICAL TREATMENT OF STERILISED AQUEOUS WASTE.
Australian Patent 469,399. Issued February 12, 1976. Official Journal of Patents, Trade Marks, and Designs, Vol. 46, No. 4, p 369, February, 1976.

Descriptors: *Patents, *Waste water treatment, *Separation techniques, Microorganisms, Oxygen, Sludge treatment, Recycling, *Biological treatment.

A method has been patented for treating water with organic contaminants. The sterile liquid produced by an initial sterilization step is mixed with sludge activated by a selected microorganism. Between one and 50% of the mixture's weight is sludge. This mixture is then contacted with an oxygen containing gas. The sludge and the liquor are separated; at least a portion of the sludge is recycled. (Snyder-FIRL)
W76-08995

SEWAGE PIPE FITTING,
For primary bibliographic entry see Field 8G.
W76-08996

REMOVAL OF WATER FROM SLUDGES WITH FILTER PRESSES (SCHLAMMENTWAESSERUNG MIT PRESSFILTERN),
C. Alt.
Chemie-Ingenieur-Technik Vol. 48, No. 2, p 115-124, February, 1976. 17 fig, 1 tab, 7 ref.

Descriptors: *Sludge treatment, *Dewatering, Equipment, Filtration, *Waste water treatment.
Identifiers: *Filter presses.

Filter presses have been used to decrease the residual moisture in certain sludge filter cakes. Several types of machinery, both batch and continuous, have proven efficient for this purpose. Others continue to be tested. A brief theoretical description, which permits some conclusions to be drawn regarding the process engineering problems involved, is provided. Some of the most important developments in sludge dewatering are also described. (Kramer-FIRL)
W76-08998

AN EXPERIMENTAL INVESTIGATION OF TERTIARY TREATMENT WITH A SUBMERGED FILTER (SESSHOKU BAKKIHO NI YORU GESUI SANJISHORI NO JIKKENTEKI KENKYU),
S. Masuda, M. Ishiguro, and Y. Watanabe.
Miyazaki Daigaku Kogaku-bu Kenkyu Hokoku, No. 21, p 19-25, 1975. 7 fig, 3 tab, 12 ref.

Descriptors: *Filters, *Tertiary treatment, *Waste water treatment, *Sewage treatment, Nitrification, Denitrification, Nutrient removal, Notrogen compounds, *Filtration.
Identifiers: Submerged filter.

An investigation has been made of tertiary treatment for secondary treated sewage effluents. Some of the results obtained from a laboratory scale submerged filter unit operated on pretreated domestic sewage with activated sludge are described. The submerged filter consists of a bed of media through which the waste water passes with air in an upward direction. Nitrification of bacteria takes place on the surface of stones and charcoal, and long solids retention times are possible. This method provides a highly efficient means of removing BOD, PO4, and NH4-N from secondary treated domestic sewage. The influent BOD and NH4-N concentrations range from 18 to 34 and from 28 to 43 ppm, with the PO4 concentration averaging approximately 10 ppm. At a BOD loading of 0.56 kg/cu m/day of media, the unit achieved 75% removal of BOD to yield an effluent with 8 ppm BOD. At 0.05 kg/cu m/day NH4-N loading, 97% removal of NH4-N was obtained to yield an effluent with 1.7 ppm NH4-N. A subsequent denitrification experiment was performed in which only 0.5 hours contact time were needed to yield an effluent of zero ppm N03-N at a 4400 ppm MLSS level. (Kramer-FIRL)
W76-08999

ELECTRIC EQUIPMENT FOR MUKOGAWA SEWAGE TREATMENT PLANT, HYOGO PREFECTURE (HYOGOKEN MUKOGAWA SHORIJO NO DENKI SETSUBI),
Hanshin City Improvement Bureau (Japan).
K. Yokomichi, H. Hatada, S. Takahashi, M. Machida, and Y. Shiraki.
Toshiba Rebyu, (Toshiba Review) Vol. 31, No. 1, p 37-43, January, 1976. 10 fig, 3 tab.

Descriptors: *Sewage treatment, Computers, *Waste water treatment, *Automation, *Treatment facilities, Instrumentation, Water quality.
Identifiers: Japan.

The Muskogawa Sewage Treatment Plant in Hyogo Prefecture, Japan, has been built to cope with deteriorating water quality due to sewage from homes and waste water from factories. Goals include improved treatment efficiency to preserve water quality, and automation of operation to effect manpower savings. Control has been centralized by instrumentation and processes have been automated by introducing control computers. The facilities have been designed to produce further qualitative improvement in treatment through computer control, adapting to the individual quality and quantity of water. (Kramer-FIRL)
W76-09000

RECLAMATION AND USE OF MUNICIPAL WASTE WATER (TOSHI NI OKERU SEIKATSU HAISUI NO SAI-RIYO),
A. Ikehata.
Kagaku to Kogyo, Vol. 28, No. 11, p 807-811, November, 1976. 1 fig, 2 tab, 1 ref.

Descriptors: *Water reuse, *Municipal wastes, *Waste water treatment, Industrial water, Biological treatment, Coagulation, Adsorption, Reverse osmosis, Ion exchange, Electrodialysis, Chlorination, Ozone.
Identifiers: Ammonia stripping.

The reuse of municipal waste water in Japan is discussed. Although actual water purification techniques can regenerate water within the quality of drinking water specified by law, the present use of regenerated waste water for potable purposes is not likely. The use of regenerated water for nonpotable purposes has also met with citizen objections because of an emotional response to using 'dirty' waste water. Therefore, water reuse has been limited to industrial water. Techniques for the regeneration of municipal waste water include biological treatment, coagulation, adsorption, oxidation, and reverse osmosis for treating total organic compounds; biological treatment, ion exchange, ammonia stripping, and reverse osmosis for treating nitrogen and phosphorus compounds; coagulation, ion exchange, reverse osmosis, and electrodialysis for treating metals and inorganic compounds; and chlorine and ozone methods for disinfecting harmful microorganisms and viruses. These methods are being used to treat secondary treated sewage water for reuse. (Katayama-FIRL)
W76-09001

SPECIFIC POLLUTANTS IN URBAN WASTE WATERS AND THE EFFICIENCY OF THEIR PURIFICATION (SPETSIFICHESKIE ZAGRYAZNENIYA GORODSKIKH STOCHNYKH VOD I EFFEKTIVNOST' IKH OCHISTKI),
For primary bibliographic entry see Field 5A.
W76-09002

LAMELLA SETTLING TANKS (LAMELLA-ABSETZBECKEN),
For primary bibliographic entry see Field 5F.
W76-09003

SLUDGE STERILIZATION BY GAMMA RAYS (LA STERILIZZAZIONE DEI FANGHI CON RAGGI GAMMA),
Inquinamento, Vol. 17, No. 11, p 51-52, November, 1975.

Descriptors: *Sludge treatment, *Gamma rays, *Irradiation, Pathogenic bacteria, Disinfection, *Waste treatment.

In order to eliminate pathogens from sludges, a new treatment process has been developed based on ionizing irradiation of the bacteria and parasites. The facility consists of an irradiation pit with a central tube where the sludge is moved around during treatment, a processing system with circulation, and an aspiration pump, regulatory mechanisms, and pipes. Operations are discontinuous and full automatic. Irradiation improves the dewaterability of the sludge; with sedimentation alone, it is possible to remove at least half the water content of the sludge. The process does not consume oxygen and does not release gas or organic nitrogen compounds. The simple structure and functioning of the installation require only 30 minutes of human control per day. (Waltner-FIRL)
W76-09004

WASTE WATER PURIFICATION PLANT UH-WIESEN-DACHSEN

WASSERREINGUNGSANLAGE UH-
ESEN-DACHSEN),
weizerische Bauzeitung, Vol. 93, No. 45, p
-722, November, 1975. 6 fig.

criptors: *Waste water treatment, *Biological
tment, *Treatment facilities, Aeration, Set-
g basins, Anaerobic digestion, Sludge treat-
t.
ntifiers: Aerobic digestion, Switzerland.

new biological waste water treatment plant
wiesen-Dachsen (Switzerland) is described.
er the separation of floating objects, sand and
are separated in an aerated basin. The treat-
t facility is composed of an aeration basin and
sludge settling basin, and a third stage is pro-
d for the coprecipitation of phosphates by
ns of metal salts. Sludge is fermented, first
erobically at 33 C, and then in an aerobic fer-
ter. The gas released in this process is used for
ting various units of the waste water treatment
t. (Takacs-FIRL)
6-09005

ASUREMENT OF THE OXYGENATION
PACITY IN WASTE WATER TREATMENT
ANTS USING COMPLETELY MIXED AC-
ATED SLUDGE (MESURE DE LA
PACITE D'OXYGENATION DANS LES STA-
ONS DE TRAITEMENT A BOUES ACTIVEES
MELANGE INTEGRAL),
outin, A. Vachon, J. P. Bechac, and B. Lopez.
hniques et Sciences Municipales--L'Eau, No.
493-501, November, 1975. 6 fig, 5 tab, 16 ref.

criptors: *Activated sludge, *Dissolved ox-
n, Oxygenation, Aeration, Respiration, *Waste
er treatment, Measurement, Pollutant identifi-
on.

rder to determine the oxygenation capacity of
vated sludge treatment plants, the aeration and
cling processes were interrupted to allow the
olved oxygen content to drop to 0 mg/liter
ugh respiration of the microorganisms. Aera-
was periodically resumed for short periods of
e to maintain the homogeneity of the sludge
to avoid decantation. When the oxymeters in-
ted values close to 0 mg/liter, the procedure
begun. A volume of sludge was removed equal
he capacity of the pilot aeration installation and
deposited in it. Biological phenomena were
cked, in particular respiration, by adding a bac-
al toxin such as a solution of copper sulfamate.
gen concentration was noted in terms of time.
oxymeter indicated a stationary value when
saturation concentration had been reached.
oxygen was then chemically determined ac-
ding to the Winkler method. Aeration in the ac-
ted sludge vat was determined at the same
e. Interpretation consisted of measuring at vari-
points the slope of the curve on the basis of p
als K(Cs-C) to the R power where p is slope, R
spiration, K is aeration coefficient, Cs is satu-
on concentration, and C is concentration of the
id. Since nominal conditions are usually not
tical to experimental conditions, it was neces-
to utilize corrective factors in terms of waste
er and pure water, the initial temperature at the
inning of the process and the standard 10 C,
the experimental and normal atmospheric
ssures. (Waltner-FIRL)
6-09006

INFECTION OF URBAN SEWAGE SLUDGE
DESINFECTION DES BOUS RESIDUAIRES
BAINES),
Alexandre, P. Gevaudan, J. Charrel, M. N.
let, and A. Blancard.
hniques et Sciences Municipales--L'Eau, No.
p 547-555, December, 1975. 6 fig, 7 tab, 16 ref.

criptors: *Sludge treatment, *Disinfection,
mma rays, *Irradiation, *Lime, Pathogenic bac-
a, Sewage sludge.
ntifiers: *Tyndallization.

A total of 134 sludge samples were taken from total oxidation treatment, aerobic treatment, and anaerobic treatment in order to compare the efficiencies of three disinfection processes: liming, tyndallization, and irradiation. Observations focused on typical fecal bacteria and experimentally added pathogenic agents such as mycobacteria and ascaris eggs at various stages of growth. Results indicate that with tyndallization, 47.7% coli bacilli and 53% streptococci resisted, 83% mycobacteria survived, and clostricium spores increased in number by a factor of 10. With liming, 0.34% coli bacilli, 0.63% streptococci, and 0.49% clostridium spores remained; the process did not affect ascaris eggs and mycobacteria. Gamma ray irradiation results varied according to the radiation dose. With 400 R, 2.22% coli bacilli, 2.36% streptococci, 33.8% clostridium spores, and 94% mycobacteria remained; with 800 R, 0.04-0.35% enterobacteria, 3% clostridium, and 0.4% mycobacteria survived. With 1,200 R, residual percentages were, respectively 0.0023, 0.007, 0.2, and 0%, and with 1,800 R, 0.0006, 0.0013, 0.002, and 0%. Irradiation could only destroy smooth-shelled embryonic ascaris eggs starting at 400 R. The source of the sludges did not seem to influence the efficacy of treatment. While liming was effective for sludges which did not contain hospital effluents, it cannot handle atypical mycobacteria which are epidemiologically significant. (Waltner-FIRL)
W76-09007

APPLICATION OF CENTRIFUGES. DEWATERING OF SLUDGES FROM WATERWORKS (APPLICAZIONE DI CENTRIFUGHE. DISIDRATAZIONE DI FANGHI PROVENIENTI DA IMPIANTI DI POTABILIZZAZIONE),
For primary bibliographic entry see Field 5F.
W76-09008

CURRENT AERATION TECHNIQUES--AN OVERVIEW,
Water and Pollution Control, Vol. 114, No. 2, p 16-19, February, 1976. 1 tab.

Descriptors: *Aeration, *Oxygen, Equipment, Kinetics, Evaluation, Performance, *Waste water treatment, Water treatment, *Reviews.

An overview is presented of current aeration techniques for water and waste water treatment. The more common types of aeration equipment include: diffused aeration systems, submerged turbine aerators, and high- and low-speed surface aerators. Oxygen transfer occurs by generating the largest practical area of interface between a given liquid volume and air, preventing the build-up of thick interfacial films, and maintaining the highest possible driving force or concentration difference for adsorption and desorption. Most mass transfer applications in waste treatment are liquid-film controlled. An equation is provided to describe the oxygen transfer process, which involves the oxygen transfer coefficient, the oxygen saturation coefficient, the air-water interface and the volume of aerated liquid. Several procedures for testing aerators to determine equipment capabilities are available. The most widely accepted performance evaluation is the non-steady-state reaeration test. Any tests which compare different aeration devices must account for variations in physical and in chemical conditions. Various types of mechanical aerators, air diffusers, submerged turbines, and surface aerators are also described. (Kramer-FIRL)
W76-09009

WASTEWATER RECYCLING UTILIZES PESKY NUTRIENTS,
Public Works, Vol. 107, No. 3, p 60-61, March, 1976.

Descriptors: *Waste water treatment, *Recycling, *Biological treatment, Sewage treatment, Treatment facilities, Equipment, Irrigation, Nutrients, Phosphorus, Nitrogen, Algae, Agriculture, Water reuse, Cycling nutrients, Cladophora.
Identifiers: Land application.

A waste water treatment system being utilized at the Institute of Water Research at Michigan State University is described. The Water Quality Management Project (WQMP) facility includes a portion of the East Lansing sewage treatment plant, and will have the capacity of 2 mgd of waste water. The WQMP pumps waste water which contains large amounts of phosphorus and nitrogen to an area where it flows through each of four lakes. Solar energy powers photosynthesis in the lakes. Algae and rooted aquatic plants take up abundant supplies of the nutrients. The plants are harvested using a modified commercial aquatic weed cutter and special equipment similar to a rake. The typical algae harvested is Cladophora, used mainly for composting, and also for research on the possibility of feeding it to sheep. Dead algae, plankton, and other chemical compounds which settle to the bottom of the lakes are pumped and irrigated onto land. Bass have been stocked in the fourth lake and are reported to be thriving. Water from any of the four lakes may be applied to land by irrigation. Water not used for irrigation, but of a quality adhering to environmental standards, will be passed to the Red Cedar River. (Kramer-FIRL)
W76-09010

POLLUTION CONTROL PLANT IS DESIGNED TO BE AN ATTRACTIVE NEIGHBOR, TOO.
Engineering News-Record, Vol. 196, No. 13, p 25, March 25, 1976. 2 fig.

Descriptors: *Treatment facilities, *Sewage treatment, *Waste water treatment, Texas, Activated sludge, *Design, Filtration, Flow rates, Activated carbon.

A new municipal waste water treatment facility is being built in Austin, Texas, quite near a residential area. To overcome resistance to expansion at the site, plans for the new facility include landscaping the plant site, with the creation of buffer zones between the plant and its neighbors. About half of the 300-acre site will be given to the parks and recreation department for the creation of a golf course when the facility is complete in 1977. The rest of the site will accomodate expansion up to 150 mgd. With a combination of activated sludge and rapid sand filtration, the new plant is expected to produce effluent with 10 ppm BOD and 10 ppm suspended solids. The design calls for covering the facility's flow equalization and primary treatment basins and enclosing its grit removal equipment, as well as using activated carbon filters to remove odors. (Kramer-FIRL)
W76-09011

SLUDGE HANDLING AND DISPOSAL: A SPECIAL REPORT,
Pollution Engineering, Vol. 8, No. 1, p 22-23, January, 1976. 11 fig, 12 tab.

Descriptors: *Sludge, *Sludge disposal, *Sludge treatment, *Dewatering, Treatment, Polymers, Filtration, Suspended solids, Vacuum drying, Incineration, Gravity, Centrifugation, Waste water treatment.
Identifiers: Sludge dewatering, Gravity belt filtration.

Methods of sludge dewatering and disposal are discussed. Initially, quantitative limits were applied to solids levels. Twenty to 24% was considered acceptable. Later, more qualitative limits were applied. Wastes take on the density and dewatering characteristics of their components. Treatment systems must be chosen for plants that do not yet exist. Two processes are available for the removal of water from sludges: concentration and dewatering. Advantages and disadvantages of various equipment are discussed. Organic

LIBRARY U. OF A. ...

polymers have shown much advantage in improving the settling of noncharged particles and in sludge dewatering. Gravity separation can be very useful for removal of suspended solids, primarily because of the free cost of separation energy. The main disadvantage is the large area required. Vacuum filtration depends upon atmospheric pressure acting on a vacuum. Several types are discussed. Additional equipment or processes may be needed to condition the sludge before they are ready for vacuum filtration. Design parameters for this method are discussed. Gravity belt filtration has been used for municipal sludge and is being studied for use in industrial sludges. This method is used on sludges in which polymers have been added for particle flocculation. Three different types of centrifuges for dewatering sludge are discussed: the solid bowl-scroll type; the imperforate basket type; and the disc-nozzle type. Plate and frame filtration is a batch process particularly adapted to filtration of solid slurries. Incineration is used for disposal of organic sludges. Sludge can also be used as fertilizer as long as the metal content is low. (Pinto-FIRL)
W76-09012

PORTLAND ADDS SECONDARY TREATMENT,
Stevens, Thompson and Runyan, Inc., Portland, Oreg. Environmental Engineering Div.
J. A. Crom.
The American City and County, Vol. 91, No. 1, p 30-32, January, 1976.

Descriptors: *Sewage treatment, *Waste water treatment, *Treatment facilities, *Water quality, Oregon, Sludge, disposal, Water pollution control, Activated sludge, Centrifugation, Training, Education, Personnel, Dewatering.
Identifiers: Portland(Ore), Secondary clarifiers, Grit removal, Shock flows.

Portland, Oregon, has been listed by the Environmental Protection Agency as one of the best places to live in the country. In the latest step to protect the water quality, a 42 million dollar program for water pollution control was implemented. A new 25 million dollar treatment facility will increase the efficiency of the plant from 30% to 90%. However, in attempting to operate at maximum efficiency and produce a high quality effluent, problems were encountered. Skill and experience of plant operators are important in achieving successful performance, so operator training plays a significant role in planning. The operation of the plant is discussed. Grit separation occurs in two stages. Grit and sludge are removed and separated by centrifugal grit removers. The amount of grit that was removed was well above the amount that was expected, and manual cleaning was required. A pre-grit removal section is planned. The secondary system uses a complete mix activated sludge process. Secondary clarifiers are of the vacuum sludge removal type. Return flows containing high strength organics are conditioned and equalized to avoid subjecting the aeration system to shock flows. The disposal of residuals or excess sludge is a difficult problem, especially with Portland's rainy climate. Disc centrifuges thicken the activated sludge to about 4.5% solids. It is dewatered on vacuum filters and disposed of in landfill. Other options are discussed. Incineration requires much energy and produces air pollution. Transportation to Oregon's dry inland plateau during the rainy winter has more potential. Problems still must be resolved before such a step is taken. (Pinto-FIRL)
W76-09013

METHODS FOR FILTERING NITRIFIED EFFLUENTS,
Jones and Henry Engineers Ltd., Toledo, Ohio.
F. F. Sampayo.
Water and Sewage Works, Vol. 123, No. 2, p 71-73, February, 1976. 4 tab.

Descriptors: *Waste water treatment, *Design criteria, *Filters, *Nitrification, Ammonia, Data collection, Activated sludge, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Flow rates, Effluents, Ohio, Treatment facilities.

Two case histories are presented on the determination of design parameters for filtering nitrified effluents produced from activated sludge or plastic media trickling filters. Data collected at Lima, Ohio, and at Sylvania, Ohio, are provided. Studies at both locations were conducted to determine the feasibility of effluent filtration. The current process at Lima consists of primary treatment, with activated sludge and plastic media trickling filters used for nitrification. For various filter rates, the influent and effluents were measured for BOD, suspended solids, and turbidity, with the average removals of BOD and SS recorded. Ammonia concentration in the influent and effluent were also measured. At Sylvania, where the present treatment includes chemical precipitation of phosphorus in primary treatment followed by activated sludge, data were collected on flow rates, influent and effluent turbidity, BOD, suspended solids, and COD. A comparison was also made of the length of filter runs versus headloss. The results of both studies indicated that: filtration of nitrified activated sludge or nitrification tower effluents presented no special problems; average filter rates, about 4.0 gpm/sf may be used for design; and, the ammonia concentration in the effluent is dependent upon the performance of the biological treatment processes, and is not related to the effectiveness of the filter design. (Kramer-FIRL)
W76-09015

COSTS OF BIOLOGICAL WASTE WATER PURIFICATION (DIE KOSTEN DER BIOLOGISCHEN ABWASSERREINIGUNG),
J. Negaard.
Gas-Wasser-Abwasser, Vol. 56, No. 1, p 18-24, 6 fig, 2 tab, 1 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Treatment facilities, *Costs, *Sewage treatment, Capital costs, Operating costs, Statistical methods, Regression analysis.
Identifiers: *Switzerland.

Data from 50 Swiss sewage treatment plants were used to derive functional relationships between the construction and operating costs and their main parameters. For various costs, the combined effect of all important parameters may be determined by means of a multiple regression technique. This method has obtained much more reliable functions than those where only a single parameter is considered. By analysis of the cost relationships, some important conclusions concerning the construction and operating costs of sewage treatment plants can be drawn. (Kramer-FIRL)
W76-09016

TREATMENT OF WASTE WATER CONTAINING MERCURIALS BY ACTIVATED SLUDGE. I. MECHANISM OF REMOVAL OF MERCURIALS IN WASTE WATER (KASSEI ODEI NI YORU SUIGIN GANYU HAISUI NO SHORI NI KANSURU KENKYU. I KASSEI ODEI NO SUIGIN JOKYO KIKO),
K. Nakamura, J. Ito, and M. Dazai.
Kogyo Gijutsuin Biseibutsu Kogyo Gijutsu Kenkyusho Kenkyu Hokoku (Reports of the Fermentation Research Institute) No. 47, p. 49-57, December, 1975. 7 fig, 2 tab, 7 ref.

Descriptors: *Mercury, *Waste water treatment, *Activated sludge, Measurement, Heavy metals.
Identifiers: Volatilization, Index of activity.

The mechanism occurring in the treatment of waste water containing mercurials was studied. Discontinuous treatment of waste water containing mercuric chloride by activated sludge proved satisfactory; mercury removal rates were over 99.8% in all cases. Volatilization also removed mercury. Using sludge acclimated to low concentrations (below 15 ppm) of mercuric chloride, the mercury concentration in the solution decreased rapidly after the addition of mercuric chloride. Within several hours, volatilization of mercury was almost complete, but at that time 1 to 3% per dry sludge weight mercury remained in the sludge. This mercury was volatilized after further addition of mercuric chloride. In activated sludge treatment, it was assumed that the use of mercury volatilization rate as the index of activity was appropriate for waste waters containing mercurials. (See also W76-09018) (Kramer-FIRL)
W76-09017

TREATMENT OF WASTE WATER CONTAINING MERCURIALS BY ACTIVATED SLUDGE. 2. MERCURY VOLATILIZATION AND THE CAPACITY OF ACTIVATED SLUDGE FOR WASTE WATER CONTAINING MERCURIALS (KASSEIODEI NI YORU SUIGIN GANYU HAISUI NO SHOR NI KANSURU KENKYU. 2),
K. Nakamura, J. Ito, and M. Dazai.
Kogyo Gijutsuin Biseibutsu Kogyo Gijutsu Kenkyusho Kenkyu Hokoku, (Reports of the Fermentation Research Institute), No. 47, p 59-66, December, 1975. 10 fig, 1 tab, 3 ref.

Descriptors: *Mercury, *Waste water treatment, *Activated sludge, Measurement, Waste assimilative capacity.
Identifiers: Volatilization rate, Flameless atomic absorption.

Mercury removal in the treatment of waste water containing mercuric chloride by activated sludge has been studied. It was found that added mercuric chloride was reduced to metallic mercury and volatilized. It was also assumed that the use of the mercury volatilization rate was an appropriate index of activity. This further investigation was made to measure the mercury volatilization rate by flameless atomic absorption. The decrease in mercury concentration by adsorption to sludge and volatilization declined with decreasing sludge concentration. It was found, however, that 20 ppm of sludge was appropriate, and that a sludge concentration below 10 ppm, the amount of volatilized mercury decreased and accuracy of measurement was reduced. Optimum pH and temperature for mercury volatilization were from 8 to 9 and from 42 to 43 C, respectively. (See also W76-09017) (Kramer-FIRL)
W76-09018

CANADIAN CLARIFIER IS LOW IN COST,
Water and Pollution Control, Vol. 114, No. 2, p 27, February, 1976. 1 fig.

Descriptors: Equipment, *Waste water treatment, *Sewage treatment, *Design, Filtration, Canada, Suspended solids.
Identifiers: *Claripak, Clarification, *Clarifiers.

An economical and efficient alternative to the conventional clarifier has been designed in Canada. Called the Claripak, the unit has a capital cost of about one half that of a standard clarifier, and considerably reduced maintenance costs, due to the fact that there are no moving parts. The Claripak consists of a series of parallel stainless steel plates lying inches apart and set at a 45 degree angle. Influent, such as a mixture of hydrocarbons, suspended solids and water, is distributed evenly at the top and moves downward over the plate. A laminar flow pattern for improving the settling qualities of the solids is produced. Any hydrocarbon droplets move upwards, contact the upper plate and slide up past a knife-edge into an enclosed discharge channel. Those materials heavier than water move down to a lower plate, and slide into the sludge holding tank. The treated liquid passes through the unit into a collection chamber and flows upward to the outlet connection. The

Claripak can be applied both to industrial and municipal facilities. It is suitable for secondary and tertiary treatment at municipal water pollution control plants and for treating back wash wastes from filtration facilities. (Kramer-FIRL)
W76-09019

ADVANCED WASTE TREATMENT PLANT FEATURES NITRIFICATION,
Camp, Dresser and McKee, Inc., Boston, Mass.
J. E. Leu, and M. A. Reynolds.
Public Works, Vol. 107, No. 4, p 56-61, April, 1976. 3 fig, 2 tab.

Descriptors: *Waste water treatment, *Nitrification, *Treatment facilities, *Design criteria, Biological treatment, Sludge disposal, Landfills, Massachusetts, New England, *Tertiary treatment.
Identifiers: Physics-chemical treatment.

New England's first large, single-stage nitrification plant for waste water treatment has been planned for two communities along the Charles River in Massachusetts. It was concluded that a combination of physico-chemical and biological processes would be more efficient than either alone. A single-stage process was selected as simpler and more economical than a two-stage process. The possibility of ultimately serving a larger region was considered in the design criteria. The process steps selected were comminution, primary sedimentation, mechanical aeration, Secondary sedimentation, filtration, chlorination, and sludge processing. A filter press will be used to produce a dry sludge cake, which has advantages for landfilling. Onsite disposal as landfill is expected to be feasible until 1998. (Snyder-FIRL)
W76-09020

MODERN FILTER PRESS TECHNOLOGY FOR SEWAGE SLUDGE DEWATERING,
Edwards and Jones Ltd., Stoke-on-Trent (England).
A. S. Gunn.
Filtration and Separation, Vol. 13, No. 1, p 72, 74, 76, 78, 80, January/February, 1976. 4 fig, 1 tab.

Descriptors: *Waste water treatment, *Dewatering, *Sludge treatment, *Filters, *Water treatment, Lime, On-site tests, Wisconsin.
Identifiers: *Filter presses, Ferric chloride.

The Kenosha Water Utility plant in Wisconsin is the first American waste water treatment facility to use British filter presses and sludge dewatering technology. It has been performing at least equal to the design requirements. Sludge build-up was avoided, ensuring a more efficient waste water treatment works. Approximately 3% ferric chloride and 17% lime can be used to dewater raw mixed primary and activated, mixed digested and pre-thickened activated sludge within 2 hours. Average moisture content of the cake was always 60% or less. Full utilization of the plant can increase plant throughput. Success was achieved with in-line conditioning with a buffer tank system, but in-line macerators proved unsuccessful. With this type of automatic plant, periodic checking with C.S.T. of pH meters is useful and reliable in determining the chemical dosage and the conditioned sludge quality. If intensive site testing is performed, chemical filters are selected correctly, and modern equipment is used, it is possible for filter pressing to be effective, economical, and fully competitive with other municipal sludge dewatering methods. (Snyder-FIRL)
W76-09021

MUNICIPAL WASTE WATER TREATMENT BY ROTATING DISC METHOD (KAITEN ENBAHO NI YORU HISUI SHORI),
K. Nakayama.
Yosui to Haisui, (Journal of Water and Waste), Vol. 18, No. 1, p 37-46, 1976. 25 fig, 22 ref.

Descriptors: *Waste water treatment, *Biological treatment, Biochemical oxygen demand, Nitrification, Hydrogen ion concentration, Temperature, Dissolved oxygen concentration, Municipal wastes.
Identifiers: *Rotating discs.

Biological waste water treatment using a rotating disc process has several advantages, including simplicity of operation, flexibility with varying load of the input water, capability for advanced treatment of waste water, small electricity consumption for operating the system, and capacity for expansion of the existing system. BOD removal efficiency by the process decreases when the water temperature is less than 13 C. However, the efficiency does not change at temperatures between 13 and 30 C. The ideal pH for this treatment is between 6.5 and 8.5. The optimum rotation speed of the discs is 18 m/min for municipal waste water and 10 to 30 m/min for industrial waste water. Factors affecting nitrification in the rotating disc process are temperature, disc rotation speed, and dissolved oxygen content. Optimum conditions are the same as those in BOD removal efficiency. Nitrification is not affected if the dissolved oxygen content is greater than 0.5. (Katayama-FIRL)
W76-09022

AMMONIA NITROGEN REMOVAL FROM WASTE WATER EFFLUENTS BY ZEOLITE ION EXCHANGE AND ELECTROLYSIS COMBINATION (ZEORAITO NI YORU IONKOKANDENKAI NO KUMIAWASE NI YORU HAISUI KARANO AMMONIASEI CHISSO JOKYO),
T. Seiyama, T. Kitao, T. Hiasa, and H. Ishimaru.
Mizushori Gijutsu, (Water Purification and Liquid Wastes Treatment), Vol. 17, No. 2, p 135-147, 1976. 9 fig, 7 tab, 11 ref.

Descriptors: *Electrolysis, *Oxidation, *Waste water treatment, Nitrogen compounds, Ammonia, Zeolite, Ion exchange.
Identifiers: *Electrolytic oxidation.

The electrolytic oxidation of ammonia nitrogen was studied in the treatment of waste water using a zeolite to exchange ammonia ions. The ammonia ion fixed on the zeolite was eluted by sodium chloride solution, and electrolysis of the eluted solution was performed. This solution was then used to regenerate the zeolite, following adjustment of the sodium ion concentration. The electrolytic cell used five bi-pole electrodes, each of which consisted of six platinum electroplated titanium plates, 30 mm x 50 mm x 2 mm in size. Chlorine, hydrogen chloride, and nitrogen oxides gases generated during the electrolysis were absorbed by the sodium hydroxide solution which could be used to adjust the sodium ion concentration of the zeolite regeneration solution. Either a neutral or an alkaline pH was desirable for the elution solution, and the solution pH decreased with the electrolysis. The pH adjustment for the zeolite regeneration solution (thus the elution solution) could also be achieved by the sodium hydroxide solution used to absorb the gases generated during the electrolysis. The NaCl concentration required for the elution solution was more than one normal due to the electrolytic efficiency. In an application of the system, secondary treated sewage was treated with a zeolite which removed 90% of the ammonia nitrogen from the sample water; the electricity required to oxidize ammonia nitrogen in the zeolite elution solution was determined to be 35 to 46 KWH/kg N. (Katayama-FIRL)
W76-09023

MUNICIPAL WASTE WATER TREATMENT BY OZONE (OZON NI YORU TOSHIGESUI SHORI),
A. Takusagawa, T. Matsumura, and T. Fukuzuka.
Gesuido Kyokaishi, (Journal of Japan Sewage Works Association), Vol. 13, No. 140, p 51-58, January, 1976. 12 fig, 9 ref.

Descriptors: *Ozone, *Waste water treatment, *Tertiary treatment, Disinfection, Chemical oxygen demand, Color, Coliforms.

An ozone method has been studied for its decolorization, sterilization, and COD reduction effects, using tertiary treated sewage water. The COD removal efficiency was affected by the suspended solids concentration of the raw sample water. When sample water was filtered with a 3 micron pore filter paper, COD reduction with ozone treatment was about 23%; it was 48% when the sample water was filtered with one micron pore filter paper. Decolorization efficiency using the ozone treatment was very effective. A light yellow sample water could be completely decolorized by the ozone method in a short time, and the clarity of the treated water was comparable to that of drinking water. The degree of disinfection was determined by the number of coli group bacteria. No disinfection could be achieved with an ozone injection of 1.5 mg/liter water; however, nearly 100% of the coli group bacteria could be destroyed with an ozone injection of greater than 10 mg/liter water. A combination of ozone treatment with an electrolytic method and with an ultrasonic wave method were also studied for their effects on COD removal. The combination of ozone and ultrasonic waves did not increase the COD reduction efficiency. However, when ozone was injected between two electrodes during an electrolytic treatment, the COD reduction efficiency increased 1.5 to 2 times as compared to removal obtained with ozone alone. (Katayama-FIRL)
W76-09025

DECOLORIZATION OF NIGHT SOIL TREATMENT PLANT EFFLUENT BY OZONE (OZON NI YORU SHINYO SHORISUI NO DASSHOKU),
T. Kobayashi, H. Tachikawa, and Y. Eto.
Mizushori Gijutsu, (Water Purification and Liquid Wastes Treatment), Vol. 16, No. 11, p 1067-1073, November, 1975. 10 fig, 7 tab, 4 ref.

Descriptors: *Waste water treatment, *Ozone, *Tertiary treatment, Color, Chemical oxygen demand, Suspended solids, Coagulation, Effluents.
Identifiers: *Decolorization.

Tertiary treatment for the decolorization of domestic liquid wastes using ozone is described. Wastes which had received secondary treatment were used, and the color of the sample waste water ranged from 429 to 730. The waste water was treated in an aeration tank with bubbled ozonized air having a gas-liquid ratio of 15. By ozone flotation, up to 90% decolorization efficiency could be obtained. However, the removal efficiencies of COD, SS, and turbidity of the sample water were low, measured at a maximum of 45%, 50%, and 70%, respectively. Removal of COD and SS increased with increased ozone concentration; however, this increased ozone concentration raised the BOD level in the treated water. In order to have optimum ozone tertiary treatment, the use of coagulation before or after ozonization was necessary. Coagulation was found to be more economical before ozone treatment than after. The coagulation plus ozone tertiary treatment method gave removal efficiencies of 83.1%, 56.9%, 83.3%, and 87.6% for color, COD, turbidity, and suspended solids, respectively. (Katayama-FIRL)
W76-09026

DOUBLE FUNNEL WITH BAFFLE CASCADE AERATION UNIT,
Atara Corp., Montreal (Quebec). (Assignee).
D. S. Murphy.
United States Patent 3,931,370. Issued January 6, 1976. Official Gazette of the United States Patent Office, Vol. 942, No. 1, p 525, January, 1976. 1 fig.

Descriptors: *Waste water treatment, *Patents, *Aeration, Equipment, Sewage treatment, Aerobic conditions.

LIBRARY U. OF I. URBANA-CHAMP.

The design for an aerator for sewage has been patented. The apparatus is a double funnel with a baffled cascade aeration unit. It consists of an oxygen containing gas supply, two pairs of funnels, and baffle means. The oxygen containing gas supply means has two delivery orifices which cause the formation of two gas streams. The first two funnels converge downstream from the orifices so that the oxygen containing gas issuing from the orifice entrains liquids. The baffle means are located in the flow path between the exit from the first funnels and the entry to the second pair of funnels. The two pairs of funnels and the baffle means are secured together so that the mixture of oxygen containing gas and sewage leaving the first funnels impinges on the baffle. (Orr-FIRL)
W76-09027

GRAVITY SEPARATION OF COARSE SOLIDS IN WASTEWATER,
J. C. Lodholz, and H. Pentz.
Public Works, Vol. 107, No. 3, p 76-78, March, 1976. 5 fig.

Descriptors: *Solids removal, *Waste water treatment, *Separation techniques, Equipment, Pretreatment, Maintenance.
Identifiers: *Gravity separation.

Equipment for removing coarse solids in pre-treatment operations is discussed. The normal purpose of such equipment is to minimize wear on mechanical equipment in the subsequent treatment steps. Most equipment for removing coarse solids is designed for removing 65 mesh material. Adjustable weirs can control velocity in long flow-through grit chambers without aeration. The basis for designing aerated grit chambers is normally detention time. Coarse solids removal can affect the capability and effluent characteristics of the plant as a whole. Two inclined drag flight conveyor types may be used to handle heavy inorganic solids; the first has submerged sprockets, but only flights are submerged in the second. Aerated grit chambers are designed around other conveyor types, such as screw conveyors. Alternative methods of solids handling include scraper types in shallow settling tanks and cyclones in connection with screw washers. Monthly and yearly records should be kept of at least the volumes of coarse solids. Proper lubrication and maintenance of coarse solids removal equipment extends the life of other equipment in the plant. (Snyder-FIRL)
W76-09028

STUDIES OF HIGH-RATE BIOLOGICAL TREATMENT OF IPSWICH SEWAGE ON PILOT FILTERS USING PLASTICS MEDIA,
P. A. Banks, K. W. Hitchcock, and D. G. Wright.
Water Pollution Control, Vol. 75, No. 1, p 40-46, 1976. 2 ref.

Descriptors: *Filtration, *Waste water treatment, *Pilot plants, Suspended solids, *Biological oxygen demand, Sewage treatment, *Filters, *Biological treatment, Estuaries.
Identifiers: *High-rate biological filters.

High-rate biological filtration was investigated as a means of partially treating effluent to make it suitable to be discharged into an estuary. A pilot plant was used to study the new filter media, higher application rates, the nature and settlement of the sludge, the effects of varying the flow application frequency, and the required air access beneath the filters. Standards of 70 mg/liter suspended solids (SS) and 140 mg/liter biochemical oxygen demand (BOD) were proposed. Six biological filters which contain plastics could treat sewage at constant hydraulic loadings up to 10 cu m/cu m d with BOD loading as high as 3.5 kg/cu m d, producing an effluent with an average BOD between 70 and 80 mg/liter after settlement. The high-rate filter containing mineral media produced similar effluent quality operating at 4 cu m/cu m d hydraulic loading and 1.4 kg/cu m d BOD loading. The plastics media's specific surfaces did not affect the filter's BOD removal performance between 90 and 167 sq m/cu m. Treatment efficiency varied less with temperature than expected. The media characteristics did not affect the remaining SS concentrations in the filter effluents after quiescent settlement for 30 min. SS concentration averaged between 100 and 120 mg/liter, increasing slightly during spring. Modifications to the standard for SS have been considered. Surface dose rates of about 12 cu m/sq m d were satisfactory for distributions uniform enough to wet the top of the media adequately. High-rate filter performances were not affected by periodic liquid application at intervals of about 4 min. Full-scale high-rate biological filters containing high specific surface media can operate successfully without major provisions for ventilation. (Snyder-FIRL)
W76-09029

BASINGSTOKE SEWAGE TREATMENT WORKS, 1961-1975,
R. J. Axtell.
The Public Health Engineer, Vol. 4, No. 1, p 4-14, 22, January, 1976. 6 append.

Descriptors: *Sludge treatment, *Sewage treatment, *Treatment facilities, *Sewage, Sedimentation, Activated sludge, Sludge disposal, Aeration, Biological treatment, *Waste water treatment.
Identifiers: Basingstoke(England), Microstraining, Dry weather flow.

The design of the present sewage treatment works at Basingstoke is discussed. The Works were designed in 1960 to treat sewage from a population of 80,000 people and from existing and new industrial areas. Present standards of effluent are 8 mg/liter biochemical oxygen demand and 10 mg/liter suspended solids with an ammonia limit of 2 mg/liter in the summer and 5 mg/liter in the winter. The inlet works consist of a 51 inch bitumen lined steel sewer and two mechanically raked screens. Grit is removed with a horizontal flow circular detritor. Two storm water tanks are provided and designed to work in series. Radial flow settlement tanks are used for primary sedimentation because of the greater ease in controlling flow distribution. Sludge is drawn hydrostatically but experiments have been conducted using pneumatic desludging. This has increased sludge concentration from 4% to 5%. Aeration with diffused air is used in the biological treatment. The retention time for Stage 1 is 7 1/4 hours Dry Weather Flow (DWF) and is increased to 8 1/2 hours DWF in Stage 2 in order to increase the degree of nitrification. Activated sludge was returned by means of four air lift pumps with poor efficiency. They were replaced with a variable speed bowl pump. The use of screw pumps is recommended in the future. Circular tanks are provided for secondary settlement. Walls are scraped with chains and the sludge is withdrawn hydrostatically. Microstraining was adopted for tertiary treatment. In Stage 1 heated sludge digestion followed by drying on open beds was adopted. Some problems encountered in sludge treatment are discussed. (Pinto-FIRL)
W76-09030

WASTEWATER RESEARCH FACILITY DESIGNED FOR COMPARATIVE TESTING,
C. F. Clough.
Water and Pollution Control, Vol. 114, No. 1, p 17, 30, January, 1976.

Descriptors: *Waste water treatment, *Pilot plants, *Treatment facilities, Lime, Activated carbon, Flocculation, Sewage treatment, Testing, Testing procedures, Tertiary treatment.
Identifiers: Great Britain.

A pilot plant has been set up in Great Britain to evaluate advanced waste water treatment processes and equipment at a facility at the Coleshill Works of the Severn-Trent Water Authority. The Coleshill project is able to treat the waste in two separate complete water pollution control works in order to compare similar treatment methods. Sewage will be withdrawn from either or both of two sewers and industrial wastes may be added. Following preliminary screening and grit removal, flow control and balancing, the wastes will be passed to a movable treatment unit for advanced treatment. Reagents such as lime slurry or other flocculants are prepared in fixed equipment located near sludge dewatering facilities. The movable units will be used to experiment all types of treatment. Presently, the processes tested include liming, recarbonation, dual media filtration, and activated carbon. (Kramer-FIRL)
W76-09031

SEWER CLEANER FLUSHES OUT ACIDS,
For primary bibliographic entry see Field 8G.
W76-09032

MUNICIPAL WASTEWATER ODOR STILL A PROBLEM, PART 2,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
W. J. Hartman, and D. A. Long.
Water and Sewage Works, Vol. 123, No. 1, p 52-54, January, 1976. 1 fig, 33 ref.

Descriptors: *Odor, Municipal wastes, *Waste water treatment, *Waste water disposal, *Odor-producing algae, Chlorination, Microorganisms, Enteric bacteria, Bacteria, Sulfides, Treatment facilities, Air pollution, Chemical precipitation, Oxidation, Sludge disposal.
Identifiers: *Odor control.

Recent research has shown that coliform organisms can become airborne in moisture droplets after irrigation of golf courses with raw waste water. Microbes in soils and on the surface of growing plants have a minimal chance of survival. By following strict safety measures, the contamination of residential areas adjacent to irrigation areas can be avoided. It is concluded that the irrigation of land by sewage is hygienically safe as long as the operation is in the hands of well organized and well run companies. Air pollution associated with waste water treatment and disposal is difficult and costly to control. The main problem of waste water treatment plants is odor control. The oldest method of odor control is chlorination. Chlorine will both oxidize and disinfect. It must be applied before sulfide generation begins, and this may be in some remote part of the sewer system. Other oxidants such as ozone, chromates, manganese dioxide, and chlorinated and brominated hydrocarbons are also effective for controlling odors, but they are also expensive. Some metallic ions will precipitate with sulfide and be toxic to certain growths to control odors. Nitrates and molecular oxygen prevent the reduction of sulfate to sulfite, to control odors. Odors associated with sludge disposal can also reduce odors. Masking of odors is effective but costly. Microorganisms in the soil can reduce odors. Breaking up algae mats and the addition of pesticides will control odors in stabilization lagoons. (See also W76-05773) (Pinto-FIRL)
W76-09044

WATER PLANT WASTE TREATMENT: STATE OF THE ART, PART II,
Metcalf and Eddy, Inc., New York.
G. P. Fulton.
Public Works, Vol. 107, No. 2, p 57-60, 96, February, 1976. 2 fig.

Descriptors: *Waste water treatment, *Waste treatment, *Treatment facilities, Water treatment, Sludge treatment, *Lagoons, Dewatering, Cost analysis, Sewerage, Filtration, Centrifugation, Reviews.
Identifiers: Zero discharge.

The treatment of the waste element in water plant ischarges is discussed. Present technology can ome very close to accomplishing zero waste ischarge. Only solids must then be removed from he water plant site. The Major problem in the reatment of water plant wastes is the conditioning f sludge so that it is suitable for discharge at a easonable cost. The lagoon is the most common vaste treatment facility in use, serving as the all urpose method for treatment. The lagoon installa- ion is inexpensive but it requires a large land area nd difficulty arises in removing the sludge. Discharging wastes to the sewerage system can ause two major problems. The hydraulic ele- ients may not be able to handle the shock load of ischarges like filter backwash and the treatment lant may not be able to handle the solids loading. Dewatering of water plant waste solids in sludge rying beds can be very effective where the cli- ate provides long periods of little or no rainfall. Natural freezing on open beds has also proven to e an effective means of dewatering, again where he climate permits. Mechanical dewatering evices such as the centrifuge, the belt press, and he filter press, have been utilized with some suc- ess. For all three devices, preconditioning of the ludge is required. It may be economically feasible or some plants to recalcinate lime from the treat- ent process. The big problem the water industry aces is that the best practicable control technolo- y currently available does not provide reasonable olutions for all water plant waste treatment situa- ons. Several trends that can be expected in the uture are discussed. (Pinto-FIRL)
W76-09045

APPARATUS AND PROCESS OF SEPARATING PACKING HOUSE WASTE,
D. C. Irwin.
U. S. Patent No. 3,947,355, 7 p, 6 fig, 4 ref; Offi- ial Gazette of the United States Patent Office, Vol 944, No 5, p 2452, March 30, 1976.

Descriptors: *Patents, *Waste water treatment, Water pollution control, Water quality control, Water pollution treatment, *Organic wastes, Oily ater, *Oil pollution, Oil wastes, *Separation echniques.
Identifiers: *Packing house wastes, Tallow.

A vertically elongated tank is used as a container or separating light semi-liquid components from rge volumes of contaminated water. Volumes of uch water are passed into the container at a sub- tantial distance below the zone where the com- onents are initially separated so as to create a eep quiescent zone for the initial separation. A loped and vertically elongated ramp is used to in- ulate the mass of material from the translating nd agitating action of a series of scrapers. The crapers are arranged to act only on the upper sur- ace portions of the mass in the container to very mited depths. Each scraper is so supported as to rovide, at its bottom edge, an upward, forward nd centrally directed straight skewed or oblique ne of contact with the sloped ramp upper surface hile forming a line of contact with the wall of the ontainer adjacent the ramp at the side edge of the craper to repeatedly create V-shaped pockets ith cleanable straight line edges. The pockets so rmed serve to continually raise portions of the rface layers of the oily, semi-liquid tallow aterial on the ramp and to separate it from the quid. The scraping elements are continually auto- atically cleansed of the adherent gum-like oily aterial by the continual passage of the scraper by leansing elements located in the path of the crapers. (Sinha-OEIS)
W76-09046

METHOD FOR BIOLOGICALLY TREATING SEWAGE AND AN INSTALLATION FOR CARRYING OUT THE METHOD,
Schreiber (August), Hanover (West Germany).
. Schreiber, and B. Schreiber.
U. S. Patent No. 3,947,358, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2453-2454, March 30, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Water quality control, Water pollution treatment, *Aeration, Activated sludge, *Biological treatment, Circulation, Bubbles, *Treatment facilities.

An apparatus biologically treats sewage with aeration of a flowing sewage/activated-sludge mixture in an elongated circulation tank. It is divided by a longitudinally extending central partition terminating before and at a distance from the two end walls of the tank, into two parallel flow channels connected together at the ends, and the sewage is forced by aerators rotating near the base of the tank about a perpendicular axis of rotation on the longitudinal axis of the circulation tank, into a circulating flow about the axis of rotation and about the central partion. The circulating flow about the rotation is decelerated. By deceleration of the circulating of the circulating flow of sewage cause by the rotation of the aerators, the air bubbles issuing from the aerators are deflected from the perpendicular so that they have to travel a long distance in the sewage, with the result that the required, long residence time of the air bubbLes in the sewage is maintained. (Sinha-OEIS)
W76-09047

DIRECT CONTACT MULTI-STAGE FLASH DESALINATION,
Department of the Interior, Washington, D. C. Office of the Secretary.
For primary bibliographic entry see Field 3A.
W76-09052

PROCESS FOR ELECTROLYSIS OF BRINE,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y. (Assignee).
E. H. Cook Jr, A. T. Emergy, and B. O. Schoepfle.
U.S. Patent No. 3,948,737, 6 p, 2 tab, 1 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 312, April 6, 1976.

Descriptors: *Patents, Water pollution sources, Industrial wastes, Water pollution control, Water quality control, *Electrolysis, Separation techniques, Chlorine, Alkalis(Bases), Anodes, Cathodes, Industrial production, *Brine, *Waste water treatment, Ion exchange, Membranes.
Identifiers: Alkali metal chlorides.

The invention provides a process for the electrolysis of aqueous alkali metal chloride solutions to produce chlorine and alkali metal hydroxides which provide relatively high anode and cathode current efficiencies while operating at reduced power consumption and which does not present waste disposal problems or require the use of purge streams to control impurity buildup. The process is described of electrolyzing an aqueous alkali metal chloride solution in a electrolytic cell having an anode compartment containing an anode, a cathode compartment containing a cathode and a substantially fluid impervious permselective cationic membrane barrier separating the anode and cathode compartments. The barrier consists essentially of a hydrolyzed copolymer of tetrafluoroethylene and a sulfonated perfluorovinyl ether. An aqueous alkali metal chloride solution is continuously flowed through the anode compartment of the cell while adding water to the cathode compartment of the cell and passing an electrolytic current between the anode and cathode. (Sinha - OEIS)
W76-09053

METHOD AND APPARATUS FOR SEPARATING OIL FROM AQUEOUS LIQUIDS,
W. F. Chapman.
U.S. Patent No. 3,948,767, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 321, April 6, 1976.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Oil pollution, *Oily water, Water pollution treatment, Water quality control, *Water pollution control, *Separation techniques, Flow, Pollution abatement.
Identifiers: Oleophilic granules, Fluidized bed.

A method and apparatus are provided for separating oily particles from an emulsion in an aqueous liquid. The emulsion is passed through a bed of oleophilic granules supported on a foraminous support. The oleophilic granules, by virtue of their density are fluidized by the passage of liquid through them. The oily particles are removed from the emulsion by the oleophilic granules in the bed, and the oily material accumulates and agglomerates and is transported out of the bed by the passage of liquid. The movement of the liquid then carries the oily droplets which are formed in the bed and deposits them upon a screen positioned downstream of the bed and the aqueous liquid passes through the screen in purified form. The oil accumulates on the screen and is propelled by the moving liquid into an oil reservoir positioned downstream of the screen. (See also W76-09055) (Sinha - OEIS)
W76-09054

METHOD AND APPARATUS FOR SEPARATING OIL FROM AQUEOUS LIQUIDS,
W. F. Chapman.
U.S. Patent No. 3,948,768, 5 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 321, April 6, 1976.

Descriptors: *Patents, Industrial wastes, *Waste water treatment, Oil pollution, *Oily water, Water pollution treatment, Water quality control, Water pollution control, *Separation techniques, Flow, Flow rates, Velocity, *Pollution abatement.
Identifiers: Oleophilic granules.

A method and apparatus are provided for separating fine oily particles from aqueous liquids at very high flow velocities by passing the mixture upwardly through an unconfined mass of oleophilic granules in a column with adequate velocity to separate and lift the individual granules into the upward flowing mixture within the column where movement of the individual granules serves to collect and coalesce the fine oily particles, and finally to release large oil drops back into the mainstream of the upward flowing mixture column. These large oil drops are then intercepted and extracted by a steeply inclined screen and caused to flow to storage in the form of a fine oil film propelled by the force of the flow of the aqueous liquid through the screen. (See also W76-09054) (Sinha - OEIS)
W76-09055

LIGAND EXCHANGE PROCESS FOR REMOVAL OF AMMONIA,
Environmental Protection Agency, Washington, D.C. (Assignee).
R. A. Dobbs.
U.S. Patent No. 3,948,769, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 322, April 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Water quality control, Water pollution control, Ammonia, Ion exchange, Separation techniques, Resins, Hydrogen ion concentration.
Identifiers: Regeneration, *Ligand exchange process.

A method for the selective removal of ammonia from aqueous solutions includes the preparation of an exchanger to render it suitable for a ligand exchange process, treating waste water with the treated exchanger, and regeneration of the exchanger to return it to a form suitable for removing ammonia from further batches of waste water. In the first step a suitable exchanger is treated with a solution containing a metal ion which forms a

LIBRARY U. OF A. ARCHIVES

complex with ammonia. Exchangers which are suitable include synthetic resins with carboxylic groups and inorganic hydrous metal oxides. Resins which contain carboxylic groups and inorganic exchangers of the hydrous metal oxide type have exchange capacities which are strongly dependent on the pH of the solution. As a result of loading the exchanger under strongly basic conditions, resins with carboxylic groups are more completely ionized and will contain more complexing metal ion at equilibrium. The inorganic hydrous metal oxides will exhibit higher capacities for the metal ion at elevated pH. This method of preparation results in greater ligand exchange properties for the exchanger and greater capacity for ammonia removal. In the regeneration step, the thermal process may involve hot air or water or low pressure steam. Low pressure steam is advantageous because it provides the ligand (water) to restore the resin for reuse. (Sinha - OEIS)
W76-09056

SPLIT STREAM ULTRAVIOLET PURIFICATION DEVICE,
S. Ellner.
U.S. Patent No. 3,948,772, 4 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 323, April 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Water quality control, Water pollution control, *Water purification, Disinfection, *Ultraviolet radiation, Opacity, Flow control.
Identifiers: *Ultraviolet water purification.

A split stream ultraviolet purification device is provided in which a selected amount of clear water is added to the inlet stream of opaque untreated liquid entering an ultraviolet purification chamber. The clear water dilutes the opaque untreated liquid sufficiently to assure that the ultraviolet radiation level transmitted within the purification chamber is of a dosage high enough to effect complete disinfection. The clear water is added to the inlet stream of opaque liquid by an electric mixing valve which is controlled by an ultraviolet monitoring system which receives a signal from an ultraviolet sensor located at the perimeter of the purification chamber. The electric mixing valve adjusts the flow of clear water in accordance with the requirements of the untreated liquid to maintain a predetermined level of ultraviolet radiation within the purification chamber. The discharge pipe of the purification chamber leads to a flow control valve which limits the liquid flow to a preset rate, thus preventing an undesired decrease in the ultraviolet dosage received by the liquid due to an increase in the flow rate. (Sinha - OEIS)
W76-09058

WATER PURIFICATION PROCESS AND APPARATUS,
Environment Improvement, Inc., Torrance, Calif. (Assignee).
W. E. Lindman.
U.S. Patent No. 3,948,774, 10 p, 14 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 323, April 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Water quality control, Water pollution control, Domestic wastes, Industrial wastes, Filtration, Iron, Filters, Flocculation, Sulfur compounds, Oxydation, *Water purification.
Identifiers: Barium ions, Sulfur dioxide gas, *Chemical treatment.

A process and apparatus is described for continuously obtaining separate outflows of pure water and sterile sludge when starting with various aqueous slurries containing organic or oxidizable contaminants. The flowing mixture is first treated with sulfur dioxide and iron under conditions of closely controlled acidity and in the absence of oxygen. The invention provides a multiple-stage, closed, operating system, a primary segment of which is characterized by a self-contained, continuously recycling oxygen-free gaseous flow comprising sulfur dioxide gas which moves through an iron reaction bed concurrent with the contaminant stream. Successive segments include continuously recycled oxygen-containing gas flow and closely monitored step-wise acidity control and utilization of free ions in consecutive neutralization and treating units, including introduction of barium ions by means of which potentially solid components are retained in solution or suspension until reaching the desired flocculation stage. The sequence includes units for automatic sludge removal, backflush cleansing of alternate filtering units during continued operation of the flow-treatment, use of a non-sparking ozone generator in association with particular air treatment lines, and final purification of exhaust air before venting. (Sinha - OEIS)
W76-09059

SEPARATION BY SOLVENT EXTRACTION,
Energy Research and Development Administration, Washington, D. C. (Assignee).
C. H. Holt, Jr.
U. S. Patent No. 3,949,048, 5 p, 1 fig, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 391, April 6, 1976.

Descriptors: *Solvent extractions, Aqueous solutions, *Patents, *Waste water treatment, Water pollution treatment, Water pollution control, *Water quality control, Waste water disposal, Waste disposal, Radioactive waste disposal, Waste storage, Freezing, *Separation techniques.
Identifiers: Fission products.

A process for separating fission product values from uranium and plutonium values contained in an aqueous solution is comprised of adding an oxidizing agent to the solution to secure uranium and plutonium in their hexavalent state. The aqueous solution is contacted with a substantially water-immiscible organic solvent and agitated while maintaining the temperature at from -1 deg to -2 deg C. until the major part of the water present is frozen. Three phases form; one solid ice consisting of pure water; the second phase is a relatively concentrated aqueous solution containing mainly the fission product nitrates; and the third phase is a hexone solution containing the bulk of uranyl and plutonyl nitrates. The phases are then separated. The concentrated aqueous phase which remains unfrozen and contains the bulk of the fission product values is made ready for waste disposal. For further concentration, the aqueous liquid is subjected to a distillation process where the bulk of the water is removed. The vapors distilled off in two concentration steps may be condensed and added to the liquid aqueous phase obtained after separation of the three phases and recycled through the process again. The remaining mixture is filled into stainless steel cylinders and inserted into a cask for disposal. (Sinha-OEIS)
W76-09061

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3E.
W76-09065

HYDROLOGIC ENVIRONMENTAL EFFECTS OF SPRAYED SEWAGE EFFLUENT, TALLAHASSEE, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-09134

TREATING SEWAGE AS A RESOURC REVIVES INTEREST IN LAND DISPOSAL.
For primary bibliographic entry see Field 5E.
W76-09151

THERE IS SOMETHING NEW UNDER TH SUN,
D. A. Wilke.
Water and Wastes Engineering, Vol. 13, No. 3, 18-22, March, 1976. 4 fig.

Descriptors: *Waste water treatment, *Treatme facilities, *Energy, Topography, Anaerol digestion, Design, Heating, Maine.
Identifiers: *Solar energy.

The waste water treatment plant designed for W ton, Maine, is totally energy conscious; its desi uses a fully-integrated architectural/engineeri approach, and the plant uses siting to a maximu The site was chosen to make use of natural terr for the process hydraulic gravity flow, and the s rounding topography was selected or altered provide natural weather protection and refl sunlight onto solar collecting surfaces from sn in winter. The process layout is arranged eliminate some pumping requirements and co serve heat. The The building is well insulated fr the outdoors and various areas of the building k at different temperatures are insulated from ea other. The materials were chosen to reduce ener use for heating and lighting and many require lit energy in their manufacture. The anaerol digesters use heat provided by solar ener Pumps are used only to lift waste water into t plant. Heat from generator coolant, exhaust a and effluent is recovered with a heat pump. T plant's high degree of self-sufficiency is especia an advantage due to the area's relative win isolation. (Snyder-FIRL)
W76-09152

ANAEROBIC DIGESTION OF SOLID WAS AND SEWAGE SLUDGE INTO METHANE,
Environmental Protection Agency, Washingt D. C. Office of Solid Waste Management P grams.
S. J. Hitte.
Compost Science, Vol. 17, No. 1, p 26-36, Jan ry/February, 1976. 3 fig, 1 tab, 9 ref.

Descriptors: *Anaerobic digestion, *Sewa sludge, *Solid wastes, *Methane, Costs, Industr wastes, Municipal wastes, *Waste water tre ment.

Anaerobic digestion is discussed as a means producing methane from organic wastes to off the natural gas shortage. This process is compar with use of solid waste as a supplemental fu pyrolysis, waterwall incineration, and hydrogas cation. The current research on anaerol digestion is summarized. Estimated costs analyzed for a 1,000-ton-per-day organic wa digestion facility. The only current drawback implementing such a system is the initial inve ment. Anaerobic digestion could, if it attains plicable technology stages, maximize conversi of organic wastes into fuel; facilitate materi recovery; handle some industrial wastes a animal and crop wastes mixed with sewage slud and municipal solid waste; and operate witho causing air pollution. The processes will rem separated, however, until the various componen which are already available, are joined into a c gruent system for treating both solid waste a sewage sludge. (Snyder-FIRL)
W76-09153

PROCESSES MAKE SEWAGE COME CLE MORE CHEAPLY.
Engineering News-Record, Vol. 196, No. 1, p January 1, 1976.

criptors: *Waste water treatment, *Sewage ment, *Activated sludge, *Activated carbon, ation, Gamma radiation, Pilot plants, Costs, sylvania.
tifiers: Philadelphia(Penn).

variations of conventional sewage treatment niques have been developed which may ena- cities to stretch their funds allocated to water ation control. Philadelphia, Pennsylvania, is ently testing an activated sludge system which an aerator designed to increase air transfer reduce retention time. The system can reduce al costs of a full-scale facility by 35 to 40% compared with conventional aerators, ating costs by 10%, and land requirements by A 55 gal prototype tested by Philadelphia ved BOD removals up to 99% on raw sewage aining 200-300 ppm BOD. The system is com- ble to a pure oxygen-activated sludge system rformance, power and land requirements but simpler system without the disadvantages of complicated technology of pure oxygen ems. In addition, a plant with conventional tors is easily converted to one of this type. second innovative technique is an activated on system in which the step needed to reac- e carbon filters after saturation is eliminated. ad, the system is continually subjected to na radiation which induces oxidation of the nics that are held on the carbon. Before the e water is passed through the carbon filter-ir- tor, it is injected with oxygen and ozone. The em has been tested since 1973 at a pilot plant in etta, Georgia. Organic concentrations ranging 100 to 1150 ppm have been consistently ced by 95%. (Orr-FIRL)
-09154

IBINATION OF PHYSICAL CHEMICAL CESSES OF WASTE WATER PURIFICA- N WITH OZONE TREATMENT MBINATION PHYSI-KALISCH- MISCHER VERFAHREN DER ABWASSER- NIGUNG MIT OZON-BEHANDLUNG),
. Dietrich.
niker-Zeitung, Vol. 100, No. 2, p 68-71, 1976. 2 tab, 3 ref.

riptors: *Organic compounds, *Waste water ment, *Ozone, Municipal wastes, Industrial es, Chemical precipitation, Flocculation, Ad- ion, Biochemical oxygen demand, Chemical en demand.
tifiers: *Physico-chemical treatment.

ethod has been developed for the decomposi- of organic wastes. The process involves the of physico-chemical treatment, precipita- flocculation, adsorption, and flotation, her with an ozonization step. The precipita- flocculation/adsorption/flotation step ves at least half of the organic compounds the waste water; the remainder is decom- d by ozone in a second step. Color and odor emoved and stringent BOD and COD require- s will be met. The system has been applied to reatment of both industrial and municipal e water. (Kramer-FIRL)
-09156

/ TO DESIGN AERATED LAGOON EMS TO MEET 1977 EFFLUENT STAN- DS EXPERIMENTAL STUDIES,
n Carolina Dept. of Health and Environmen- ontrol, Columbia.
White, and L. G. Rich.
r and Sewage Works, Vol. 123, No. 3, p 85- larch, 1976. 8 fig, 1 tab.

riptors: *Aerated lagoons, *Waste water ment, *Suspended solids, Aerobic treatment, nentation, *South Carolina.

rimental studies on controlling suspended s in effluents of aerated lagoon systems are being carried out in South Carolina in two phases. One phase is a field study of the characteristics of the solids in the influents and effluents of polishing ponds of several existing aerated lagoon systems. In this phase, samples were taken of the effluents and influents of six lagoon systems on five different days in a dry weather period in late summer. During the period studied, effluents did not consistently meet the standard for suspended solids, 30 mg/liter. Some polishing ponds actually increased the concentration of suspended solids. A correlation exists between algae in aeration cells and power level. The non-algal portions of the suspended solids in the effluents apparently meet the standard of 30 mg/liter. A laboratory study was performed to determine how biological solids' settling characteristics change with the mean solids retention time. In this experiment, a given volume of synthetic waste water was added daily to an aerated cone to replace an equal volume of the contents, which was wasted. The settling characteristics of biological solids for a given waste water are affected by both the mean solids retention time and suspended solids concentration. At 22 and 23C, mean solids retention times of 4 and 5 days produced optimal settling characteristics for relatively high suspended solids concentrations. Times of about six days produced optimal settling for more dilute concentrations. (Snyder-FIRL)
W76-09157

DESTRUCTIVE AIR DEODORISATION AT A DUBLIN SEWAGE WORKS,
W. Summer.
Process Biochemistry, Vol. 11, No. 1, p 26-27, January/February, 1976.

Descriptors: *Odor, *Sewage treatment, *Hydrogen sulfide, Ozone, Oxygen, Ultraviolet radiation.
Identifiers: Deodorization, Dublin(Ireland).

Sewage odors emanating from the end point of waste collection pipeline at the Sewage Pumping Station, Dublin had caused an environmental problem. Such sewage air contains indole or benzopyrrole (C8H7N), skatole or methylindole (C9H9N) and hydrogen sulfide. Ozone had been generated at the Pumping Station by means of a silent electric discharge in a chamber through which air was passed. This method proved ineffective, and a new system was designed in which the foul air is passed through a radiation field of defined wavelengths and intensity, so that nascent oxygen atoms will form and attach themselves to the organic molecules, thus oxidizing them. Surplus oxygen will form ozone, indicating that the deodorization is complete. The radiation field is produced by ultra-violet generators of the monokymatic mercury discharge type. The advantage of producing nascent oxygen atoms is that there is a gap in the absorption spectrum of nitrogen where the emission of ultraviolet energy is a maximum; thus no nitrous gas contaminants will be formed by the breakdown of nitrogen molecules into atoms. Using five reaction chambers in series, this method has been employed to treat a sewage air flow of up to 5000 cu m per hour. (Kramer-FIRL)
W76-09158

REVIEW OF ADVANCED TREATMENT TECHNIQUES FOR WASTE WATER,
Water Pollution Research Lab., Stevenage (England).
R. W. Bayley, and P. F. Cooper.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 245-258, 1976. 5 fig, 6 tab, 16 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, *Nutrient removal, Phosphorus, Nitrogen, Activated sludge, Anaerobic conditions, Reviews.

Conventional methods of waste water treatment, while successful in some respects, remove little nitrogen and phosphorus from the wastes and are poorly adapted to sudden changes in waste water. Alternative treatment methods are being studied to remedy these problems. The activated sludge process has been modified to remove significant amounts of oxidized nitrogen from final treated effluent. Some existing plants would be able to use this method. The modified process would require additional mixed-liquor tank capacity to accomodate anoxic reactors, but its costs would probably be outweighed by the resulting savings in aeration equipment costs. High quality water may be obtained using commercially available reverse osmosis equipment. Application of the process is seriously restricted, however, by the costs involved in maintaining the high operating pressure required. This situation could be changed markedly by the development of new membranes operating at lower pressures. Several chemical methods of primary treatment have been examined, but problems have been encountered. Adsorption onto activated carbon does not efficiently remove all of the soluble organic matter present in sewage. Urea also persists in sewage, and limiting the nitrogen in the final effluent may require biological processes. (Snyder-FIRL)
W76-09159

PRESTON SEWAGE LIFT STATION MEETS FLUCTUATION IN FLOW,
For primary bibliographic entry see Field 8C.
W76-09160

WASTEWATER PLANT WILL USE NO CHEMICALS FOR SLUDGE CONDITIONING,
Camp, Dresser and McKee Inc., Boston, Mass.
J. Josti.
Water and Sewage Works, Vol. 123, No. 3, p 66-69, March, 1976. 4 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Sludge treatment, *Disinfection, Sodium compounds, Activated sludge, Connecticut.
Identifiers: Waste activated sludge, Sodium hypochlorite, New Haven(Conn).

The new East Shore waste water treatment plant in New Haven, Connecticut, will not use chemicals to condition sludge and will produce the sodium hypochlorite it uses for disinfection. The facility was designed for 40 mgd daily average flow and 100 mgd peak hourly flow. The equipment for treating the waste water will include a wet well, five vertical centrifugal pumps, four comminutors, primary sedimentation tanks where sludge, grit, and scum will be removed, aeration basins, final sedimentation basins, and two chlorine contact basins. The grit will be incinerated, and the scum and the primary sludge will be mixed. Normally, equal amounts of primary thickened sludge and waste activated sludge will be blended with some scum in a blend tank. After oxidation, the dewatered blended sludge will be incinerated. An economic analysis showed that producing sodium hypochlorite on site was the least expensive type of disinfection system. The sodium hypochlorite will be produced by electrolysis of screened, warm seawater used for cooling at a nearby electric generating station. Laboratory areas, personnel areas, and plant controls, as well as various process units, will be housed in the process building. An illuminated panel indicating the status of various units, a logging typewriter, a cathode ray tube alarm, and various controls will enable the operator to observe and control the process. (Snyder-FIRL)
W76-09161

CHEMICAL FEED: IT'S A WAY OF LIFE AT WINDSOR,
Water and Pollution Control, Vol. 114, No. 3, p 6-7, March, 1976.

Descriptors: *Nutrient removal, *Sewage treatment, *Chemical precipitation, *Polymers, De-

LIBRARY U. OF I. URBANA-CHAMPAIGN

watering, Sludge treatment, Polyelectrolytes, Phosphorus, Canada.
Identifiers: Windsor, Ontario(Canada).

The city of Windsor, Ontario, is attempting to economize the costs of Ontario's program for nutrient removal in its sewage treatment plants. Much work has been directed toward ensuring that chemicals are added proportionately to flow. Three of the city's projects use dry chemical feed; two use liquid chemicals. Dry polyelectrolytes are wetted before use. The particles are then mixed in solution and transferred to a feed tank. A meter controls application of the polymer solution from this tank. Switching to chemical treatment increased the quantity of sludge and changed its composition. Various polymers are being evaluated to correct the problem. The city also uses ferric chloride and lime for dewatering. Another project adds a phosphorus removal chemical directly to raw sewage, reducing biochemical oxygen demand loading and increasing sludge volume. This sludge is dewatered by centrifugation. Polymer effectiveness varies between the city's two sewage plants, depending upon the characteristics of the raw sewage. (Snyder-FIRL)
W76-09162

ALUM SLUDGE FROM WATER PLANT CONDITIONS SEWAGE SLUDGE,
Wayne State Univ., Detroit, Mich. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W76-09163

REVERSE OSMOSIS SEPARATION OF POLAR ORGANIC COMPOUNDS IN AQUEOUS SOLUTION,
Illinois Univ. At Urbana-Champaign. Dept. of Civil Engineering.
H. H. P. Fang, and E. S. K. Chian.
Environmental Science and Technology, Vol. 10, No. 4, p 364-369, April, 1976. 8 fig, 4 tab, 19 ref.

Descriptors: *Reverse osmosis, *Waste water treatment, *Organic wastes, Membrane processes, *Membranes, Separation techniques, Aqueous solutions, *Desalination.

Reverse osmosis was studied as a means to separate polar organic compounds from water. Thirteen polar organic compounds with low molecular weight, consisting of various functional groups, were used to test 12 reverse osmosis membranes. These compounds were separated less effectively than inorganic salts by all membranes tested. The aromatic-polyamide-(AP)-, NS-type, and cellulose acetate base membranes gave overall polar organic compound separations of 50%, 75%, and between 13% and 27%, respectively. The chemical nature and characteristics of both the molecule and the membrane determine the separation of a particular organic compound by a given membrane. Compounds with any given functional group are separated increasingly as the molecule size and branching increase. The overall separations obtained experimentally can be considered as minimum values when applying reverse osmosis in waste water treatment. (Snyder-FIRL)
W76-09165

WATER SUPPLY AND SEWAGE TREATMENT IN ARID AREAS,
Water Services, Vol. 80, No. 960, p 79-80, February, 1976.

Descriptors: *Waste water treatment, *Water supply, *Water sources, *Sewage treatment, Desalination, Oxidation lagoons, Filtration, Potable water, Water treatment, Asia.
Identifiers: Middle East.

Sewage treatment and water supply pose special problems in areas like the Middle East, in which potable water is scarce due to special environmental and geographical factors. The characteristics of the water and sewage may also be different from those found in other areas. Possible water sources include: springs, deep boreholes, and protected catchments; treated water from unprotected catchments, rivers, lakes, and water holes; and desalination of water from oceans and saline wells. Possible methods of sewage treatment include oxidation ponds, percolating filters, tertiary treatment lagoons, and sand filters. Preliminary polluted water treatment in remote areas should be simple, avoiding open storage tanks and reservoirs, with suitably treated water being used to reclaim desert land for agriculture. A need for practical guidance exists in the remote areas, due to unfamiliarity with proper treatment facilities. Although there are many plans for treatment of water and sewage in parts of the Middle East, good water supplies are virtually unknown in many areas. (Snyder-FIRL)
W76-09166

THE USE OF OXYGEN IN THE TREATMENT OF WASTE WATER,
Water Pollution Research Lab., Stevenage (England).
Notes on Water Research, No. 1, p 1-4, December, 1975. 28 ref.

Descriptors: *Oxygen, *Activated sludge, *Aerobic treatment, *Dissolved oxygen, *Waste water treatment, *Oxygenation.
Identifiers: Oxygen activated sludge.

Sufficient dissolved oxygen is essential for aerobic biological treatment of waste water. Using oxygen rather than air increases the rate at which oxygen is dissolved almost fivefold. Oxygen is produced commercially by fractional distillation of liquified air. Oxygen-enriched air is produced by pressure-swing adsorption (PSA), in which nitrogen is adsorbed from air using a zeolite. The relative costs and power requirements of PSA and the cryogenic process depend on the plant size. The techniques for more efficient oxygen use in the activated-sludge process include: agitation of oxygen and mixed liquor in a covered tank for several hrs prior to separating the effluent and sludge in a conventional sedimentation tank; releasing oxygen at the bottom of the tank; temporarily separating a side-stream of liquor into which oxygen is injected under pressure; and injecting the oxygen into a mixed liquor stream flowing downward. The advantages claimed for treating waste water with oxygen include dissolving oxygen in the mixed liquor rapidly enough that dissolved oxygen does not limit the biochemical oxidation rate; possible reduction of aerial nuisance with covered tanks; better settling characteristics and smaller quantities of sludge; and reduction of the possibility of sludge bulking. The disadvantages of oxygen use include reliance on either complex equipment or an external manufacturer, greater energy use to produce and dissolve oxygen, the need to modify the process to achieve nitrification in single-stage plants, and possible hazards in using and storing oxygen. (Snyder-FIRL)
W76-09167

SEWERAGE PROJECT ON UPSTREAM AREA OF THE YAMATO RIVER,
Nara Prefecture Sewerage Dept. (Japan).
M. Yamada.
Civil Engineering in Japan, Vol. 14, p 122-132, 1975. 4 fig, 2 tab.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, Sewerage, Water pollution control, *Settling basins, Aeration.
Identifiers: *Yamato River(Japan).

The Yamato River's upstream area is in a mountainous area of Nara Prefecture, one of Japan's historic and scenic areas. A regional sewerage project administered by the prefectural government was begun in 1970 to alleviate a pollution problem which had become apparent in the river. A treatment center was built in a low area surrounded by mountains, so that a natural flow system can be used. Treatment is based on the activated sludge process. Circular radial-flow type primary settling tanks are used. The aeration tank can be used for step aeration or tapered aeration as the load changes. Only the final settling tank is not enclosed. As much as possible of the operation is automated. Only about half of the treatment center site is used for present needs. The remainder is used as a recreation area. (Snyder-FIRL)
W76-09168

REVERSE OSMOSIS TODAY,
Process Biochemistry, Vol. 11, No. 1, p 32-34, January-February, 1976. 3 fig, 2 tab.

Descriptors: *Reverse osmosis, *Water treatment, *Waste water treatment, *Desalination, Membrane processes, Water reuse, Membranes.
Identifiers: Membrane configurations.

Representatives of various industries participated in a 2 day seminar on principles, applications, and limitations of reverse osmosis. Techniques and membrane configurations discussed include the plate and frame technique, the spiral wound technique, the tubular technique, the spaghetti technique, and the hollow fiber technique. For all of these techniques, water should not exceed stipulated pH, temperature, and chlorine levels or contain excessive hardness, particulate matter, dissolved iron, or colloidal matter. The membranes reject organic molecules with high molecular weights, including nearly all viruses and pyrogens. Reverse osmosis reduces salt by approximately 90 to 95% independently of total dissolved solids levels under approximately 1500 ppm for most waters. Because reverse osmosis is compact, it is sufficiently mobile for treating drinking water in emergencies. Use of reverse osmosis in waste water treatment is expected to increase; it can provide for recycling of effluents when combined with filtration and ion exchange. It is expected that reverse osmosis will also be used for desalination of sea water. Reverse osmosis has been used for 18 mo virtually without problems to purify water for a soft drink manufacturing plant. Another factory obtained sufficiently pure water with reverse osmosis for use in manufacturing tablets. Reverse osmosis systems must be matched to local conditions such as turbidity, water hardness, and colloid levels. (Snyder-FIRL)
W76-09169

PACKAGE SEWAGE TREATMENT PROCESS,
M. J. Martin.
Process Biochemistry, Vol. 11, No. 1, p 29-30, January-February, 1976. 1 fig, 1 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage treatment, Aeration, Activated sludge, Denitrification, Nitrification, Anaerobic conditions, Automation.
Identifiers: *Package plants.

The Degremont Diapac U. I. sewage treatment system is designed to serve populations of 100 to 30,000 inhabitants. Operation is automated as much as possible. The plant contains two compartments for aeration, clarification, or both as well as equipment for pumping and screening raw sewage. It may be extended to meet future requirements. The treatment system, which operates as an extended aeration activated sludge process, makes use of the fact that activated sludge from such a process can undergo relatively long periods with no aeration. It uses the same unit for nitrification and denitrification. The two compartments alternate between aeration and solids/liquids separation. A timer mechanism controls the change of functions. (Snyder-FIRL)
W76-09170

EMOVAL OF FAECAL COLIFORM FROM ASTE WATER BY PROPER AEROBIC OLOGICAL TREATMENT,
otre Dame Univ., Ind. Environmental Health gineering.
H. L. Howe.
ocess Biochemistry, Vol. 11, No. 1, p 18-19, 24, nuary-February, 1976. 1 tab, 16 ref.

escriptors: *Waste water treatment, *Aerobic atment, *Coliforms, *Biological treatment, ublic health, Biochemical oxygen demand, emical oxygen demand.

blic health protection is the most important ason for waste water treatment. An initial prin-al objective of aerobic biological waste water atment is the removal or reduction of bacteria. ological flocculation, which brings bacteria gether into a biological mass as a part of aerobic ological treatment, makes it possible to separate em mechanically. Undesirable anaerobic bac-ia cannot survive in the aerobic environment ovided by aerobic biological oxidation. Some croorganisms interfere with certain other bac-ia's survival. The effluents from trickling filter, tivated sludge, or anaerobic digestion contain aller numbers of all microorganisms present in e sewage before treatment. These microorgan-ns will be more concentrated in the accumulated ids than in the liquid portion. Removal of crobes parallels biochemical oxygen demand d chemical oxygen demand, and microbial den-y, especially that of coliform, is likely to be at a nimum when they are at a minimum. Coliforms n occur in waste water that does not contain nitary sewage. (Snyder-FIRL)
76-09171

CROBIOLOGY AND ACTIVATED SLUDGE,
ater Pollution Research Lab., Stevenage ngland).
L. Jones.
ocess Biochemistry, Vol. 11, No. 1, p 3-5, 24, nuary-February, 1976. 3 fig, 1 tab, 6 ref.

escriptors: *Activated sludge, *Microorganisms, inetics, *Waste water treatment, icrobiology, Bacteria, Protozoa, Biomass.

aste water is treated biologically by bringing it o contact with suitable microorganisms for a fficient period of time for the microorganisms to tabolize the polluting constituents to the quired extent. Maintaining a high bacterial mass ncentration in the aeration tank and a low sub-ate concentration in the effluent produce cul-al conditions resembling those near the end of a ch culture with nearly exhausted substrate, nimal bacterial growth rate, and possibly creased viability of the culture. The bacterial pulation in activated sludge is predominantly ribund, but biochemical oxygen demand (BOD) ewage can be removed without viable bacteria. otozoa are also present in activated sludge tems, their role being primarily concerned with rifying the final effluent. The rate of sludge noval from the system is very important in con-lling activated sludge. The obtainable degree of atment and the quantity of biological solids duced from the BOD applied to the system de-d on it. The most common, and probably most cessful, kinetic models of activated sludge, e been pragmatic models describing the overall nt performance in terms of a non-specific ameter such as BOD on first-order kinetics. st microbiological models do not account for relatively low proportion of viable bacteria in ivated sludge. Settlement and recycling are d to increase the concentration of biomass in tact with the waste water. This serves two pur-es: increasing the rate of waste water purifica-; and, reducing the amount of biological solids duced from the BOD removed. (Snyder-FIRL)
6-09172

EVALUATING ROTATING BIOLOGICAL CONTACTOR PERFORMANCE,
Weston (Roy F.), Inc., West Chester, Pa.
E. L. Stover, and D. F. Kincannon.
water and Sewage Works, Vol. 123, No. 3, p 88-91, March 1976. 8 fig, 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Organic loading, Flow rate, Chemical oxygen demand, Dissolved oxygen, Efficiencies, Performance.
Identifiers: Rotating discs.

The relationship of the organic concentrations and flow rates of a synthetic carbohydrate waste water and an industrial waste water and their influence on the removal of organics in a rotating biological contactor were investigated. A 4 ft long pilot system with 10 gal capacity was used in the investigations. Microbial populations were started in the waste water with an initial seed of sewage from a sewage treatment plant. Waste water was pumped into the first treatment stage, from which it flowed through the following five stages. Samples were collected at the influent line and at the end of every stage, and their pH, dissolved oxygen, influent and effluent temperatures, and chemical oxygen demand were measured. Increases in organic concentration and flow rate caused decreases in removal rates and treatment efficiencies. First-order decreasing removal rates at each stage characteristic of the process for both types of waste water. The rotating biological contactor's response to treatment of various waste waters varies with the constituents and characteristics of the waste waters. The removal efficiencies approach constant minimum values as the organic loadings increase. (Snyder-FIRL)
W76-09173

THE EFFECT OF FLOCCULANTS ON POST-COAGULATION SLUDGE DEWATERING (WPLYW FLOKULANTOW NA ODWADNIALNOSC OSADOW POKOAGULACYJNYCH),
A. Grossman, H. Koscielniak, W. Kusznik, and W. Pawlita.
Inzynieria Sanitarna, Vol. 19, No. 443, p 103-117, 1976. 3 fig, 2 tab, 9 ref.

Descriptors: *Flocculation, *Sludge treatment, *Dewatering, *Filtration, Measurement, *Waste water treatment, Coagulation.

The effects of flocculants on the resulting sludge and its dewaterability characteristics following coagulation were investigated. Studies were performed on commercial and laboratory scales to determine an adaptation of a method of filtration resistance measurement commonly used to estimate sludge characteristics, as well as to determine the effect of different combinations of reacting substances used in coagulation on the degree of sludge dewatering. It was found that the known method of measurement of waste water sludge filtration resistance is applicable to testing post-coagulation sludge dewatering. The proper selection of a filter size had a significant effect on the filtration resistance measurement and filter cloth BT-103 was useful for this measurement. In addition, application of flocculating agents in combination with the coagulant lowers the coefficient of the post-coagulation sludge filtration resistance. (Kramer-FIRL)
W76-09174

EFFECTS OF ACTIVATED CARBON ADDITION TO THE ACTIVATED SLUDGE PROCESS (WPLYW DODATKU WEGLA AKTYWNEGO DO PROCESU OSADU CZYNNEGO),
J. Suschka, and I. Pusz.
Inzynieria Sanitarna, Vol. 19, No. 443, p 19-32, 1976. 12 fig, 4 ref.

Descriptors: *Activated carbon, *Activated sludge, *Aeration, *Waste water treatment, Laboratory tests, Biochemical oxygen demand, Chemical oxygen demand, Nitrification, Aeration lagoons.

Laboratory scale experiments were performed to study the effect of the direct addition of activated crbon to the aeration tank in the activated sludge process. A definite increase in the removal of biochemical oxygen demand (BOD) was noted. However, no significant changes in the effectiveness of COD removal with the added activated carbon could be observed. Also, the nitrification process was slowed in the experimental activated carbon unit. (Kramer-FIRL)
W76-09175

NEWMARKET'S REPLACEMENT SEWAGE TREATMENT WORKS,
Water Services, Vol. 80, No. 959, p 50-51, January, 1976.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage treatment, Storm water, Flow rates.
Identifiers: Great Britain(Newmarket).

A new sewage treatment works recently replaced the town of Newmarket's original works in Great Britain. The works will serve a population of 20,000 initially, and can be expanded to serve 30,000. One tenth mgd of the design dry weather flow of 1.1 mgd represents flows from the village of Exning. The primary settlement and storm water tanks are located at an intermediate level between the aeration tanks and the incoming sewer, resulting in two pumping stages with screw pumps. All sludge is transported nine miles to Cambridge's works for final treatment. Newmarket's main flows pass through a measuring flume incorporating emergency overflow channel. After they are pumped to the first level and joined by sewage from Exning, grit is removed in aerated grit channels. The channel conveying the sewage to the sedimentation tanks has an overflow channel in case the second stage pumping should fail. The primary sedimentation tanks have continuously revolving scrapers sweeping sludge into a sump from which it is discharged. The flows are then pumped to two adjoining aeration chambers. The effluent is gravity fed from the aeration chambers to two settlement tanks providing the last stage of treatment. Activated sludge from these tanks is recirculated. Combined secondary and primary sludge discharged from the primary tanks flows by gravity to sludge storage/thickener tanks which hold it until delivery to Cambridge. These tanks have fixed bridge stirrers, helping to release supernatant water. (Snyder-FIRL)
W76-09176

COMBINED UTILITY PROVIDES WATER AND WASTEWATER TREATMENT.
Water and Sewage Works, Vol. 123, No. 2, p 70, February, 1976.

Descriptors: *Waste water treatment, *Water treatment, *Treatment facilities, Hydrogen sulfide, Iron, Chemical precipitation, Chlorination, Construction costs, Florida.
Identifiers: Combined treatment.

A new facility near Boynton Beach, Florida, will soon begin treating both water and waste water. It is designed to serve 4,740 units in two developments. Water is pumped from two wells, and must be treated to remove iron and hydrogen sulfide. The water is aerated and lime, alum, and certain polyelectrolytes are added. Mechanicl scrapers collect the precipitate which is produced. The system collects the effluent through radial launderers and passes it through a medium of polishing sand, graded gravel, and anthrafilt. Two pumps distribute the water among the four cells containing the medium. A contact stabilization unit having extended aeration capabilities is used to treat the waste water. The waste water being treated will be almost entirely domestic. After the effluent is

LIBRARY U. OF A. ORONO-Science

treated and chlorinated, it is conducted to two oxidation ponds. From there it will enter two transpiration-evaporation ponds. Construction costs total approximately $2.1 million, not including engineering land land. Palm Beach country will take over the utility when it is completed. (Snyder-FIRL)
W76-09177

REGINA TERTIARY TREATMENT PLANT STUDY AND DESIGN, PART I, CASE HISTORY,
M. J. Stewart, and D. H. Lewis.
Water and Pollution Control, Vol. 114, No. 3, p 28-32, 34-35, March, 1976. 3 fig, 2 tab.

Descriptors: *Tertiary treatment, *Waste water treatment, Nitrate, Phosphate, River, Waste disposal, Chemical precipitation, *Treatment facilities, Nutrient removal, Pilot plants, Design, Canada.
Identifiers: Regina(Canada), Qu'Appelle River basin.

A 1972 study showed that the waste water treatment works for the city of Regina, Canada, contributed substantial amounts of nitrogen and phosphate to local rivers. The capacity of these treatment works had been increased in 1970 by adding two series-flow aerated cells. A research program on tertiary treatment was undertaken to evaluate chemically treating stabilization pond effluent used with a settling-tube module, high-rate, upflow clarifier. There was a need for developing an economical means to improve the effluent from stabilization ponds. A pilot plant was constructed in 1971. Its main features include flow control, rapid mix, chemical feed, flocculation, and high-rate clarification facilities. It received effluent from the City's outfall line before chlorination and returned waste sludges and treated flows to the outfall. Various dosages of alum and lime were tested between September and December 1971. Further tests at warmer temperatures were performed between May and July 1972. Higher flow rates, removal of the settling-tube module, and two sampling methods were studied. Samples were tested onsite for pH, color, temperature, alkalinity, turbidity, and hardness and for other characteristics at the University of Saskatchewan. The approximate weight of algae in samples from the stabilization pond could be determined by multiplying the measured concentrations of chlorophyl by 0.05. (Snyder-FIRL)
W76-09178

THE PERFORMANCE-POTENTIAL OF POLYELECTROLYTES AND HIGH VELOCITY GRADIENTS IN THE TREATMENT OF WASTEWATERS,
Ife Univ., (Nigeria). Dept. of Agricultural Engineering.
O. Ogedengbe.
Water Research, Vol. 10, No. 4, p 343-349, 1976. 5 fig, 6 tab, 11 ref.

Descriptors: *Polyelectrolytes, *Waste water treatment, *Sewage treatment, Coagulation, Performance, Cations, Turbidity.
Identifiers: Alum, Sodium aluminate.

The use of cationic polyelectrolytes for treating domestic sewage was studied at various velocity gradients and periods of rapid mixing, both with and without coagulantaids. Slow mixing and settling followed the rapid mixing. Velocity gradients as high as 500/sec may be desirable for waste water treated with cationic polyelectrolytes. Rapid mixing periods as long as about 25 min also may be desirable. Use of bentonite clay as a coagulant aid improved the turbidity removal, but aluminum sulfate and sodium aluminate were even more effective. Sedimentation in sewage samples which had been treated with polyelectrolytes was essentially completed in 10 to 15 min. Overall performance of somewhat overloaded waste water treatment plants might be improved by using high velocity gradients, polyelectrolytes, and coagulant aids. (Snyder-FIRL)
W76-09179

AMMONIA REMOVAL BY USE OF CLINOPTILOLITE,
Langkaer Vaenge, Copenhagen (Denmark).
S. E. Jorgensen, O. Libor, K. L. Graber, and K. Barkacs.
Water Research, Vol. 10, No. 3, p 213-224, 1976. 12 fig, 7 tab, 12 ref.

Descriptors: *Ion exchange, *Polyelectrolytes, *Ammonium, Chemical precipitation, Pilot plants, Adsorption, Organic compounds, *Waste water treatment.
Identifiers: *Clinoptilolite, *Ammonia removal, Physico-chemical treatment.

The ion exchange process, using the ammonium selective ion exchanger clinoptilolite, was studied, including the dependence of the efficiency and capacity on pH, flow, and interval of regenerations and practical use in a combined physical-chemical method with chemical precipitation. The basic process was investigated in ammonium chloride, hydrochloric acid, and ammonia solutions, and in ion-free distilled water. Ammonia removal was studied as a function of time, volume treated, and number of regenerations. An attempt was made to reproduce the results of these laboratory experiments in pilot plant tests. Clinoptilolite works by ion exchange at low concentrations of the counter ion; adsorption increases at higher concentrations. The capacity is apparently around 8 mmol/100 g. The electrochemical properties of the counter ion are similar to those of the ammonium ion. The efficiency increases with the amount of material used up to a certain level. Increasing the contact time increases the capacity for times up to 120 min. Increasing the number of regenerations increases the capacity up to three regenerations. The other ions present inwaste water and tap water considerably reduce the ammonium-removal capacity as compared to distilled water. Five to 10/vv is a preferred flow rate. A combined method with chemical precipitation gives 90% removal efficiency of both organics and ammonium. The results can be duplicated on a pilot plant treating 100 liters/hr. (Snyder-FIRL)
W76-09180

CONDITIONING IMPROVES SLUDGE FILTERABILITY,
Water Pollution Control National Research Center, Cairo (Egypt).
F. A. El-Gohary, and M. Saleh.
Water and Sewage Works, Vol. 123, No. 3, p 72-76, March, 1976. 6 fig, 9 tab, 19 ref.

Descriptors: *Sludge treatment, *Filtration, *Activated sludge, Dewatering, Coagulation, *Waste water treatment.
Identifiers: Sludge conditioning, Ferric chloride.

Secondary sludge, consisting almost entirely of microorganisms produced during biological treatment, is usually harder to concentrate than primary sludge. Because it is economically difficult to provide the space required for sludge drying, the sludge must be treated with filtering agents and mechanical methods to accelerate drainage. The properties of excess sludge from a contact stabilization pilot plant were studied. The ability of surplus activated sludge to be dewatered by vacuum filtration was investigated with laboratory scale procedures. Ferric chloride, ferrous sulfate, calcium oxide, and Nalco '600 S' were used as coagulants. Sludge was thickened, reducing the volume by about 20%, before chemical treatment or aerobic digestion. The sludge's specific resistance tended to increase at increasing pressures. The specific resistance of surplus sludge from the stabilization zone was 2.09 times 10 to the 10th power after 18 hr aeration, 3.19 times 10 to the 10th power after 42 hr aeration, and 2.5 times 10 to the tenth power after 90 hr of aeration. When nitrogen and phosphorus salts were added to the sludge prior to aeration, increasing the aeration time improved the rate of filtration. Ferric chloride was the best coagulant for treating surplus activated sludge under the conditions studied. Coupling 100 mg/liter ferrous sulfate with 100 mg/liter calcium oxide also improved the clarification rate of the supernatant. Nalco '600' in dosages between 5 and 10 mg/liter reduced the sludge volume between 21 and 23%. (Snyder-FIRL)
W76-09181

TWO-STEP PHOSPHATE REMOVAL FROM SOLUTION USING ALUMINUM SALTS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
P. H. Hsu.
Environmental Letters, Vol. 10, No. 4, p 311-317, 1975. 2 tab, 4 ref.

Descriptors: *Chemical precipitation, *Phosphates, *Nutrient removal, *Waste water treatment, Iron, Aluminum, Lime, Salts.
Identifiers: Alum.

It is possible to precipitate phosphate from waste water using iron, aluminum, or lime, but this is seldom done. The procedure has been considered too expensive, although there is little conclusive information on costs. Both low residual phosphate concentration and large amounts of phosphate precipitated per mole of coagulant are desired, but these two criteria are not always compatible. An experiment was performed in which phosphate was precipitated from phosphate solutions of varying concentrations in a conventional one-step process. Three or 4 moles of aluminum sulfate must be added per mole of phosphate to produce a phosphate concentration below 0.1 ppm. In a second experiment, a dosage of aluminum approximately equal to the amount of phosphate present was first added; after an hour for settling, 3 times the amount of phosphate remaining in solution was added to the filtered solution. Between 1.6 and 2.2 moles of aluminum per mole of phosphate initially present were required to produce phosphate concentrations below 0.1 ppm. Both experiments were conducted with sample pH between 4.5 and 7; even better results may be obtained above pH 7. The two-step process may be useful in removing phosphate from waste water with high phosphate content. Similar results were obtained in experiments using aluminum chloride instead of aluminum sulfate, except that the sample pH had to be adjusted to above 6. (Snyder-FIRL)
W76-09182

SEWAGE TREATMENT WITH ACTIVATED FLY-ASH AND REGENERATED ALUM SLUDGE,
University Coll. of Science, Calcutta (India); and University Coll. of Technology, Calcutta (India).
M. Adhikari, S. K. Gupta, and B. Banerjee.
Journal of the Institution of Chemists (India), Vol. 47, Part 5, p 165-169, September, 1975. 1 tab, 1 ref.

Descriptors: *Sewage treatment, *Coagulation, Polyelectrolytes, Bacteria, Adsorption, Flocculation, Solids removal, *Waste water treatment.
Identifiers: *Alum sludge, *Fly ash.

The use of activated fly-ash/reclaimed alum sludge with a conventional coagulant in domestic sewage treatment was studied. Sewage water was treated with alum together with activated fly-ash, regenerated alum sludge, polyelectrolytes, or combinations of two agents; or with primary coagulant. Algae were enumerated and the presumptive coliform count was used to measure the bacterial population. Properly treated fly ash showed increased adsorption capacity and acted as a coagulating and flocculating agent. Polyelectrolytes and fly-ash showed a synergistic effect. Their use wi

m for sewage treatment improves the efficiency operation and increases the capacity of a given nt. The process also markedly reduced osphate content, oxygen consumed, most obable number of coliforms, and total dissolved ids in treated water. (Snyder-FIRL)
6-09183

E TYNESIDE SEWERAGE SCHEME,
rthumbrian Water Authority, Gosforth ngland).
B. Norgrove, and K. D. Staples.
rnal of the Institution of Water Engineers and entists, Vol. 30, No. 1, p 9-34, February, 1976. 6 1 tab, 5 ref.

scriptors: *Sewage treatment, *Treatment ilities, *Sewerage, Water pollution control, dge treatment, *Waste water treatment, ers, Estuaries.
ntifiers: Tyneside Sewerage Scheme(Great tain).

ch of the sewage from Tyneside, Great Britain, lischarged into the River Tyne and its tributa-, without receiving any treatment. Tyneside's verage system is currently being improved to uce the resulting pollution in the estuary. Inter-tor sewers are being built along both sides of river. Vortex-type overflows will be used to arate storm water, due to the super-critical w velocities in many sewers. The treatment cess will initially consist of screening, grit noval, and primary sedimentation; river water nitoring will determine what further treatment cesses are necessary. Optimized design ameters for the aerated spiral flow grit tanks e determined by model analysis. They were igned with sewage entering at the surface per-dicular to the tanks with a maximum longitu-al velocity of 0.2 m/sec. The minimum retention e was 2.5 min, and the air supply was based on 3 cu m/min per m tank length. A surface loading re of 36.5 cu m/sq m per day and a scour ocity of 31 mm/sec were used in designing the imentation tank. Sludge quantities were based 0.07 kg/h/d for primary sludge and 0.11 kg/h/d mixed sludge in 1975, and 0.08 kg/h/d and 0.12 h/d for primary and mixed sludge, respectively 995. The Tyne Siphon was constructed to con- sewage from the Jarrow preliminary treatment rks under the River Tyne to the Howden treat-t works. (Snyder-FIRL)
6-09184

ERGY SAVING--AN IMPORTANT CON-ERATION,
primary bibliographic entry see Field 5A.
6-09187

E NATURE OF ACTIVATED SLUDGE OCS,
versity Coll., Cardiff (Wales). Dept. of robiology.
. Steiner, D. A. McLaren, and C. F. Forster.
er Research, Vol. 10, No. 1, p 25-30, 1976. 6 3 tab, 26 ref.

criptors: *Activated sludge, *Flocculation, ste water treatment, Biological treatment, lge, Polymers, Chemical properties, Physical erties, Analytical techniques.

eral studies have confirmed that the settling erties of sludge depend upon the chemical and ical nature of the floc surface and that sludge me index may be related to the surface charge ied by the sludge particles. Several experimen-echniques were implemented to explain the nomenon of bio-flocculation. These included ge sampling, electrophoretic mobility mea-ments, thin layer chromatography, enzymic ments, and general analytic methods. From work, it appears that the activated sludge ix is composed of at least two polymeric spe-cies both of which contribute to the negative charge carried by the sludge. This charge affects the sludge settling properties. Within the matrix occurs inter-polymer bonding by metal ions. Because further cation absorption may occur by attachment to hydroxyl units in the polymers, this is believed to be the mechanism by which heavy metal ions are removed during effluent treatment. (Kramer-FIRL)
W76-09188

CHLORINATION AND IODINATION OF POLIOVIRUS AND F2,
Maryland Dept. of Natural Resources, Annapolis.
For primary bibliographic entry see Field 5A.
W76-09196

MONITORING DISSOLVED-OXYGEN CONTENT TO ASSURE CLEAN WASTEWATER,
For primary bibliographic entry see Field 5A.
W76-09202

QUALITY CONTROL IN SEWAGE TREATMENT PLANT (GESUISHORIJO NO SHISHUTSU SEIGYO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
Y. Nagata, T. Tomita, I. Takase, and S. Yoshida.
Toshiba Rebyu, (Toshiba Review), Vol. 31, No. 1, p 23-26, January, 1976. 3 fig, 6 tab, 2 ref.

Descriptors: *Water quality control, *Sewage treatment, Treatment facilities, Instrumentation, *Activated sludge, *Mathematical models, Model studies, *Waste water treatment.

Mathematical modelling for sewage treatment processes using the activated sludge method may be discussed both theoretically and experimentally. The Toshiba firm's viewpoints concerning both systems and hardware were expressed. Water quality sensors based on field results have been evaluated. Both mathematical models and present state evaluation were used to compare instrumentation systems. (Kramer-FIRL)
W76-09205

DECISION PERSPECTIVES ON URBAN STORM WATER POLLUTION,
GKY and Associates, Alexandria, Va.
For primary bibliographic entry see Field 5G.
W76-09207

HYDRAULIC CALCULATION OF SLUDGE PIPELINES IN WASTE WATER TREATMENT PLANTS (DE HYDRAULISCHE BEREKENING VAN SLIBWATERLEIDINGEN OP RIOOLWATERZUIVERINGSTALLATIES),
For primary bibliographic entry see Field 8C.
W76-09208

PROBABILITY MODELS OF WASTEWATER TREATMENT PLANT OPERATION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. W. Bulkley.
Journal of Hydrology, Vol. 28, No. 2/4, p 317-329, February, 1976. 2 fig, 3 tab, 4 ref.

Descriptors: *Waste water treatment, *Model studies, *Treatment facilities, *Phosphorus, *Operations, Biochemical oxygen demand, Suspended solids, Chemical precipitation, Probability.

Mathematical probability models have been used to evaluate the data from waste water treatment facilities and to compare performance data with planned design standards. Three years of daily operating data from a waste water treatment plant at Ann Arbor, Michigan, were studied. Parameters investigated were Voltaire suspended solids, biochemical oxygen demand, and total phosphorus. Statistical analyses showed that once chemical processes for phosphorus removal had been stabilized, the removal efficiencies of both volatile solids and BOD improved significantly and could be represented by normal distributions. Precipitation of phosphate through the addition of ferric chloride resulted in a noticeable improvement in subsequent BOD and suspended solids removal in the secondary treatment phase of plant operation. However, no parameter variation has been performed to find range differences which are not significant for the assumed distribution. (Kramer-FIRL)
W76-09210

DESIGN PROCEDURE FOR A CONTACT STABILIZATION ACTIVATED SLUDGE PROCESS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
L. D. Benefield, and C. W. Randall.
Journal Water Pollution Control Federation, Vol. 48, No. 1, p 147-152, January, 1976. 2 fig, 11 ref.

Descriptors: *Activated sludge, *Design criteria, *Waste water treatment, Equations, Mathematical models.
Identifiers: *Contact stabilization, Design equations.

One widely used modification of the activated sludge process is contact stabilization. The development of design equations for this process by using concepts proposed by Eckenfelder and Lawrence and McCarty is presented. The typical flow scheme for the contact stabilization activated sludge process is illustrated. The design procedure entails selection of the desired effluent substrate concentration, selection of desired solids concentration for the contact tank, selection of the desired sludge age, plotting of the variation of sludge volume index with sludge age, calculation of the expected solids concentration in the underflow from the secondary clarifier, operation of the stabilization tank at a solids concentration equal to the solids concentration of the underflow from the secondary clarifier, determination of kinetic coefficients, calculation of the hydraulic detention time in the contact tank, and substituting the proper values into a formula to obtain the required kinetic volume for the contact tank. Equations for each of these steps are provided, as well as details of how to further obtain the volume of the secondary clarifier. Although many assumptions were made to develop this design procedure, it is expected that it will provide the engineer with a design applicable for determining a desired treatment. (Kramer-FIRL)
W76-09211

RECENT TRENDS OF PROCESS CONTROL FOR WATER WORKS AND DRAINAGE (JOGESUIDO PUROSESU SEIGYO NO DOKO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
For primary bibliographic entry see Field 5G.
W76-09214

COMPUTER CONTROL OF SEWAGE AND RAIN WATER PUMPS AT SEWAGE TREATMENT PLANT (GESUISHORIJO NO OSUI, AMAMIZU PONPU NO KEISANKI SEIGYO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
For primary bibliographic entry see Field 8C.
W76-09215

UTILIZATION OF WASTEWATER SLUDGE FOR AGRICULTURAL SOIL ENRICHMENT,
East Bay Municipal Utility District, Oakland, Calif.
H. C. Hyde.
Journal Water Pollution Control Federation, Vol. 48, No. 1, p 77-90, January, 1976. 6 fig, 6 tab, 17 ref.

LIBRARY OF THE UNIVERSITY OF

Descriptors: *Heavy metals, *Groundwater, *Sludge disposal, Irrigation, Crops, Waste water treatment, Data collection, Heavy metals, Nutrients, *Water reuse, Waste water disposal.
Identifiers: Land application.

Waste water sludge was studied as a source of plant nutrients. Soil, groundwater, and plant samples were collected from field corn plots, pasture, irrigated pasture, and dry land. It seems to be feasible to use waste water sludge for soil enrichment subject to proper management and regulatory requirements. The soil type, topography, and sparse population of the study location were favorable for application of sludge on land. Quality and production of crops and forage were improved by sludge application. Salinity, nutrients, and trace elements did not significantly effect the soil-plant-water ecosystem. Pathogenic organisms survived in the sludge, but restricted public access and selection of crop systems and grazing animals would minimize the risks. The final status of regulatory requirements on the system is uncertain. The importance of public attitudes requires that aesthetic characteristics and effects on land quality and public health be thoroughly understood. An important technical obstacle to the process is the unknown effects of heavy metals in the sludge on the ecosystem and, eventually, in human food. The data obtained demonstrate the difficulties involved in assessing the long-term effects that heavy metals might produce. (Snyder-FIRL)
W76-09219

HEPATITIS ATTRIBUTED TO POLLUTED STREAM,
Pierce County Health Dept., Tacoma, Wash.
For primary bibliographic entry see Field 5C.
W76-09220

STUDY ON THE BALANCE OF HEAVY METALS IN ACTIVATED SLUDGE TREATMENT PROCESS (GESUI SHORI SHISETSU NI OKERU JUKINZOKURUI NO SHUSHI NI KANSURU KENKYU),
Public Works Research Inst., Tokyo (Japan).
For primary bibliographic entry see Field 5A.
W76-09222

EXPERIMENTAL REPORT FOR REGENERATION OF ACTIVATED CARBON AND RECALCINATION OF LIME SLUDGE (KASSEITAN, SEKKAI-ODEN NO SAISEI JIKKEN HOKOKU),
F. Hirose, T. Kataoka, and T. Kato.
Gesuido Kyokaishi, (Journal of Japan Sewage Works Association), Vol. 12, No. 139, p 26-36, December, 1975. 8 fig, 12 tab, 9 ref.

Descriptors: *Activated carbon, Lime, *Waste water treatment, Recycling.
Identifiers: *Regeneration, *Lime sludge recalcination, *Regeneration furnace.

The regeneration of activated carbon by a six stage regeneration furnace is described, and the recalcination of lime sludge by the same furnace is also considered. The regeneration furnace consisted of three processes: drying, roasting, and activation. The effects of the furnace temperature, regeneration time, and furnace atmosphere on the carbon and lime regenerations were studied. For carbon regeneration, an adsorption capability of 99 to 110% for iodine, phenol, DBS, and Tartrazine (MW 5498) could be obtained when the used carbon was regenerated at 850 C for 30 minutes with a total steam injection rate of about 30 kg/hr and a carbon input rate of 25 to 28 kg/sq m/hr. No decrease in the hardness of the carbon was observed by the regeneration treatment. The yield for the regeneration was more than 97% based on weight. The recovery efficiency of the pore characteristics was high, with a 91 to 101% recovery of both the pore surface area and the pore capacity being obtained. For lime sludge recalcination, 95% conversion from calcium carbonate to calcium oxide could be achieved at a temperature above 850 C for a recalcination time longer than 50 minutes. (Katayama-FIRL)
W76-09223

MONOGRAPH OF THE EFFECTIVENESS AND COST OF WATER TREATMENT PROCESSES FOR REMOVAL OF SPECIFIC CONTAMINANTS. VOL. I. TECHNICAL MANUAL,
Volkert (David) and Associates, Bethesda, Md.
For primary bibliographic entry see Field 5F.
W76-09227

CAPABILITIES AND COSTS OF TECHNOLOGY ASSOCIATED WITH THE ACHIEVEMENT OF THE REQUIREMENTS AND GOALS OF THE FWPCA OF 1972 FOR PULP AND PAPER INDUSTRY.
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 5G.
W76-09229

NEW METHOD FOR REMOVING SODIUM SULFIDE FROM SLUDGE,
Environmental Science Research Lab., Nagoya (Japan).
Y. Ueno.
Svensk Papperstidning, Vol. 79, No. 2, p 62-66, February 10, 1976. 5 fig, 6 ref, 2 tab.

Descriptors: *Sludge treatment, *Chemical precipitation, Pulp wastes, Wastes, Water pollution treatment, Industrial wastes, Water pollution sources, Sludge, *Waste water treatment, Catalysts, Oxidation, Dewatering, Neutralization, Aeration, Odor, Air pollution, Sulfur compounds, Sulfides.
Identifiers: *Sodium sulfide, Hydroquinone, Iron chloride, Ammonium peroxydisulfate, Kraft mills.

Sludge from pulp mill effluent was freed of sodium sulfide, using a catalyst system of hydroquinone, ferric chloride, and/or ammonium peroxydisulfate. The pilot-plant operation involved precipitation of sodium sulfide by oxidation in suspension, sedimentation of sludge, catalyst recovery from the suspension for reuse, and neutralization plus dewatering of the sludge for disposal. In calculating air volumes needed for complete removal of sodium sulfide from experimental data, it became obvious that multiples of the theoretical air volume were about 45 (without catalyst), 15 (for hydroquinone/ferric chloride), and 10 or less (for hydroquinone/ferric chloride/ammonium persulfate). Good results were obtained while preserving the catalytic activity. The process seems well applicable to industrial sludge treatment for kraft mill odor control and similar air pollution abatement. (Brown-IPC)
W76-09278

CONTINUOUS FILTER FOR DEWATERING SLUDGES (FILTRE CONTINU DE DESHYDRATATION DES BOUES),
Papier, Carton et Cellulose, Vol. 24, No. 11, p 45, November, 1975. 1 fig, 2 illus, 1 tab.

Descriptors: *Sludge treatment, *Dewatering, *Filters, Equipment, Filtration, Water pollution sources, Pulp wastes, Wastes, Industrial wastes, Sludge, *Waste water treatment.

Twin-wire filters made by the Andritz Co. of Graz, Austria, for continuously dewatering paper mill sludges are briefly described, including the 'P' model for fibrous sludges and the 'S' model for viscous sludges such as those coming from secondary (biological) effluent treatment. (Speckhard-IPC)
W76-09279

STUDIES OF FLOCCULATION AND SEDIMENTATION TREATMENT OF PULP MILL EFFLUENTS: AN APPROACH OF A CLOSED SYSTEM USING CALCIUM ALUMINATE HYDRATES (IN JAPANESE),
Oji Paper Co. Ltd., Kasugai (Japan).
T. Horikoshi, O. Ebinuma, K. Koide, and S. Inoue.
Japan Tappi, Vol. 30, No. 1, p 40-50, January, 1976. 13 fig, 17 ref, 3 tab. English summary.

Descriptors: *Flocculation, *Sedimentation, *Pulp wastes, *Chemical precipitation, *Waste water treatment, *Hydrates, Aluminum, Calcium, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Silica, Sludge treatment, Incineration, Sulfur, Magnesium, Drainage, Water pollution control, Sludge disposal, Closed conduits, Effluents.
Identifiers: Chemical recovery, Chemical consumption, *Calcium aluminate, Aluminum-calcium hydrates, Closed systems, Spent pulping liquors.

The flocculating/settling properties of aluminum-calcium hydrates prepared by reacting aluminum chloride with calcium hydroxide at pH 11 or above were investigated on effluents from cold-soda semichemical and high-yield sulfite pulping. The aluminum-calcium treatment was found to be superior to the use of aluminum hydroxide or massive lime dosage. Sludges from the treated effluents could be incinerated above 600 C and the chemicals recovered by carbonating the first thickener effluent below pH 8.5, so that chemical consumptions (aluminum chloride and CaO) are low in the closed system. The drainage properties of the sludge were superior to those from aluminum hydroxide treatment, and comparable to those of lime-precipitated sludge. Compounds interfering with the closed-system operation include S, Mg, and silica, since S reacts with aluminum-calcium hydrates, and silica and Mg react with calcium hydroxide to form a CaO/silican dioxide/magnesium hydroxide complex. (Brown-IPC)
W76-09284

PROBLEMS CAUSED BY INDUSTRIAL RESIDUAL WATERS TREATED IN CONJUNCTION WITH URBAN WATERS (PROBLEMAS PLANTEADOS POR LAS AGUAS RESIDUALES INDUSTRIALES EN SU TRATAMIENTO CONJUNTO CON LAS AGUAS URBANAS),
J. G. Catalan Lafuente.
Investigacion y Tecnica del Papel, Vol. 12, No. 46, p 953-967, October, 1975. English summary.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, Water pollution treatment, Water pollution sources, Wastes, Waste treatment, Toxicity, Sedimentation, Biodegration, Treatment facilities, Water pollution control.
Identifiers: *Combined treatment.

Parameters usually considered when determining waste water treatment procedures are reviewed. It is suggested that when mixtures of industrial and domestic waste waters are to be treated, it is necessary to consider the composition and volume of water to be treated, and the content of toxic substances. A treatment facility should be selected based on the type of water being processed and in agreement with the sedimentation and biodegradation rates of the substances present in the water. (Sykes-IPC)
W76-09285

FILTER MEDIA COMPARISON AT PRINCE GEORGE PULP AND PAPER (LIMITED),
Prince George Pulp and Paper Ltd. (British Columbia).
C. E. Stapley, and J. McDonald.
Canadian Pulp and Paper Association Transactions Technical Section, Vol. 1, No. 4, p 107-112, December, 1975. 14 fig, 11 ref, 8 tab.

Descriptors: *Pulp wastes, *Filters, *Suspended solids, Water pollution sources, Wastes, Industrial

astes, Bleaching wastes, Chemical precipitation, ignins, Salts, Neutralization, Biochemical oxgen demand, Color, Filtration, *Waste water eatment, Water pollution treatment, Calcium ompounds, Monitoring, Particle size, Effluents. lentifiers: Glass fibers, Filter paper, Kraft mills, olecular weight.

omparative performances of glass fiber vs. paper lters in monitoring kraft mill suspended solids of ueous effluents are discussed. Increased spended solids contents were encountered with e glass fiber filter, caused by precipitation of calum lignate during neutralization of bleachery astes. The lignin-calcium complex was characrized for settleability, 5-day BOD, color absorpon, and molecular size. Possibilities of preventg its formation are discussed. (Brown-IPC)
76-09286

USPENDED SOLIDS REMOVAL FROM OODROOM EFFLUENT,
onsolidated-Bathurst Ltd., Montreal (Quebec).
M. Mehta, Y. Lemay, and G. Menier.
: Canadian Pulp and Paper Association Environent Improvement Conference, Vancouver, Octber 15-17, 1975, Preprinted Proceedings lontreal, P.Q.), p 1-8. 7 fig, 5 tab.

escriptors: *Suspended solids, *Wood wastes, Vaste water treatment, Wastes, Industrial astes, Centrifugation, Screens, Flotation, Water llution treatment, Water purification, Pilot ants, Operation and maintenance, Bark, Waste eatment, Water pollution sources, Effluents, ater pollution control, Equipment.
entifiers: Lamella thickener, Hydrocyclonic otostrainer, Vorject cleaner, Sedifloat, oodroom effluents, Krofta Engineering Corration.

e performance of centrifugal cleaners (Vorject eaners of different sizes), a rotary slotted screen ydrocyclonic Rotostrainer), an inclined-plate ckener (Lamella Thickener), and dissolved air tation equipment (Sedifloat from Krofta Enneering Corporation) in reducing the suspended lids losses from woodroom effluent were evalued in pilot plant trials conducted mainly at the urentide and Port Alfred Division mills of Conlidated-Bathurst Ltd. This report describes the sults obtained and operating problems encounred during these studies, with emphasis on the als with the flotation unit and inclined-plate limentation clarifier. The findings showed that th the Lamella Thickener and air flotation vice were satisfactory for removing bark fines m woodroom effluent. The centrifugal cleaners l the rotary screen were ineffective for fines ving a particle size less than 100-mesh. (Witt-C)
76-09289

ONOMIC CONSIDERATIONS IN THE LECTION OF A BIOLOGICAL TREATMENT STEM,
. G. Sikes, and G. A. Nieminen.
Canadian Pulp and Paper Association Environnt Improvement Conference, Vancouver, Octer 15-17, 1975, Preprinted Proceedings ontreal, P.Q.), p 9-16. 3 fig, 19 ref, 5 tab.

scriptors: *Biological treatment, *Pulp wastes, aste water treatment, *Economics, Wastes, Intrial wastes, Water pollution sources, Water lution treatment, Aerated lagoons, Activated dge, Operating costs, Costs, Nutrients, Sludge, xicity.
ntifiers: *Kraft mills.

t comparisons of a short- and long-detention ated lagoon for a typical 800 ton/day bleached ft mill indicate minimal differences in overall ual costs between the two lagoons, providing able land is available. Similar comparisons for gh- and low-rate conventional activated sludge plant suggest that the operating cost reductions associated with the larger plant may outweigh the additional initial investment. The major reasons for reduced operating costs for low-rate biological treatment plants are lower nutrient requirements and, in the case of an activated sludge system, less excess biological sludge. Other benefits of larger plants are better toxicity reduction, lower sensitivity to raw effluent load fluctuations, and compatibility with future mill expansion or more stringent regulatory requirements. (Witt-IPC)
W76-09290

DESIGN CONSIDERATIONS OF FOAM SEPARATION PROCESS FOR DETOXIFICATION OF KRAFT EFFLUENTS,
B. C. Research Ltd., Vancouver.
K. S. Ng, and P. Temoin.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P. Q.), p 27-32. 1 fig, 1 illus, 9 ref, 9 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Foam separation, *Aeration, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Toxicity, Water pollution treatment, Bubbles, Capital costs, Operating costs, Costs, Mixing, Water quality control, Separation techniques.
Identifiers: *Kraft mills, Skum Slaker.

Foam separation effectively detoxifies bleached kraft whole mill effluent. A jet aeration system is recommended for foam generation. It produces bubbles of less than 1 mm diameter, provides 30 sq m/liter/hr of gas-liquid interfacial area (bubble surface), permits long contact time, and provides complete mixing. A turbine centrifugal type foam breaker (Skum Slaker) is recommended for foam breaking. This system exerts a positive driving force and draws the stagnant foam to the rapidly rotating blades. The capital cost of equipment for a foam separation plant detoxifying 25 million gal/day of effluent from a 750 ton/day mill is estimated to be $1,781,000. Operating costs including foam breaking and foam treatment is estimated to be $2.10/ton of pulp or 6.3 cents/1000 gal. This cost is comparable to aerated lagoon systems and is less than high rate biological systems. (Witt-IPC)
W76-09292

CHEMICAL CHARACTERISTICS, ACUTE TOXICITY AND DETOXIFICATION OF FOAM IN TWO AERATED LAGOONS,
International Pacific Salmon Fisheries Commission, Cultus Lake (British Columbia). Sweltzer Creek Salmon Research Lab.
For primary bibliographic entry see Field 5C.
W76-09295

SECONDARY EFFLUENT TREATMENT AT NORTHWOOD PULP AND TIMBER LIMITED,
Northwood Pulp and Timber Ltd., Prince George (British Columbia).
J. E. Nylund.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 65-68. 3 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Sewage treatment, *Treatment facilities, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Biological treatment, Activated sludge, Aeration, Hydrogen ion concentration, Nutrients, Water purification, Biochemical oxygen demand, Suspended solids, Aerated lagoons, Operation and maintenance, Costs, Temperature, Toxicity.

Improvements in Northwood Pulp and Timber Ltd. effluent treatment facilities over the past 9 years are outlined. The out-plant treatment facilities at the mill startup in 1966 consisted of biological treatment of only the contaminated mill sewers using an extended activated sludge treatment plant. In 1968, to handle the higher loadings from the mill, improvements were made, such as addition of floating aerators, dredging of the biobasin, better pH control, and installation of a batch makeup system for shift addition of nutrients. A 220-ft-diameter primary clarifier was installed in 1971 to eliminate the problem of solids deposition in the biobasin and to ensure that the general sewer water was treated for BOD as well as for solids. Finally, a 5-day aerated stabilization basin was installed in the secondary treatment system in late 1974. During 5 months operation of the aerated stabilization basin, it was found that BOD loadings to the receiving water have decreased approximately 20 lb/air-dry ton, problems with effluent toxicity have been eliminated, nutrient costs have decreased by 50%, and having two biological systems in service has allowed BOD polishing in the extended activated sludge plant. Although there have been great benefits from the aerated stabilization basin, the suspended solids loadings from the treatment system have not been in complete compliance with the solids requirement of 15 lb/air-dry ton, and the stabilization basin's ability to destroy BOD appears to depend on effluent temperature. (Witt-IPC)
W76-09297

DETOXIFICATION AND DECOLORIZATION OF KRAFT PULP MILL EFFLUENTS USING ACTIVATED CARBON,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, T. Tenn, J. Dorica, and S. Prahacs.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 69-75. 6 fig, 35 ref, 4 tab.

Descriptors: *Pulp wastes, *Activated carbon, *Color, *Toxicity, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution control, Aeration, Water purification, Biochemical oxygen demand, Carbon, Air, Polyelectrolytes, Capital costs, Operating costs, Costs, Effluents.
Identifiers: *Kraft mills, Aluminum sulfate.

A method developed by the Pulp and Paper Research Institute of Canada for detoxifying bleached kraft mill effluent involves addition of powdered activated carbon to the effluent, aeration for 20-30 minutes, addition of settling aids (alum and polyelectrolyte), and clarification by conventional means. Simultaneously, 70-85% of the color and 20-40% of the BOD are also removed. Recent mill-site tests of the process showed that the optimum dosages of carbon, air, alum, and polyelectrolyte for detoxification and decolorization of combined kraft mill effluents are 200 mg/liter, 14 liters/liter, 300 mg/liter, and 1 mg/liter, respectively. The treatment of effluents from a 455 ton/day kraft mill is estimated to require a capital investment of $2-3 million and an operating cost of about $6/ton of pulp. (Witt-IPC)
W76-09298

SECONDARY TREATMENT AT ONTARIO-MINNESOTA PULP AND PAPER COMPANY LIMITED, FORT FRANCES, ONTARIO,
Ontario-Minnesota Pulp and Paper Co. Ltd., Fort Frances (Ontario).
S. C. Mosher.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 93-97. 2 fig, 5 ref, 5 tab.

Descriptors: *Pulp wastes, *Treatment facilities, *Waste water treatment, Sewage treatment, Aerated lagoons, Settling basins, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Bark, Operation and maintenance, Operating costs, Costs, Water pollution control.
Identifiers: Kraft mills, Groundwood mills.

LIBRARY U. OF A. ...

The Fort Frances mill is an integrated pulp and paper complex consisting of a 500 ton/day paper mill, a 500 ton/day groundwood mill with its associated wetbarking facility, and a 500 ton/day bleached kraft mill and associated dry barking operation. A secondary treatment system has been in operation since late 1971 when an aeration lagoon and two settling basins went onstream in conjunction with the kraft mill startup. Performance data for this system are reviewed, and operating problems and their solutions are outlined. Operating costs for 1974 totaled $251,000, including $130,000 for pond cleaning ($60,000 for labor and $70,000 for equipment rental), $71,000 for nutrients, and $50,000 for power (aerators, lighting, and pumps). (Witt-IPC)
W76-09301

STUDIES ON OXYGEN-ALKALI TREATMENT OF LIGNEOUS MATERIALS. PART V. RECYCLE AND REUSE OF WASTE LIQUOR IN O-PA-P BLEACHING SEQUENCE (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood Chemistry Lab.
For primary bibliographic entry see Field 3E.
W76-09337

SEPARATION PROCESSES USED FOR POLLUTION CONTROL IN THE PULP AND PAPER INDUSTRY,
Foundation of Canada Engineering Corp. Ltd., Halifax (Nova Scotia).
R. H. Fletcher, and M. Schwartz.
American Institute of Chemical Engineers (A.I.Ch.E.) Symposium Series, Vol. 70, No. 136, p 693-712, 1974. 13 fig, 14 ref, 1 tab.

Descriptors: *Water pollution control, *Pulp and paper industry, *Separation techniques, Color, Odor, Toxicity, *Waste water treatment, Water pollution sources, Wastes, *Industrial wastes, Waste treatment, Pulp wastes, *Biological treatment, Aerated lagoons, Biochemical oxygen demand, Water pollution treatment, Effluents, Dispersion.
Identifiers: Boat Harbor(Nova Scotia), Kraft mills.

Water separation techniques for pollution control in the pulp and paper industry are reviewed. Impending shortages of petroleum products and rising costs of oil make wood-derived products more attractive. Waste separation processes are discussed, including color removal from bleached kraft mill waste water, odor and toxicity removal, and condensate stripping. Liquid-solids separation and biochemical treatment, and dispersal of effluents are also considered. A case history of the Boat Harbor, Nova Scotia, biological treatment facilities for kraft mill wastes is presented. The six-day retention aerated lagoon was based on the following criteria; flow measurements, 5-day BOD analysis, settling column tests for primary sedimentation, and allowance for future expansion. (Sykes-IPC)
W76-09340

PAPETERIES DE L'AA -- SUSPENDED SOLIDS REDUCED BY 98%, ORGANIC MATERIALS BY 74% (PAPETERIES DE l'AA -- MES REDUITES DE 98%, ET MO DE 74%),
M. Vandewoestyne, and K. Maric.
Papier, Carton et Cellulose, Vol. 24, No. 11, p 70-73, November, 1975. 3 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Water reuse, Foreign countries, Hydrogen ion concentration, Flocculation, Sludge treatment, Dewatering, Wastes, Waste treatment, Industrial wastes, Water pollution sources, Water pollution treatment, Filtration, Recycling, Chemical precipitation, Water purification, Sludge, *Organic matter, *Suspended solids.
Identifiers: *France, White water(Paper machine), Aluminum sulfate.

Efforts to reduce pollution at a French paper mill and coating plant are reviewed, including the recycling of the paper machine primary and secondary water circuits and the development of physicochemical treatment for the mill effluent. The physicochemical treatment includes acidification of the coating mill effluent, mixture of this effluent with the paper machine effluent, chemical flocculation using alum, final pH adjustment, and sludge dewatering via filtration. Possibilities for recycling the clarified effluent and for reusing the dewatered sludge are being studied. (Speckhard-IPC)
W76-09341

KINETICS AND CONTROL TESTS OF NITRIFICATION-DENITRICATION PROCESS, PART I: KINETICS,
Rensselaer Polytechnic Inst., Troy, N. Y.
L. K. Wang, M. H. Wang, C. P. C. Poon, and J. Bergenthal.
In: Proceedings of the 22nd Annual Technical Meeting of the Institute of Environmental Sciences, April 26-28, 1976, Philadelphia, Pennsylvania, p 496-500. 18 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Nitrification, *Denitrification, *Kinetics, Mathematical models, Biochemistry, Nitrogen compounds.
Identifiers: Nitrogeneous oxygen demand.

Organic nitrogen, ammonia nitrogen, nitrite nitrogen and nitrate nitrogen add to total oxygen demand by contributing a nitrogeneous oxygen demand (NOD). Since 1970, it has been recognized that this nitrogeneous oxygen demand is a potential load of stream pollution as well as the carbonaceous BOD. Activated sludge systems are now being designed that incorporate nitrification and denitrification into the overall treatment. General kinetic equations for nitrification and denitrification are presented. Important process design criteria are reviewed and discussed. Various activated sludge configurations include a three-stage biological system, a single stage unit in which sufficient time is allowed for the development of the nitrifying organisms, or a plug-flow aerobic-anoxic aeration unit. The equations presented can be considered to be mathematical models of nitrification-denitrification kinetics and chemistry. (See also W76-09366) (Orr-FIRL)
W76-09365

KINETICS AND CONTROL TESTS OF NITRIFICATION-DENITRIFICATION PROCESS, PART II: RESPIRATION AND CONTROL TESTS,
New York State Dept. of Environmental Conservation, Albany.
C. Beer, L. K. Wang, and J. Bergenthal.
In: Proceedings of the 22nd Annual Technical Meeting of the Institute of Environmental Sciences, April 26-28, 1976, Philadelphia, Pennsylvania, p 501-508. 12 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Nitrification, *Denitrification, Mathematical models, *Kinetics, *Respiration, Oxygen uptake rate, Analytical techniques, Control schemes.
Identifiers: Nitrifying ability, Denitrifying ability.

The kinetics and chemistry relating to oxygen respiration, substrate nitrate respiration, endogenous oxygen respiration, and endogenous nitrate respiration are discussed. Equations are presented for the following reactions: biological oxidation in the carbon oxidation unit; oxygen respiration in the carbon oxidation unit for glucose and for sewage; biological oxidation in the nitrification unit; oxygen respiration in the nitrification unit for sewage; the overall energy reaction in denitrification; substrate nitrate respiration for glucose and for sewage; endogenous oxygen respiration; and, endogenous nitrate respiration. The bacterial mass of a single-stage activated sludge system which incorporates carbonaceous BOD removal and nitrification-denitrification consists of three types of organisms: facultative anaerobes which perform nitrate respiration; aerobic bacteria which cannot perform nitrate respiration, and nitrifiers, nitrosomas and nitrobacter, which are capable of oxidizing ammoniacal compounds into nitrates. For plant control purposes, it is useful to obtain an estimate of the mass of nitrifying organisms and of the mass of facultative anaerobes present in the activated sludge, and to obtain a measure of their performance under uninhibited standardized conditions. The methodology for tests of nitrifying ability, denitrifying ability, and oxygen uptake rate are presented. (See also W76-09365) (Orr-FIRL)
W76-09366

AGRONOMIC AND CATTLE STUDIES WITH MUNICIPAL LIQUID DIGESTED SLUDGE,
Agricultural Research Center, Jay, Fla.
For primary bibliographic entry see Field 5E.
W76-09367

5E. Ultimate Disposal Of Wastes

RATIONALE FOR A WATER POLLUTION CODE PART 1: THE WASTE SYSTEM AND THE NATURAL SYSTEM,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W76-08839

WASTE-HEAT DISPOSAL FROM STEAM ELECTRIC PLANTS WITH REFERENCE TO THE STOCHASTIC NATURE OF SOME ENVIRONMENTAL CONDITIONS AND TO THERMAL POLLUTION CONTROL REGULATIONS,
Energoprojekt, Belgrade, (Yugoslavia).
For primary bibliographic entry see Field 5G.
W76-08865

TREATMENT AND DISPOSAL OF WASTE FLUIDS FROM ONSHORE DRILLING SITES,
Wilson Mud Service, Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5D.
W76-08910

THE TOXICITY OF DRILLING FLUIDS, THEIR TESTING AND DISPOSAL,
Alberta Energy Resources Conservation Board, Edmonton.
For primary bibliographic entry see Field 5D.
W76-08911

THE HANDLING AND TREATING OF WATER-BASED DRILLING MUDS,
Sun Oil Co., Richardson, Tex. Production Service Lab.
For primary bibliographic entry see Field 5D.
W76-08912

WASTE WATER BASE DRILLING FLUID DISPOSAL,
Dresser Industries, Inc., Houston, Tex. Oilfield Products Div.
For primary bibliographic entry see Field 5D.
W76-08914

DISPOSAL OF DRILLING FLUIDS AND DRILLED-UP SOLIDS IN OFFSHORE DRILLING OPERATIONS,
Texas A and M Univ., College Station. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 5D.
W76-08915

EGULATION OF ONSHORE AND OFFSHORE
L FIELD WASTE DISPOSAL,
xas Railroad Commission, Austin, Tex.
E. Smith.
Conference Proceedings on Environmental
pects of Chemical Use in Well-Drilling Opera-
ns, May, 1975, p. 579-584.

scriptors: *Waste disposal, *Oil wastes, State
vernments, *Texas, Regulation, Standards.

e Texas Railroad Commission, an agency of the
te of Texas, has the responsibility for the regu-
on of waste disposal on both state lands and
te waters. This includes waste disposal from oil
l gas operations. The exercise of these responsi-
ties is made under general statutory authority,
tewide rules, or special orders. (See also W76-
89) (Heiss-NWWA)
6-08919

-FLOW SEPARATOR,
primary bibliographic entry see Field 5D.
6-08983

OCESS FOR TREATING SEWAGE SLUDGE
D FERTILIZER PRODUCTS THEREOF,
gonics, Inc., Slatersville, R.I. (Assignee).
primary bibliographic entry see Field 5D.
6-08984

UIDIZED FURNACE CONSTRUCTION FOR
RNING PARTLY DEHYDRATED SLUDGE,
einstrahl A. G., Essen (West Germany).
signee).
Albrecht.
ited States Patent 3,939,782. Issued February
1976. Official Gazette of the United States
ent Office, Vol. 943, No. 4, p 1631, February,
6. 1 fig.

scriptors: *Waste water treatment, *Sludge
posal, *Incineration, *Patents, Design, Equip-
nt, Ultimate disposal.
ntifiers: Fluidized bed furnace, Dehydrated
lge.

ew configuration for a fluidized bed furnace to
nerate partially dehydrated sludge has been
ented. The furnace housing has a bottom which
ns a fluidized bed support, side walls which
ne a combustion chamber above the fluidized
, an inlet for sludge through one side wall, and
ischarge for the sludge on the opposite side
. The housing bottom consists of numerous
portions arranged at distinct elevations in
cending order from the inlet to the discharge.
ns are also provided for directing air upwardly
ugh the step portions to maintain the vertical
ration of the bed and to support combustion in
combustion chamber. (Orr-FIRL)
5-08988

THOD AND APPARATUS FOR TREATING
CONTINUOUS FLOW OF FLUID WASTE
DUCTS AND OTHER MATERIALS,
ian Construction Co., Dayton, Ohio.
signee).
primary bibliographic entry see Field 5D.
5-08993

STEWATER RECYCLING UTILIZES
KY NUTRIENTS,
primary bibliographic entry see Field 5D.
-09010

DGE HANDLING AND DISPOSAL: A SPE-
L REPORT,
primary bibliographic entry see Field 5D.
-09012

ADVANCED WASTE TREATMENT PLANT FEATURES NITRIFICATION,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W76-09020

STUDIES OF HIGH-RATE BIOLOGICAL TREATMENT OF IPSWICH SEWAGE ON PILOT FILTERS USING PLASTICS MEDIA,
For primary bibliographic entry see Field 5D.
W76-09029

WATER PLANT WASTE TREATMENT: STATE OF THE ART, PART II,
Metcalf and Eddy, Inc., New York.
For primary bibliographic entry see Field 5D.
W76-09045

SEPARATION BY SOLVENT EXTRACTION,
Energy Research and Development Administration, Washington, D. C. (Assignee).
For primary bibliographic entry see Field 5D.
W76-09061

TREATING SEWAGE AS A RESOURCE REVIVES INTEREST IN LAND DISPOSAL.
Engineering News-Record, Vol. 196, No. 14, p 22-23, April 1, 1976.

Descriptors: *Sewage treatment, *Land treatment, *Water reuse, Crops, Toxicity, Municipal wastes, Waste disposal, Waste water disposal.
Identifiers: Land application.

Numerous obstacles have been encountered by recently proposed land treatment systems for municipal wastes. Both consulting engineers and the Environmental Protection Agency have contributed to this situation, although the EPA requires that cities consider the method. The advantages of land disposal systems include returning plant nutrients to the land and reuse of water as a resource. Its disadvantages include possible toxic effects of heavy metals in the effluent and the large land areas involved. Land treatment is extremely dependent on land availability and local conditions. Some predict increasing viability for land treatment due to the high costs of other treatment methods. It is believed that land treatment has a particularly good future in small towns, whose smaller operations will cause smaller public acceptability problems. Land treatment is predicted to be popular in suburban regions with the realization that it not only treats sewage but also encourages the growth of crops and provides for open spaces. (Snyder-FIRL)
W76-09151

ANAEROBIC DIGESTION OF SOLID WASTE AND SEWAGE SLUDGE INTO METHANE,
Environmental Protection Agency, Washington, D. C. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5D.
W76-09153

NUTRIENT MASS BALANCE IN COLUMNS REPRESENTING FILL SYSTEMS FOR DISPOSAL OF SEPTIC TANK EFFLUENTS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
F. R. Magdoff, and D. R. Keeney.
Environmental Letters, Vol. 10, No. 4, p 285-294, 1975. 3 fig, 3 tab, 11 ref.

Descriptors: *Nutrient removal, *Waste water disposal, *Septic tanks, *Nitrogen, *Phosphorus, *Carbon, Septic tanks, Pollutant identification.

The distribution of carbon, nitrogen, and phosphorus was investigated in a simulated fill system for disposal of septic tank effluent. The fill system's vertical dimensions were represented in soil columns, which were dosed with septic tank effluent. After prolonged leaching, analysis revealed that carbon and nitrogen accumulated mainly in and just below the crust on top of the 60 cm sand layer. Carbon and nitrogen were sufficiently depleted from the 30 cm layer and silt loam just above the lowest layer to produce a net carbon and nitrogen loss from the soil. The columns removed approximately 22% of the influent nitrogen and almost all of the chemical oxygen demand. Influent carbon was removed by microbial respiration. Adsorption, precipitation, or a combination of the two removed phosphorus from the liquid phase; the phosphorus lost was recovered by analysis of the column soil materials. (Snyder-FIRL)
W76-09164

REGINA TERTIARY TREATMENT PLANT STUDY AND DESIGN, PART I, CASE HISTORY,
For primary bibliographic entry see Field 5D.
W76-09178

DISCHARGE OF TREATED WASTE WATER IN LAKES (DIE EINLEITUNG VON GEREINIGTEM ABWASSER IN SEEN),
For primary bibliographic entry see Field 5B.
W76-09216

PERSISTENCE OF FECAL COLIFORM INDICATOR BACTERIA ON ALFALFA IRRIGATED WITH MUNICIPAL SEWAGE LAGOON EFFLUENT,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 5C.
W76-09217

SUBSURFACE BRINE DISPOSAL - BE REASONABLE,
Engineering Enterprises, Inc., Norman, Okla.
For primary bibliographic entry see Field 5B.
W76-09261

NEW METHOD FOR REMOVING SODIUM SULFIDE FROM SLUDGE,
Environmental Science Research Lab., Nagoya (Japan).
For primary bibliographic entry see Field 5D.
W76-09278

OPTIONS FOR THE USE AND DISPOSAL OF BARK,
Neill and Gunter Ltd., Fredericton (New Brunswick).
R. D. Neill.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 99-106. 4 fig, 9 ref, 3 tab.

Descriptors: *Bark, *Waste disposal, *Canada, *Wood wastes, Disposal, Water pollution sources, Wastes, Industrial wastes, Foreign countries, Fuels, Mulching, Soil amendments, Solid wastes, Legislation, Ultimate disposal.
Identifiers: Charcoal.

Present uses and methods of bark disposal in Canada are reviewed, and environmental regulations and codes affecting its use are compared. The wood-processing industry presently disposes of 16 million tons of bark and wood waste annually. It is concluded that most bark must eventually be used as fuel. Potential profitable uses also exist for this raw material resource in producing agricultural mulch and soil additives, charcoal, and manufactured products. (Witt-IPC)
W76-09302

LIBRARY OF THE UNIVERSITY OF TEXAS AT AUSTIN

HISTORIC HEAT CURVE OF RECOVERY OPERATIONS,
B. Werenskiold.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 107-110. 1 fig.

Descriptors: *Incineration, *Fuels, *Pulp wastes, Water pollution sources, Wastes, Industrial wastes, Gases.
Identifiers: *Heat recovery, Chemical recovery.

The historic heat curve of spent pulping liquor recovery operations illustrates the gradual progress in utilizing thermal values when processing dissolved wood solids and spent chemicals. This assessment covers the past century, and includes the conversion of initially high thermal demands of 15-30 million Btu's/air-dry ton (brownstock) into net surpluses of 12-13.5 million Btu's/air-dry ton for northern conifers. Other major advances are also plotted, including more significant environmental protection measures such as stripping and flame destruction of odorous tail gases and spill retention. (Sykes-IPC)
W76-09303

OCEAN DUMPING--A RATIONAL APPROACH TO AN INTERNATIONAL PROBLEM,
Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-09304

REPORT ON THE HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE SPOIL DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
F. G. Oertel.
Available from the National Technical Information Service, Springfield, Va. 22161 as AD-A010 411 $5.50 in paper copy, $2.25 in microfiche. Final Report to the Savannah District of the Corps of Engineers, July 1974. 111 p, 36 fig, 5 tab, 9 ref.

Descriptors: *Continental Shelf, *Environmental effects, Water pollution effects Dredging, *Spoil banks, Coastal engineering, Waves(Water), Currents(Water), Winds, Storms, Ocean currents, Tidal effects, Sedimentation, Sediment transport, Sediment distribution, Settling velocity, Suspended solids, Particle size, *Georgia.
Identifiers: *Offshore spoil disposal, Siting, Underwater topography, *Savannah River(GA), Outer Continental Shelf, Offshore technology, Environmental impact.

Before selection of a site of an ocean spoil area, considerations should be given to such parameters as, proximity to an inlet, depth of water, velocity of tidal currents, velocity of coastal currents, wave character, grain size and grain settling characteristics. The Savannah River disposal area is located just within the influence of the suspended-sediment plume of the Savannah River. In this area, near-bottom tidal currents (from the inlet jet) have weakened to velocities below the threshold velocity of most of the sediment in the spoil. Major storm activity along the southeast coast is generally out of the northeast and these storms are capable of moving large ridges and mounds of spoil in a southerly direction. Thus the semistable spoil becomes active during large storms. During deposition of spoil, coarse material is accumulated in an area directly below the disposal path of the dredge. Fine-grained spoil may be dispersed a mile or more away from the disposal path of the dredge. The stability of the sediment in the disposal area is closely related to water depth and physical energy. The upper portions of the disposal mound are most susceptible to change because of their proximity to wave surge and surface currents. The combination of wave surge and surface currents during storms appears to have the greatest effect upon the movement of the mound. Biologic activity was directly related to grain size and water depth. (Sinha - OEIS)
W76-09309

WATER POLLUTION ASPECTS FROM WASTE DRILLING MUD DISPOSAL IN CANADA'S ARCTIC,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5G.
W76-09334

APPLICATION OF GROUND-WATER FLOW THEORY TO A SUBSURFACE OIL SPILL,
Geological Survey, Menlo Park, Calif. Engineering Geology Branch.
For primary bibliographic entry see Field 2L.
W76-09350

AGRONOMIC AND CATTLE STUDIES WITH MUNICIPAL LIQUID DIGESTED SLUDGE,
Agricultural Research Center, Jay, Fla.
M. C. Lutrick, and J. E. Bertrand.
In: Proceedings of the 22nd Annual Technical Meeting of the Institute of Environmental Sciences, April 26-28, 1976, Philadelphia, Pennsylvania, p 528-532. 1 fig, 7 tab, 8 ref.

Descriptors: *Waste water treatment, *Sludge disposal, Agriculture, Agronomy, Crops, Cattle, Ultimate disposal, Crop response, *Heavy metals, Crop production, Fertilization, Fertilizers.
Identifiers: *Land application, Liquid digested sludge.

Studies were conducted during 1975 to determine the crop responses, nutrient uptake and heavy metal accumulation on land treated with liquid digested sludge (LDS) and to evaluate the effects of feeding dried LDS to steers in terms of performance data, accumulation of heavy metals, microorganisms, and pesticides in the animal tissues. Corn, grain sorghum, and soybeans were grown on plots receiving 0, 7.5, 15.0, and 22.5 cm of LDS applied on an annual basis. The plots receiving no LDS were fertilized with a commercial preparation while LDS treated plots were not treated with a commercial fertilizer. Three experimental Holstein steers were fed a high roughage ration, containing 100 g of sun-dried LDS, for 219 days, while control animals were fed a high roughage diet containing no LDS. Yields from all three crops were reduced due to excessive rainfall. Soybean yields were higher from all levels of LDS application than from the commercial fertilizer treatment. The corn yield from commercial fertilizer treatment was higher than any of the LDS treatments. The higher applications of LDS produced greater sorghum yields than the commercial fertilizer although the lowest LDS application produced less yield. The lead content in the kidney tissue of the LDS fed steers was higher than that in the control animals. The content of Al, Cu, Fe, Mg, Ni, and Zn was lower in the liver of the LDS fed steers than in the control steers. Fecal coliform die-off tests performed by applying 5 cm of LDS to the soil surface with check, wet, dry, and incorporated techniques showed that about four months were required for complete die-off. (Orr-FIRL)
W76-09367

NEW YORK ALTERNATIVE DUMPSITE ASSESSMENT - RECONNAISSANCE STUDY OF SURFICIAL SEDIMENTS,
National Oceanic and Atmospheric Administration, New York. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5G.
W76-09383

5F. Water Treatment and Quality Alteration

OZONIZATION OF WATER IN MOSCOW (OZONISATION DE L'EAU A MOSCOU),
I. Tverskoi.
La Nouvelle Presse Medicale, Vol. 5, No. 2, p 6 62, 1976.

Descriptors: *Potable water, *Ozon *Disinfection, *Water treatment, Foreig research, Organoleptic properties, Colo *Treatment facilities.
Identifiers: *Moscow(USSR).

A new drinking-water ozonization plant with daily capacity of 1,200,000 cu m of water is bei installed in Moscow by the French company Tre lygaz. Ozonization is performed in two steps. Fir in a bath, ozone is admitted through porous cera ic tubes at a rate of 3 mg/liter of water f decolorization and the improvement of organole tic properties. A second step follows conventio purification and filtration. This second ste operating at an ozone expenditure of one mg/lit is used for disinfection. (Takacs-FIRL)
W76-08997

LAMELLA SETTLING TANKS (LAMELLA-A SETZBECKEN),
P. Colomb.
Gas-Wasser-Abwasser, Vol. 56, No. 1, p 43-4 1976. 3 fig, 1 tab, 4 ref.

Descriptors: *Sedimentation, *Waste water tre ment, *Water treatment, *Settling basins, Sepa tion techniques, Equipment, Potable water, Ind trial wastes.
Identifiers: *Lamella settling tanks, Chemi treatment.

General theory of sedimentation, and the uses a advantages of lamellar decanters in drinking-wa preparation and waste water treatment described. Lamellar decanters have the advant of having a large decanting surface in a limi space. They can operate at loads of up to m/hour against 2.3 m/hour for conventional s tling basins in drinking-water preparation. Th can be used with or without flocculation. waste water treatment, they are used as a fi step, operating at a load of about 15 m/hour re tive to the free water surface. In case coprecipitation, the flocculant is added after p mary treatment for sludge separation in the lam lar decanter. The rates of BOD5 and phospho elimination are 70% and 90%, respectively. In c of precipitation after biological purification, rate of elimination amounts to 90% for both BO and phosphorus. Chemical treatment is necess for efficient phosphorus elimination. Lamellar canters are highly efficient in the separation recovery of useful materials from industrial wa waters, including those from the pulp and paper dustry, metal pickling, foundries, and metallu cal plants. (Takacs-FIRL)
W76-09003

APPLICATION OF CENTRIFUGES. DEWATE ING OF SLUDGES FROM WATERWOR (APPLICAZIONE DI CENTRIFUGHE. D IDRATAZIONE DI FANGHI PROVENIENTI IMPIANTI DI POTABILIZZAZIONE),
M. Scorsa.
Inquinamento, Vol. 17, No. 11, p 49- November, 1975.

Descriptors: *Sludge treatment, *Dewater *Centrifugation, Equipment, *Polyelectroly *Suspended solids, *Water treatment, Treatm facilities.
Identifiers: Centrifuges.

Sludges which accumulate at the bottom of sludge thickeners can be dewatered in centrifuges. The solids must be able to sediment while being centrifuged, and the sedimented solids must be transportable on a discharge cone located at the end of the centrifuge drum. Such conditions are achieved by injecting a polyelectrolyte solution at certain points outside and inside the centrifuge. Turbid waters containing 0.5 to 5% suspended solids can be centrifuged. A Sharples P. 3400 SDC centrifuge is capable of handling a production of 45,000 cu m/day of sludge, by working 24 hours a day and assuming that the sludge contains about 1.5% solids. The centrifuge takes up only 2.5 by 2 meters and weighs less than 2 tons. Results vary from installation to installation, but loads remain between 5 to 8 cu m/hour, with a product containing 15 to 30% dry solids and 2 to 5 kg of polyelectrolytes per ton. In all cases, over 95% of solids is recovered. (Waltner-FIRL)
W76-09008

MODERN FILTER PRESS TECHNOLOGY FOR SEWAGE SLUDGE DEWATERING,
Edwards and Jones Ltd., Stoke-on-Trent (England).
For primary bibliographic entry see Field 5D.
W76-09021

INSTRUMENTATION AND CONTROL FOR WATER WORKS (SUIDOSETSUBI NO KEISOKU TO SEIGYO),
Yokosuka Waterworks Bureau (Japan).
I. Omata, K. Hiroi, and K. Kawabe.
Toshiba Rebyu, (Toshiba Review), Vol. 30, No. 11, p 809-812, October, 1975. 7 fig.

Descriptors: *Water works, *Water treatment, *Instrumentation, Equipment, Computers, Monitoring, *Control systems.
Identifiers: Japan.

The more modern water service systems in Japan have tendencies towards increases in scale, elimination of manpower, and more economical service. Scales of water works are being enlarged through the introduction of new monitoring instruments, telemeters, and process computers, both for intake and for distribution. Instrument control equipment has significantly increased in importance. A description is presented of the remote supervision system supplied by Toshiba to the Yokosuka Waterworks Bureau, as well as new techniques for monitoring and control of waterworks. (Kramer-FIRL)
W76-09024

CHLORINATED RESIN INTENDED FOR WATER TREATMENT,
D. P. Horning, and R. E. Robertson.
U.S. Patent No. 3,948,853, 5 p, 5 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 341, April 6, 1976.

Descriptors: *Water treatment, *Patents, *Water purification, Water quality control, *Water pollution treatment, Water pollution control, Chemical reactions, *Resins, *Chlorination, *Oxidation, Water supply.

The effect of self-oxidation is evident when chlorinated polyamides derived from urea-formaldehyde or urea-melamine-formaldehyde are used in treating water supplies. With such chlorinated resins in water, a volume of gas (consisting of carbon dioxide, nitrogen and smaller amounts of carbon monoxide) equivalent to the volume of the chlorinated polymer may be produced in less than one day. This gas production is not only undesirable in the stated application, but represents a continuing loss of active chlorine and further appears to seal off a large proportion of the remaining chlorine, effectively removing it from utilization in water treatment. This tendency to self-destruction in such systems can be reduced to a low level by using a polyamide which has been prepared by using paraformaldehyde in place of formaldehyde to produce an improved polymer and by the use of special chlorination procedures. The procedure removes, prior to final chlorination, groups easily oxidised and thus produces a final product which is less susceptible to self-oxidation in the presence of water. (Sinha - OEIS)
W76-09060

THREE-MEDIA FILTRATION PLANT TREATS A PROBLEM WATER,
Queensbury Water Dept., New York.
T. K. Flaherty.
Public Works, Vol. 107, No. 4, p 67, April, 1976.

Descriptors: *Water treatment, *Water works, *Treatment facilities, *Color, Water supply, Rivers, Wells, Filtration, Activated carbon, Potable water, New York, Hudson River.
Identifiers: Dual media filters, Activated carbon filters.

Droughts which increased the hardness and iron content of the well water supply of Queensbury, New York, as well as decreasing well output, forced the city to tap the Hudson River as a source of municipal water. Although the river is polluted from municipal and industrial sources with a color content that may exceed 20 units, it is readily amenable to treatment. The main feature of the 3 mgd treatment plant is two automatic backwash filters containing three media types. One of the filters contains a 16 inch bed of granular activated carbon with an 8 x 30 mesh, while the other filter is a dual media filter containing sand and Anthrafilt. Raw water taken from the Hudson is passed through screens which are cleaned by reversing the flow. The inflow is split between two lines which feed identical parallel treatment processes, which can operate separately or simultaneously. In each treatment sequence, the water flows into a rapid mixing basin where alum, caustic soda and chlorine are added for coagulation, pH adjustment, and disinfection, respectively. Water then flows through flocculation basins where activated carbon, potassium permanganate and a polymer may be added. The water is then retained for three hours in rectangular electrifiers. Clarified water is fed to the dual media filter and then to the carbon bed filter. Backwashing is initiated by loss of head, automatically, or at specified time intervals. The filtered water is chlorinated, neutralized, and stored before being released to the distribution system. (Orr-FIRL)
W76-09155

ALUM SLUDGE FROM WATER PLANT CONDITIONS SEWAGE SLUDGE,
Wayne State Univ., Detroit, Mich. Dept. of Civil Engineering.
D. Y. Hsu.
Water and Sewage Works, Vol. 123, No. 3, p 62-64, March, 1976. 3 fig, 12 ref.

Descriptors: *Water treatment, *Waste water treatment, *Sludge treatment, Potable water, Polyelectrolytes, Dewatering, Polymers, Lagoons, Sewage sludge.
Identifiers: Alum sludge.

Water treatment plants supplying potable water produce their own waste water in the form of sludge from sedimentation tanks. Use of small doses of polyelectrolytes instead of alum reduces the amount of sludge. The sludge produced is also easier to dewater and incinerate. Because of the higher cost of the polymers, a combination of alum and polymers may be used. The simplest method of on-site treatment of alum sludge is sludge lagooning. The same function, that of thickening the sludge, can also be performed by gravity thickeners. The most important subsequent procedure for treating the sludge is dewatering. Usually, the sludge is conditioned either physically or chemically and then dewatered mechanically. Treating sludge from water treatment together with waste water sludge is the most promising method for treating alum sludge off-site. When properly thickened and mixed with waste water sludge, alum sludge can be used to condition it for dewatering. (Snyder-FIRL)
W76-09163

WATER SUPPLY AND SEWAGE TREATMENT IN ARID AREAS,
For primary bibliographic entry see Field 5D.
W76-09166

REVERSE OSMOSIS TODAY,
For primary bibliographic entry see Field 5D.
W76-09169

COMBINED UTILITY PROVIDES WATER AND WASTEWATER TREATMENT.
For primary bibliographic entry see Field 5D.
W76-09177

FLOW VELOCITY AS A RATE DETERMINING FACTOR FOR SELF-PURIFICATION IN RIVERS (UBER DEN EINFLUSS DER STROMUNGSGESCHWINDIGKEIT AUF DIE SELBSTREINIGUNG IN FLIESSGEWAESSERN),
K. Wuhrmann, E. Eichenberger, H. A. Leidner, and D. Wuest.
Schweizerische Zeitschrift fuer Hydrologie, Vol. 37, No. 2, p 253-272, 1975. 8 tab, 5 ref.

Descriptors: *Rivers, *Model studies, Flow rates, *Flow velocities, *Kinetics, Waste assimilative capacity, *Self-purification, Path of pollutants.
Identifiers: Active transport.

Experiments have been conducted on the self-purification rate of model rivers using the function of the concentrations of pollutants and the flow velocity. Velocities of 24, 13, and 3.7 cm/sec were employed, with all other parameters remaining constant. Results indicated that the ratio of the rates of substrate transport from the flowing wave to cell surfaces and of active transport in substrate uptake is the determining factor for the rate of self-purification. Contrary to expectation, this ratio decreases rapidly with decreasing water flow velocities. Results were based on the kinetics of active transport. (Kramer-FIRL)
W76-09204

MICROFLOCCULATION--COMPARATIVE EXPERIMENTS BETWEEN SINGLE AND DOUBLE LAYER FILTERS WITH IRON AND ALUMINUM SULFATE (MICROFLOCKUNG--VERGLEICHSVERSUCHE ZWISCHEN EIN-UND ZWEISCHICHTEILTERN MIT EISEN-UND ALUMINUMSULFAT),
M. Schalenkamp.
Gas-Wasser-Abwasser, Vol. 55, No. 9, p 508-515, 1975. 24 fig, 3 ref.

Descriptors: *Water treatment, *Flocculation, Filtration, *Filters, Water quality control, Chlorination.
Identifiers: Alum, Iron sulfate, *Microflocculation, Aluminum sulfate.

Microflocculation tests in single and double layer filters with and without iron sulfate and aluminum sulfate were carried out with chlorinated lake water at the Lengg waterworks in Switzerland. Both the filter cycle and the purification efficiency (in terms of turbidity, detritus and phytoplankton) were poor when aluminum or iron sulfate doses of 8 mg/liter were used. Microflocculation was efficient with 2 mg/liter doses of either iron or aluminum sulfate, particularly aluminum sulfate, and was consistently more efficient than without flocculating agents. Therefore, chlorinated lake water, with a suspended solids content of 5-20 mg/liter, is

LIBRARY U. OF I. URBANA-CHAMPAIGN

treated by microflocculation with aluminum sulfate (2 mg/liter). A flocculating aid (0.2 mg/liter) may also be added. (Takacs-FIRL)
W76-09206

QUALITY ASSURANCE FOR GROUNDWATER,
For primary bibliographic entry see Field 5G.
W76-09213

RECENT TRENDS OF PROCESS CONTROL FOR WATER WORKS AND DRAINAGE (JOGESUIDO PUROSESU SEIGYO NO DOKO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
For primary bibliographic entry see Field 5G.
W76-09214

HEPATITIS ATTRIBUTED TO POLLUTED STREAM,
Pierce County Health Dept., Tacoma, Wash.
For primary bibliographic entry see Field 5C.
W76-09220

MONOGRAPH OF THE EFFECTIVENESS AND COST OF WATER TREATMENT PROCESSES FOR REMOVAL OF SPECIFIC CONTAMINANTS. VOL. 1. TECHNICAL MANUAL,
Volkert (David) and Associates, Bethesda, Md.
I. C. Watson, S. J. Spano, H. N. Davis, and F. M. Heider.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 442, $10.00 in paper copy, $2.25 in microfiche. EPA Report No. 430/9-75-008, August 1974. 335 p. 101 fig., 26 tab., 3 append. EPA 68-01-1833.

Descriptors: *Potable water, *Water purification, *Costs, *Technology, *Water pollution treatment, Pollutants, Physical properties, Chemical properties, Heavy metals, Organophosphorus compounds, Radioisotopes, Disinfection, Organoleptic properties, Foam separation, Water quality control, Water storage, Water tanks, Distribution systems, Sodium, Public health, Water quality standards, Pesticide removal.
Identifiers: Technical manual.

The cost and technical data for water treatment and other techniques which, when applied, will result in the production of water whose constituent limits conform to applicable federal standards, are compiled, together with capital cost analyses and operating cost data. Standards and treatment methods are given for bacteria, odor, color, turbidity, arsenic, barium, cadmium, chromium, fluorides, copper, cyanide, foaming agents, organics-carbon chloroform extract, lead, iron, manganese, mercury, nitrates, selenium, silver, sodium, various pesticides, common organophosphates, radioactive contaminants, sulfates, zinc, and tritium. Discussed also are methods of water source protection, treated water storage, control of water quality in distribution systems, and water treatment processes and associated costs. Guidelines are provided for treatment process selection and their effectiveness, giving unit cost curves. Appendix A gives federal bacteria standards and guidelines, and Appendix B discussed sodium levels in treated water as they relate to public health. The information is directed to utilities and engineering consultants in devising preliminary plans and cost estimates for improved water supply facilities. (Auen-Wisconsin).
W76-09227

EPA STANDARDS FOR DRINKING WATER BECOME EFFECTIVE IN JUNE, 1977.
The Johnson Drillers Journal, Vol. 48, No. 2, p 5-8, March-April, 1976. 3 fig, 4 tab.

Descriptors: *Potable water, *Federal government, *Water quality control, *Water quality act, Standards, Organic wastes, Inorganic wastes, Water analysis, Sampling, *Water quality standards.
Identifiers: *Safe Drinking Water Act of 1974, *National standards, Enforcement of standards, Water systems classification, Community water systems, Non-community water systems, Small community water systems, Contaminant levels, Sampling frequencies.

The Federal Environmental Protection Agency issued interim primary drinking water regulations on December 10, 1975, as the first step in setting national standards for drinking water quality, under the provisions of the Safe Drinking Water Act of 1974. The standards become effective in June, 1977, and will apply to all public water systems. Primary responsibility for enforcing the standards will rest with state governments, but if a State fails to demonstrate its enforcement ability, EPA will take over enforcement. Two classes of water systems are defined; community water systems, and non-community water systems. The community system supplies at least 15 service connections used by year-round residents or serves at least 25 year round residents. All other public water systems are defined as non-community systems. Non-community systems basically service transients. They include hotels, motels, restaurants, service stations, and campgrounds; some schools, factories and churches also fall in this category. Special rules apply to small community water systems which would be severly stressed by the economic imposition of a large treatment facility. Siting requirements for wells are outlined by the standards and state that new wells will not be located in areas subjected to disaster such as floods, earthquakes or fires which would cause a breakdown of the system. Contaminant levels and sampling frequencies are also set. (Heiss-NWWA)
W76-09356

5G. Water Quality Control

BIODEGRADATION OF POLYNUCLEAR AROMATIC HYDROCARBON POLLUTANTS BY SOIL AND WATER MICROORGANISMS,
Illinois Univ. at Urbana-Champaign. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-08752

POTENTIALLY BENEFICIAL USES OF SULFURIC ACID IN SOUTHWESTERN AGRICULTURE,
Arizona Univ. Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3F.
W76-08766

ASSESSMENT AND ERADICATION OF HEAVY METAL POLLUTION IN A PLANNED URBAN ENVIRONMENT,
For primary bibliographic entry see Field 5C.
W76-08795

THE IN VITRO SENSITIVITY OF SOME SPECIES OF CHLOROPHYCEAE TO A SELECTED RANGE OF HERBICIDES,
Saskatchewan Univ., Regina. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08824

RATIONALE FOR A WATER POLLUTION CODE PART 1: THE WASTE SYSTEM AND THE NATURAL SYSTEM,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
I. G. Wallis.
International Journal of Environmental Studies, Vol. 8, No. 1, p 5-16, 1975. 2 fig., 72 ref.

Descriptors: *Pollutants, *Environmental effects, *Waste disposal, *Balance of nature, *Recycling, Ultimate disposal, Waste assimilative capacity, Byproducts, Forecasting, Persistence, Ultimate disposal, Australia, Water pollution, Water quality standards, Model studies.
Identifiers: *Waste impact, Waste load, Environmental impact.

A water pollution code to balance the interests of people as waste generators against the unpleasant consequences of waste discharge must be based on the flow of materials between man and the natural environment and the impact of these on natural systems. The flow of wastes is divided into five parts: (1) Waste generation, (2) waste treatment, (3) waste transport, (4) waste interaction, and (5) waste decay. The processes involved in each part of the waste system are described, and can be modelled for each type of waste, though the accuracy of the models depends on the type of waste and the area of discharge. Overall, the distribution of wastes cannot be predicted to any more than an order of magnitude. Parameters quantifying the change in the natural system in respone to the waste load, defined as the waste impact, are also grouped into five areas: (1) Risk to human health, (2) monetary cost or loss, (3) amenity use, (4) key biological species, and (5) ecological structure. Waste impact models, despite their large margin of error, enable consequences of a range of different waste loads to be predicted. These predictions are required to more effectively evaluate the cost-benefit tradeoff of improved water quality. (Luedtke-Wisconsin).
W76-08839

MANAGEMENT OF WASTE HEAT AT NUCLEAR POWER STATIONS, ITS POSSIBLE IMPACT ON THE ENVIRONMENT, AND POSSIBILITIES OF ITS ECONOMIC USE,
Atomic Energy Commission, Washington, D. C.
W. G. Belter.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a Symposium held at Oslo, August 26-30, 1974. p 3-23, 3 tab, 60 ref.

Descriptors: *Thermal effects, *Heated water, Nuclear powerplants, Effluents, Standards, Water quality standards, Management.

Concern over the effects of rising temperatures in surface waters and the limited long-term availability of adequate cooling-water supplies have resulted in a trend towards the use of closed-cycle cooling systems. The development of dry-cooling tower systems is proceeding for use in water-short areas. Research is continuing on the ecological effects of heated water discharges. EPA effluent guidelines can have a significant bearing on the direction and extent of future thermal-effects research. A continuing energy shortage may provide a stimulus into research on beneficial uses of waste heat. (See also W76-08848) (Chilton-ORNL)
W76-08849

FOG FORMATION AND FOG ELIMINATION,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
P. Berliner.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 75-84, 4 fig, 5 ref.

Descriptors: *Environmental engineering, *Fog, *Environmetal control, Numerical analysis.

The process phases of fog formation and natural fog elimination were demonstrated on psychrometric charts. The phases are identified as (1) enthalpy rise of air within the non-saturation range; (2) fog formation in the air leaving the saturation state; (3) elevation of the warmed air to the top of the chimney; (4) mixing of warmed air with

ambient air within the two-phase range of satu-
on; (5) condensation of warmed air on the
und; and (6) enthalpy decrease of air within the
-saturation range. Possible operation processes
prevent fog are summarized as (1) increase of
t transfer surface to reduce the cooling-water
perature; (2) increase of air rate to reduce the
halpy rise beyond the saturation line; (3) appli-
on of dry convective cooling in closed cycles;
mixing of supersaturated moist air with
arately warmed dry air; (5) evaporation and
sequent dry operation; and (6) dry operation
subsequent evaporation. (See also W76-08848)
ilton-ORNL)
6-08854

OLING TOWER EXPERIENCE AND THE
TEOROLOGICAL CONSEQUENCES OF
ERMAL DISCHARGES FROM NUCLEAR
WER PLANTS IN THE FEDERAL REPUBLIC
GERMANY,
itscher Wetterdienst, Offenbach am Main
est Germany).
Bartels, and J. W. Caspar.
Environmental Effects of Cooling Systems at
clear Power Plants, CONF-740820.
ceedings of a symposium held at Oslo, August
0, 1974. p 85-98, 11 fig, 6 ref.

criptors: *Model studies, Environmental ef-
s, *Meteorology, Cooling towers, At-
sphere, Air pollution effects.
ntifiers: Plume.

dies of the form and extent of thermal
charges in relation to atmospheric conditions
summarized. To predict the expected effects
cooling tower, different computation models
e established simulating the diffusion of a cool-
tower vapour plume in the atmosphere. Simul-
eously with the atmospheric measurements, the
eorological parameters of temperature and hu-
ity must be measured within the cooling tower.
asurements reveal that considerable dif-
nces may exist at different places within the
er, especially when strong winds prevail.
ults of the model studies are given, including
extent of the changes of air temperature, air
nidity, shadows due to clouds and precipitation
ending on the site and type of cooling tower.
e also W76-08848) (Chilton-ORNL)
6-08855

ASONAL FEATURE OF THERMAL ABATE-
NT OF SHORELINE DISCHARGES AT
CLEAR SITES,
bha Atomic Research Centre, Bombay (India).
vironmental Studies Section.
. Kamath, I. S. Bhat, R. P. Gurg, B. B. Adiga,
S. Chandramouli.
Environmental Effects of Cooling Systems at
clear Power Plants, CONF-740820,
ceedings of a Symposium held at Oslo, August
0, 1974. p 217-225, 4 tab, 3 fig, 4 ref.

criptors: *Environmental effects, *Thermal
ution, Seasonal, Nuclear powerplants, Coasts,
es, Stratification, Dissolved oxygen.

perature measurements of condenser
charges were made at two nuclear stations,
apur at a coastal site and Rajasthan at an inland
. At Tarapur, the discharges are released
ugh two canals on either side of the intake.
canal operates from the start of rising tide to
k and the other canal takes over as the tide
des. The lowering of effluent temperature
ugh a traverse in the canal is small. At first
ing with seawater, there is a drop of 3-4
rees C from the outfall temperatures. Observa-
s confirm that the region of thermal influence
Tarapur is not likely to extend beyond 1 km
n the outfall in all directions. During the three
nth monsoon season, effects of thermal
harge will not be felt. Seasonal and diurnal
perature changes are greater at Rajasthan site.
The lake is highly stratified and water movement is basically dependent on wind speed and direction. Seasonal high temperatures affect lake turnover. Similar turnovers were investigated at the reactor site. The turnover phenomenon may apparently keep down the temperature rise through greater mixing but it causes an overall increase in pollutants and lowered dissolved oxygen content. (See also W76-08848) (Chilton-ORNL)
W76-08862

WASTE-HEAT DISPOSAL FROM STEAM ELECTRIC PLANTS WITH REFERENCE TO THE STOCHASTIC NATURE OF SOME ENVIRONMENTAL CONDITIONS AND TO THERMAL POLLUTION CONTROL REGULATIONS,
Energoprojekt, Belgrade, (Yugoslavia).
M. M. Mesarovic.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 311-330, 10 fig, 11 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Regulation, Heated water, Waste water(Pollution), Cooling towers, Probability, Nuclear powerplants, Electric powerplants.

The paper analyzes the environmental impact of waste-heat discharges from steam-electric plants with once-through cooling systems and with cooling towers in light of thermal pollution control regulations and water-temperature standards. Particular attention is given to siting criteria. It was concluded that a deterministic approach to the site selection may leadto conservative solutions concerning once-through cooling capabilities of natural water bodies. The probabilistic approach, which makes use of the stochastic nature of environmental conditions and lead requirements by assigning a quantitative probability of occurrence to every situation, proved to be realistic. From the viewpoint of nuclear power plants, this approach enables a better use of their geographically independent siting performances. (See also W76-08848) (Chilton-ORNL)
W76-08865

THERMAL DISCHARGE STUDIES ON THE GREAT LAKES-THE CANADIAN EXPERIENCE,
Ontario Hydro, Toronto.
W. R. Effer, and J. B. Bryce.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium, Oslo, August 26-30, 1974, p 371-388, 5 fig, 1 tab, 5 ref.

Descriptors: *Thermal pollution, *Environmental effects, Water cooling, Model studies, Fish, Benthos, Temperature, Seasonal, *Great Lakes, *Canada, Water quality standards.

Guidelines and criteria for once-through cooling systems are outlined. A model, which has been developed from on-site measurements, to predict thermal plumes under a range of conditions is discussed. Also discussed are models of sites which are used to solve problems of temperature distribution. Biological studies were made at Pickering site and Bruce site. At Pickering it was found that benthic fauna diversity was consistently but not significantly lower in the immediate discharge area. Low seasonal variations in diversity suggested that community stability was not reduced. The brown bullhead dominated the fish populations in the heated area. Periphyton growth was enhanced by increased currents and temperature. At Bruce, the benthic fauna populations decreased slightly but this may have been due to hydrogen sulphide from the heavy water plant. Most fish species were attracted to the discharge area of Douglas Point in the spring and fall but left when temperatures exceed their preferences in the summer months. Migration from the shoreline occurred in the winter. (See also W76-08848) (Chilton-ORNL)
W76-08869

DEVELOPMENT AND APPLICATION OF CRITERIA FOR MARINE COOLING WATERS,
Environmental Research Lab., Narragansett, R. I.
D. C. Miller, and A. D. Beck.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 639-657, 2 fig, 1 tab, 65 ref.

Descriptors: *Thermal pollution, *Water quality standards, Temperature, Cooling water, Thermal stress, Environmental control, Criteria.

The paper presents material for the development of general criteria for safe levels of thermal addition to coastal marine ecosystems and reviews the applicability of past studies on tolerance limits and sublethal thermal stress. Newly proposed marine temperature criteria recommend: (a) maximum acceptable incremental temperature rise over ambient during fall, winter, and spring to 2.2 degrees C; for summer, 1.1 C; (b) maintenance of characteristic daily temperature cycles, both in frequency and amplitude; (c) temperature ceilings for coastal regions having a sufficient data base; and (d) no rapid increases of thermal discharge. In applying criteria to heated water discharges, it is recommended that the cooling water process be evaluated as a unit, considering the potential impact of water intake and in-plant circulation as well as the discharge. Recommendations are made for implementing thermal criteria and include the prohibition of dilution pumping, siting of discharge on well-mixed waters and the use of near-bottom diffusers for efficient dissipation of heat. (See also W76-08848) (Chilton-ORNL)
W76-08885

REGULATIONS AND ENVIRONMENTAL INVESTIGATIONS ASSOCIATED WITH NUCLEAR STATION THERMAL DISCHARGES,
Ente Nazionale per l'Energia Elettrica, Rome (Italy). Direzione della Costruzioni.
L. Bramati, R. Gasparini, and D. Merluzzi.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 659-673, 3 tab, 4 fig, 2 ref.

Descriptors: *Thermal pollution, *Environmental effects, Water quality standards, Environmental control, Model studies, *Regulation, Europe.
Identifiers: Caorso Nuclear Power Station(Italy).

This paper describes a program which is being implemented at the Caorso nuclear power station. The details of the program are based on the results of hydraulic model tests. The impact of the station on the aquatic ecosystem will be considered from the points of impact on the intake area, thermal and mechanical impact on organisms carried through the condenser and tailrace, impact due to hot plume, and impact due to discharge of chemicals. Recently the Ministry of Public Health issued recommendations concerning the temperature limits for steam power stations located on the coast which include: (a) maximum water temperature, 35 degrees C; (b) temperature rise in the top layer (down to 2 m deep) at 1 km from the station discharge point, not more than 3 degrees C. (c) no thermal barriers in rivers or near river mouths. Alternatives indicated for the future are recourse to coastal sites and consequent power transmission to consumption centres inland or gradual adoption of cooling means (towers, spray systems, etc.) on inland continental sites. (See also W76-08848) (Chilton-ORNL)
W76-08886

CAN THE CRITERIA AND METHODOLOGY USED FOR RADIOACTIVE DISCHARGES BE APPLIED TO THERMAL DISCHARGES. (LES

LIBRARY U. OF I. URBANA-CHAMP.

CRITERES ET LA METHODOLOGIE RETENUS POUR LES REJETS RADIOACTIFS SONT-ILS TRANSPOSABLES AUX REJETS THERMIQUES.),
CEA Centre d'Etudes Nucleaires de Fontenay-aux Roses (France). Departement de Protection.
R. Coulon, G. Lacourly, and P. Bovard.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 675-681.

Descriptors: *Thermal pollution, *Environmental effects, *Radioactivity effects, *Standards, *Methodology, Cost-benefit theory, *Criteria.

The paper examines the points where problems resulting from thermal discharges and radiation exposure are similar or disimilar. Considering the fact that thermal discharges are primarily concerned with effects on the environment and radiation exposure problems primarily with the protection of man, the authors conclude that there are certain approaches which can be adopted in dealing with both problems. These approaches include the determination of critical points, the application of studies of justification of the damage incurred, and the application of cost-effectiveness concepts. (See also W76-08848) (Chilton-ORNL)
W76-08887

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN WELL DRILLING OPERATIONS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
Conference Proceedings, Environmental Aspects of Chemical Use in Various Industrial Operations, May 21-23, 1975. Houston, Texas, 604 p. EPA 68-01-2928.

Descriptors: *Environmental effect, *Chemical properties, *Chemical analysis, *Chemical degradations, *Chemical reactions, *Water chemistry, *Oil wells, *Water wells, Groundwater toxicity, Water pollution effects.
Identifiers: *Well drilling operations, *Toxic industrial chemicals.

This conference was the second in a series of three on the environmental impact of chemicals in various industrial operations. The objective of the conference was to discuss current chemical uses, functions of chemicals in the operations, and by products resulting from the use of these chemicals. In addition, known health or environmental effects and measures used or available for use to control environmental contamination by these industrial chemicals was discussed. Twenty-two papers were presented and discussion held that covered industrial emissions and effluent surveys, chemicals and their effects, as well as reclamation and disposal. (See W76-08890 thru W76-08919) (Heiss-NWWA)
W76-08889

TECHNIQUES OF DEEP WELL DRILLING,
Exxon Co., Houston, Tex. Operations Dept.
For primary bibliographic entry see Field 8B.
W76-08890

TECHNIQUES OF SHALLOW WELL DRILLING,
Layne Atlantic Co., Norfolk, Va. Water Resources Div.
For primary bibliographic entry see Field 8B.
W76-08891

SOLUTIONS FOR SOME PROBLEMS RESULTING FROM REFREEZING OF PERMAFROST AROUND A WELLBORE,
Atlantic Richfield Co., Plano, Tex. Production Research Center.
For primary bibliographic entry see Field 8G.
W76-08892

DRILLING FLUID PRINCIPLES AND OPERATIONS,
N L Industries, Inc., Houston, Tex. Baroid Div.
For primary bibliographic entry see Field 8G.
W76-08893

WELL COMPLETION - TECHNIQUES AND METHODS,
Dowell Div., Tulsa, Okla.
For primary bibliographic entry see Field 8G.
W76-08894

TOXICITY STUDY - DRILLING FLUID CHEMICALS ON AQUATIC LIFE,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.
For primary bibliographic entry see Field 5C.
W76-08895

FISH TOXICITY OF DISPERSED CLAY DRILLING MUD DEFLOCCULANTS,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.
For primary bibliographic entry see Field 5C.
W76-08896

EFFECT OF DRILLING FLUID COMPONENTS MIXTURES ON PLANTS AND SOILS,
Utah State Univ., Logan. Dept. of Soil Chemistry.
For primary bibliographic entry see Field 5C.
W76-08897

ACUTE TOXICITY OF WELL-DRILLING TO RAINBOW TROUT,
Environmental Protection Service, Edmonton (Alberta). Aquatic Toxicology Lab.
For primary bibliographic entry see Field 5A.
W76-08899

THERMAL DEGRADATION OF DRILLING MUD ADDITIVES,
Halliburton Co., Duncan, Okla. Chemical Research and Development Dept.
For primary bibliographic entry see Field 8G.
W76-08901

GROUND WATER PROBLEMS ASSOCIATED WITH WELL-DRILLING ADDITIVES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-08902

CHEMICAL APPLICATIONS IN OIL AND GAS WELL-DRILLING AND COMPLETION OPERATIONS,
Bartlesville Energy Research Center, Okla.
For primary bibliographic entry see Field 8G.
W76-08903

MOBILITY OF WELL-DRILLING ADDITIVES IN THE GROUND WATER SYSTEM,
National Water Well Association, Worthington, Ohio. Research Facility.
For primary bibliographic entry see Field 5B.
W76-08904

MOVEMENT OF CHEMICAL CONTAMINANTS IN GROUND WATER,
Dames and Moore, Park Ridge, Ill.
For primary bibliographic entry see Field 5B.
W76-08905

TOXICITY AND ENVIRONMENTAL PROPERTIES OF CHEMICALS USED IN WELL-DRILLING OPERATIONS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5C.
W76-08906

POTENTIAL EFFECTS OF OIL DRILLING AND DUMPING ACTIVITIES ON MARINE BIOTA,
North Carolina Univ. at Wilmington. Inst. of Marine Biomedical Research.
For primary bibliographic entry see Field 5C.
W76-08907

ENVIRONMENTAL IMPLICATIONS OF SEDIMENT BULK ANALYSIS TECHNIQUES FOR TRACE METALS IN OFFSHORE WELL-DRILLING OPERATIONS,
Gulf South Research Inst., New Orleans, La. Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W76-08908

EFFECTS OF DRILLING OPERATIONS ON THE MARINE ENVIRONMENT,
Exxon Co., Houston, Tex.
For primary bibliographic entry see Field 5G.
W76-08909

EFFECTS OF DRILLING OPERATIONS ON THE MARINE ENVIRONMENT,
Exxon Co., Houston, Tex.
R. P. Zingula.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975 p. 433-448, 10 fig, 1 tab, 3 ref.

Descriptors: *Waste disposal, *Drilling fluids, Sediments, Benthic fauna, Wells, Water pollution effects, Suspended solids, Crabs.
Identifiers: *Well cuttings, Grouper, Red snapper, Caustic, Barite, Chrome lignosulfonate.

Research studies conducted by Exxon scientists investigated the effect of offshore drilling operations on the marine environment. Water samples taken while the drilling operations was in progress show a very rapid drop of suspended solids in a short distance down current from the drilling rig. Scuba studies show mobile organisms active around and on borehole cutting accumulations, while drilling was in progress. After several months these cutting are turned into 'normal' sea bottom. Water samples also show that common chemicals normally used in drilling are present in small quantities, however, chemical interaction and dilution make their effect negligible. (See also W76-08889) (Heiss-NWWA)
W76-08909

TREATMENT AND DISPOSAL OF WASTE FLUIDS FROM ONSHORE DRILLING SITES,
Wilson Mud Service, Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5D.
W76-08910

THE TOXICITY OF DRILLING FLUIDS, THEIR TESTING AND DISPOSAL,
Alberta Energy Resources Conservation Board, Edmonton.
For primary bibliographic entry see Field 5D.
W76-08911

THE HANDLING AND TREATING OF WATER-BASED DRILLING MUDS,
Sun Oil Co., Richardson, Tex. Production Service Lab.
For primary bibliographic entry see Field 5D.
W76-08912

HANDLING AND TREATMENT OF OIL-BASE DRILLING MUDS,
Oil Base Inc., Houston, Tex.
For primary bibliographic entry see Field 8G.
W76-08913

WASTE WATER BASE DRILLING FLUID DISPOSAL,
Dresser Industries, Inc., Houston, Tex. Oilfield Products Div.
For primary bibliographic entry see Field 5D.
W76-08914

DISPOSAL OF DRILLING FLUIDS AND DRILLED-UP SOLIDS IN OFFSHORE DRILLING OPERATIONS,
Texas A and M Univ., College Station. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 5D.
W76-08915

OBJECTIVES OF WELL-DRILLING REGULATIONS,
National Water Well Association, Worthington, Ohio.
J. H. Lehr.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 555-566.

Descriptors: *Well regulations, Construction, Water wells, Technical writing, *Regulation, *Standards.
Identifiers: Water well construction standards, Well design, Technical water well manual.

Approximately 7 years ago the National Water Well Association recognized that the water well industry had no organized compendium of knowledge concerning recommended standards for well construction. This lack of systematic instruction has led to inadequately constructed wells which permitted surface water contact with, and consequent pollution of, ground water supplies. The Manual of Recommended Well Construction Standards was the National Water Well Association's answer to this problem. The National Water Well Association directed 33 experts over a period of 3 years and produced a stat-of-the-art manual entitled Manual of Recommended Well Construction Standards. This document gave detailed instructions to guide home owners, engineers, industries and municipalities as to the design specifications which best fulfill safety standards and constraints of the particular building situations. The document was submitted to the EPA in May, 1975. (See also W76-08889) (Heiss-NWWA)
W76-08917

RESPONSIBILITIES OF OFFSHORE DRILLING REGULATIONS,
Geological Survey, Metairie, La.
D. W. Solanas.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 571-575.

Descriptors: *Continental shelf, *Submerged Lands Act, Federal government, State governments, Well regulations, Gulf of Mexico.
Identifiers: *Continental shelf drilling, Drilling regulations, Drilling leases.

The passage of the Outer Continental Shelf Lands Act in 1953 set forth that the sea bottoms off the continental United States is owned by the federal government. Considerable dispute arose between the states and federal government after this legislation. As a result, the Submerged Lands Act gave a certain portion of the continental shelf to the coastal states. The federal government has jurisdiction over the areas not given to the states. The United States Geological Survey (USGS) then began to regulate outer continental shelf oil and gas drilling and producing operations. Their attention is concentrated in the Gulf of Mexico, where there are presently approximately 6,000 producing oil and gas wells. Responsibility for safe operation lies not only with the USGS, but principally with the lessees of the sites. (See also W76-08889) (Heiss-NWWA)
W76-08918

REGULATION OF ONSHORE AND OFFSHORE OIL FIELD WASTE DISPOSAL,
Texas Railroad Commission, Austin, Tex.
For primary bibliographic entry see Field 5E.
W76-08919

METHODS OF ESTIMATING RESIDENTIAL LAND USE FOR WATER RESOURCES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Economics.
For primary bibliographic entry see Field 4C.
W76-08924

PROBLEM OF BLOOD-SUCKING FLIES IN THE ZONES AFFECTED BY BIG WATER RESERVOIRS IN THE UKRAINIAN SSR, (IN RUSSIAN),
Zaporozhskii Gosudarstvennyi Meditsinskii Institut (USSR).
A. K. Shevchenko, and M. V. Steblyuk.
Vestn Zool. 5, p3-7, 1974.

Descriptors: *Insects, *Reservoirs, Insect behavior.
Identifiers: Anopheles-Maculipennis, *Blood sucking flies, *Flies, Simulium-Shevtshenkovae, Ukrainian-SSR, *USSR.

Qualitative and quantitative changes in blood-sucking fly composition and redistribution of developmental sites in certain big reservoirs of the Ukrainian SSR, USSR, are shown. Changes in fly development for an over 10 yr exploitation period of the Krasnooscolian reservoir, are analyzed. The effect of new environmental conditions on the species ecology or species and subspecies composition of flies is illustrated by a series of examples (Simulium shevtshenkovae; Anopheles maculipennis).--Copyright 1975, Biological Abstracts, Inc.
W76-08991

COATINGS FOR WASTEWATER TREATMENT PLANTS,
Gilbert Associates, Inc., Reading, Pa.
For primary bibliographic entry see Field 8G.
W76-09014

INDUSTRIAL DEVELOPMENT THROUGH WATER-RESOURCES PLANNING,
Department of Commerce, Washington, D. C.
For primary bibliographic entry see Field 3E.
W76-09034

ENVIRONMENT PROTECTIVE OIL SKIMMING AND REMOVAL APPARATUS,
Sandco Limited, Ottawa (Ontario). (Assignee).
S. G. Fast.
U. S. Patent No. 3,947,360, 3 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2454, March 30, 1976.

Descriptors: *Patents, *Oil pollution, Water quality control, Water pollution sources, *Oil spills, Water pollution treatment, *Water pollution control, Oily water Skimming, Application equipment, *Separation techniques, *Pollution abatement.
Identifiers: Oil collection, Conveyor belts, Catamaran-type boats.

To facilitate the collection of oil spills from the water an oil skimming apparatus mounted on a catamaran-type boat is used. The boat is provided with drive means, a holding tank and a centrally placed conveyor. The conveyor is comprised of one or more endless, smooth and unperforated belts preferably of hardened band steel which has good adhesivity with regard to oil. The lower end of the conveyor is lowered just below the surface of the water so that as the boat is driven through the water the belts collect the oil and bring it to the upper end of the conveyor where scrapers direct the oil into holding tanks located on each side of the conveyor. (Sinha-OEIS)
W76-09048

METHOD AND APPARATUS FOR SEPARATING OIL FROM AQUEOUS LIQUIDS,
For primary bibliographic entry see Field 5D.
W76-09054

METHOD AND APPARATUS FOR SEPARATING OIL FROM AQUEOUS LIQUIDS,
For primary bibliographic entry see Field 5D.
W76-09055

METHOD FOR CLARIFYING OILY WATER MIXTURES,
Exxon Research and Engineering Co., Linden, N.J. (Assignee).
R. R. Goodrich, and E. R. Corino.
U.S. Patent No. 3,948,770, 3 p, 2 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 322, April 6, 1976.

Descriptors: *Patents, *Oily water, *Oil pollution, Water pollution treatment, Water quality control, Water pollution control, Water purification, Flocculation, *Separation techniques, Montmorillonites, Polyelectrolytes, Anions, *Settling basins.
Identifiers: Oil tankers, Synergistic effects, Clarification.

When small quantities of oil are finely dispersed within the relatively large body of water, typically found in the slop tanks of large oil tankers, the settling of the fine droplets of oil is extremely slow. Rapid settling may be obtained by the use of a flocculating agent which comprises a dry powder mixture of a sodium or calcium montmorillonite clay with an anionic polyelectrolyte, typically an anionic copolymer of acrylamide. Such a combination of powders may be dispersed within the tank where it accumulates the fine oil drops, agglomerating them and assisting in their separation from the water by rising to its surface. The interaction of the clay and anionic polyelectrolyte is an important aspect. A synergistic effect occurs since neither of the individual components is particularly effective to assist in the settling of the finely dispersed oil droplets. The rapid separation which is produced by the flocculating agent permits the efficient separation of oil and water with the oil/floc mixture rising to the surface, thus permitting the disposal of clear water to the sea. (Sinha - OEIS)
W76-09057

INFECTION OF BROAD-CLAWED CRAYFISH WITH BRANCHIOBDELLA AND CONTROL MEASURES AGAINST THEM, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 2H.
W76-09086

RECLAMATION OF ACIDIFIED LAKES - MIDDLE AND LOHI, SUDBURY, ONTARIO,
J. M. Adamski, and M. F. P. Michalski.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 1971-1983, 1975. 5 fig., 6 tab., 3 ref.

Descriptors: *Hydrogen ion concentration, Surface waters, Freshwater, *Water quality, Water management(Applied), *Acidic water, Acidity, *Calcium carbonate, *Calcium hydroxide, Air pollution, *Phytoplankton, Waste treatment, Water pollution control, *Canada.
Identifiers: Smelters, *Acidified lakes, Sudbury(Ontario), Calcium levels, pH profiles.

Chemical manipulation of acidic lakes by addition of calcium hydroxide and calcium carbonate represents a return to the lakes natural state. Field

LIBRARY U. OF I. URBANA-CHAMPAIGN

experiments indicate that the treatment is a simple, effective, and relatively inexpensive water management tool for reclaiming acidic lakes. (Katz)
W76-09108

ENVIRONMENTAL CHANGES IN A PORTION OF LAKE ONTARIO FOLLOWING POLLUTION ABATEMENT,
For primary bibliographic entry see Field 5C.
W76-09119

A GUIDE TO STATE PROGRAMS FOR THE RECLAMATION OF SURFACE MINED AREAS,
Geological Survey, Reston, Va.
E. A. Imhoff, T. O. Friz, and J. R. LaFevers.
Circular 731, 1976. 33 p, 14 fig, 2 tab, 13 ref.

Descriptors: *Land reclamation, *Strip mines, *Programs, *State governments, Land classification, Strip mine lakes, Farm ponds, Governmental interrelations, Social aspects, Economics, Political aspects, Pollution abatement, Water pollution control.

During 1975 inquiries of agencies in each state and review of state statutes and related administrative codes revealed that 38 states have established programs requiring the reclamation of surface mined lands. Results of analyses of those programs and ancillary data are presented in: (1) A table (matrix) which has been designed for the notation and elaboration of information pertaining to the mined-area reclamation programs of the 50 states; (2) a primer on surface mining activities and related reclamation practices and problems; and (3) a listing of types of non-Federal governmental controls applicable to reclamation. Photographs of reclaimed surface mined lands show recreational lakes, farm ponds, and farmland. (Woodard-USGS)
W76-09142

DECISION PERSPECTIVES ON URBAN STORM WATER POLLUTION,
GKY and Associates, Alexandria, Va.
G. K. Young.
Water Resources Research, Vol. 12, No. 1, p 94-100, February, 1976. 2 fig, 2 tab, 10 ref.

Descriptors: *Storm runoff, *Urban runoff, Design, Analytical techniques, *Sewerage, Model studies, *Decision making, Water quality standards, *Combined sewers, Water pollution control, Pollution abatement.

The major features of an urban runoff, combined sewer system are described and several options for control of water pollution that occurs during rainstorms in urban areas are considered. A macroanalytical approach to defining the problem is presented in which typical values of the variables are assigned and a sensitivity analysis of urban storm-induced pollution to various control measures is demonstrated. This method should work as a screening mechanism to choose between candidate urban areas for the allotment of funds to solve pollution problems. A pollutograph scale may thus be calculated with maximums and ranks, related to the water quality standards, and thus specific control measures tailored for each city may be defined. (Kramer-FIRL)
W76-09207

DESIGN OF NATIONWIDE WATER-QUALITY-MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-09209

CRITERIA FOR SELECTING A WATER QUALITY MODEL FOR 208 PLANNING,
Hydrocomp Inc., Atlanta, Ga.
T. N. Debo, and A. M. Lumb.
Simulation Network Newsletter, Vol. 6, No. 2, p 1-5, August 15, 1975. 1 ref.

Descriptors: *Water quality control, *Planning, *Model studies, *Water quality standards, Long-term planning, Land use, *Water Pollution Control Act, *Criteria, South Carolina.
Identifiers: 208 planning, Federal Water Pollution Control Act Amendments.

Section 208 of the Federal Water Pollution Control Act Amendments of 1972 sets forth a planning program whose results will be used for the allocation of waste load and construction funds for pollution abatement. Modeling will be used to extend the results of short-term monitoring and sampling to construct an adequate data base. It will also be used to predict the effects of various land use and growth alternatives and water quality management plans on water quality. General criteria for model selection were developed in two 208 studies in South Carolina. The model must be able to analyze small and large streams and lakes and to adjust to changes in program objectives. It must also represent all major processes and interrelationships in the real system. The model must be able to handle non-equilibrium conditions. The model should have flexibility in the number of processes simulated, the number of segments of the aquatic system analyzed, and the time period simulated. It should also be able to continuously simulate water quality for several years and consider weather conditions in the analysis of nonpoint sources. Costs from computer use, program adaptation and maintenance, modification to specific needs, training time, and time for input preparation and application must be considered together with effectiveness of the model. Detailed criteria will be different for individual areas. (Snyder-FIRL)
W76-09212

QUALITY ASSURANCE FOR GROUNDWATER,
Environmental Science and Technology, Vol. 10, No. 3, March, 1976. 2 fig.

Descriptors: *Water quality control, *Groundwater, *Water supply, *Potable water, Groundwater resources, Water pollution sources, Monitoring, Legislation, *Water quality standards.
Identifiers: Safe Drinking Water Act of 1974.

As of August 1975, about 100 million Americans were dependent upon underground sources of drinking water. Recently, underground injection of waste water and other means by which groundwater may become polluted have become a matter of concern. The Safe Drinking Water Act of 1974 (PL 92-523), signed into law in December 1974, provides for the establishment of state programs for protection of underground potable water sources. Under the drinking water law, the EPA administrator designates which states must design groundwater quality control programs. It was mandated that by 180 days after the enactment of PL 92-523, the EPA administrator must have published proposed regulations for state underground injection control programs and that promulgation of these regulations was to have occurred by the next 180 days. As of the beginning of 1976, the regulations are still in the proposed stage. Sources for potential groundwater contamination include brines from secondary and tertiary oil recovery, industrial waste injection wells, petrochemical operations wastes, and leachates from sanitary landfills. Injection wells must be monitored by the states or in the absence of a satisfactory state program, the EPA will monitor. In addition to the control of groundwater pollution by the EPA, the World Health Organization Collaborating Committee on Surface and Ground Water Quality is developing the following on an international basis: uniform methods for monitoring water quality; uniform analytical instruments; and, uniform data storage and retrieval systems. (Orr-FIRL)
W76-09213

RECENT TRENDS OF PROCESS CONTROL FOR WATER WORKS AND DRAINAGE (JOGESUIDO PUROSESU SEIGYO NO DOKO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
E. Bannai, T. Sumi, T. Matsuoka, and K. Kuwayama.
Toshiba Rebyu, (Toshiba Review), Vol. 31, No. 1, p 5-8, January, 1976. 5 fig, 1 tab, 2 ref.

Descriptors: *Monitoring, *Water pollution control, *Regional development, *Waste water treatment, Sewage treatment, Water reuse, Automatic control, Computers, Water works, Water supply, Water treatment, Drainage, *Control systems.
Identifiers: *Japan.

To cope with a rapid increase in demand for water and increased pollution of natural waters, recent trends in Japan have included the development and regional utilization of water resources for water works, the expansion of facilities, the collective processing in river basin scales, and the reuse of processed sewage. A major problem is the utilization of such resources as dams, rivers, and the sea. New technology is being developed in regional monitoring systems. A description is provided of those control systems developed by Toshiba, including computer control and instrumentation control. (Kramer-FIRL)
W76-09214

NORTHERN GREAT PLAINS RESOURCE PROGRAM. SURFACE RESOURCE WORK GROUP--REGIONAL PROFILE.
Northern Great Plains Resource Program, Denver, Colo.
For primary bibliographic entry see Field 4C.
W76-09228

CAPABILITIES AND COSTS OF TECHNOLOGY ASSOCIATED WITH THE ACHIEVEMENT OF THE REQUIREMENTS AND GOALS OF THE FWPCA OF 1972 FOR PULP AND PAPER INDUSTRY.
Hazen and Sawyer, New York.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 376, $12.00 in paper copy, $2.25 in microfiche. Report No. NCWQ 75/01, May 1975. 472 p. 30 fig., 40 tab., 24 ref., 5 append. WQ5AC003.

Descriptors: *Pollution abatement, *Pulp and paper industry, *Costs, *Technology, *Waste water treatment, Capital costs, Operating costs, Maintenance costs, Water pollution control.
Identifiers: Zero waste discharges.

The pulp and paper industry is analyzed to examine its capabilities and costs of technology associated with the achievement of federal requirements for pollution abatement for 1977 to 1985. Cost estimates include capital, operating, and maintenance costs of internal and external measures needed to achieve the five selected pollution abatement levels. Cost of money, depreciation, insurance, taxes, etc., are not included. Average discharges into surface waters for January 1973 were 5200 mgd wastewater, 9,000,000 lbs/day BOD and 6,400,000 lbs/day suspended solids. To meet the 1977 EPA requirements, pollution abatement costs for Level I would be $1.88 billion above that spent up to 1973 and increase the O and M cost to $98 million per annum; Level II would require a capital investment of $2.03 billion beyond that spent up to 1973 and direct O and M expenses would increase by $104 million per annum. Internal improvements might achieve Levels III and IV without upgrading existing secondary biological facilities. The large capital cost of such improvements would be somewhat offset by savings in O and M expense. Substantial reduction of effluents would be achieved only if internal improvements are instituted. Residuals generated to achieve the waste load reductions would be increased by approximately 1,960,000 lbs

of dry solids per day to a total of 8,612,000. (Auen-Wisconsin).
W76-09229

WATER RESOURCES POLICY ISSUES - 1975.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-09230

POLLUTION FROM NON-POINT SOURCES,
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5B.
W76-09232

HEAVY METALS IN THE AQUATIC ENVIRONMENT.
For primary bibliographic entry see Field 5B.
W76-09272

CANADIAN EXPERIENCE WITH THE REDUCTION OF MERCURY AT CHLOR-ALKALI PLANTS,
Canadian Industries Ltd., Montreal (Quebec).
F. J. Flewelling.
In: Proceedings of an International Conference on Heavy Metals in the Aquatic Environment, December 4-7, 1973, Nashville, Tennessee (Pergamon Press Ltd., c1975), p 253-260. 3 tab.

Descriptors: *Mercury, *Bleaching wastes, *Canada, *Water pollution, *Air pollution, Pollutants, Water pollution sources, Statistics, Pollutants, Water quality standards, Wastes, Industrial wastes, Chlorine, Water pollution control, Sodium compounds, Alkali metals, Metals, Heavy metals, Poisons.
Identifiers: *Chlor-alkali plants, Bleached pulp mills.

Statistical and legislative data are given on mercury discharges into waterways and into the atmosphere from chlorine-generating plants in Canada and (for comparison) in the U.S.A. Although significant pollution abatement has been achieved by various control measures, more remains to be done to comply with planned regulatory effluent standards. Several problems awaiting solution are mentioned, such as accounting for lost mercury via an adequate materials balance. (Brown-IPC)
W76-09273

ECONOMICS AND ENERGY: REDUCING MILL ENERGY CONSUMPTION AND EFFLUENT VOLUME,
Ekono Inc., Bellevue, Wash.
M. Kojo.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings, (Montreal, P.Q.), p 77-82. 2 fig, 4 ref, 6 tab.

Descriptors: *Pulp wastes, *Energy, Wastes, Industrial wastes, Water pollution sources, Heat balance, Canada, Foreign countries, Effluents.
Identifiers: *Energy conservation, *Kraft mills, Weyerhaeuser Canada Limited(Canada).

The possibilities for reducing energy consumption in kraft pulp mills is discussed, using the Kamloops, British Columbia, mill of Weyerhaeuser Canada Limited as an example. Levels of consumption and possible energy savings are shown for the different operations throughout the mill (chip handling, cooking, washing, black liquor evaporation, recausticizing, lime burning, pulp screening and cleaning, bleaching, and drying). The reduction of energy consumption and its effect on the effluent stream of the mill is discussed briefly. (Witt-IPC)
W76-09299

OCEAN DUMPING--A RATIONAL APPROACH TO AN INTERNATIONAL PROBLEM,
Naval Oceanographic Office, Washington, D.C.
S. B. Nelson, and R. C. Tipper.
In: IEEE 1971 Engineering in the Ocean Environment Conference, San Diego, California, September 21-24, 1971, p 317-320, 4 ref.

Descriptors: *Continental shelf, *Environmental effects, Water resources development, Water pollution effects, *Water quality standards, *Waste disposal, Waste water disposal, Optimum development plans, Management.
Identifiers: *Outer Continental Shelf, Environmental impact, *Ocean dumping, Enforcement, Offshore technology.

A detailed look at the overall problem of ocean dumping is provided and a discussion is presented on U.S. regulations, international efforts, and an approach to the problem of ocean dumping. A systematic approach, starting with identification of types of wastes, determination of environmental effects, and providing specifications for disposal is reviewed. Enactment of legislation, identification of regulatory authority, and the establishment of a workable enforcement system are also discussed. Emphasis must be placed on evaluation of the environmental effect of any given waste. There is a critical need for research which will carefully evaluate the assimilative capability of various regions of the ocean for the spectrum of human wastes and which will promote the establishment of realistic marine water quality standards. This knowledge is the cornerstone of effective management of ocean dumping. (Sinha-OEIS)
W76-09304

SURFACE EFFECTS SKIMMER DEVELOPMENTS,
Science Applications, Inc., McLean, Va.
N. P. Trentacoste.
Available from National Technical Information Service, Springfield, Va., 22161, as PB-242 391 $5.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency Report No. EPA-670/2-75-066, June 1975. 80 p, 27 fig, 18 tab, 31 ref, append.

Descriptors: *Continental shelf, *Environmental effects, Resources development, *Oil pollution, *Oil spills, Water pollution, Water pollution treatment, *Water pollution control, Skimming, Application equipment, Waves(Water), Currents(Water), Separation techniques, Oil-water interfaces, Model studies, Water pollution effects.
Identifiers: *Outer Continental Shelf, Offshore technology, Environmental impact *Oil slicks, Air jets, Polyurethane foam belts, Surface effects skimmer.

An experimental program investigated the use of a Surface Effects Skimmer in removing thin film oil slicks spread over large water areas by fast currents. The skimmer uses a directed air jet to separate and lift spilled oil from the surface of the water in the form of a spray consisting of oil and water droplets. The oil/water spray is directed toward a rotating belt of polyurethane foam from which it is squeezed and pumped to a nearby storage tank. Initial experiments were performed in a 20 cm wide flume. Subsequent tow tank tests were conducted at speeds up to 3.25 knots in calm, choppy and smooth wave conditions with oils ranging from a very viscous Venezuelan crude to a very light No. 4 distillate fuel oil. During tests at a tow speed of 3.25 Kts in the presence of 13.75 cm high waves oil collection efficiencies of more than 80% were achieved with the Venezuelan crude oil and of about 60% with the No. 4 distillate fuel oil. In a related series of experiments, it was found that presoaking the polyurethane foam belt in either water or oil had no effect on its ability to retain oil. (Sinha - OEIS)
W76-09308

WIND AND CURRENT EFFECTS ON LARGE-SCALE OIL SLICKS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S. P. Murray.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-A012 582 $3.50 in paper copy, $2.25 in microfiche. LSU Technical Rept. No. 193, September 1975. 14 p, 10 fig, 8 ref., Also as: Reprint from Preprints, Offshore Technology Conference, Seventh, Annual, Houston, Texas, May 5-8, 1975. p 523-533.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, Water pollution effects, *Oil spills, *Water pollution sources, Oil pollution, Winds, Movement, Fronts(Atmospheric), Tides, Dispersion, Gulf of Mexico, Offshore platforms, Model studies.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact, Oil slicks, Oil slick movement, Local wind direction.

The relative effect of local winds and near-surface currents in determining the movement of oil slicks in coastal and shelf waters was determined from 39 surveys by Raydist-equipped heliocopters during the production platform Main Pass-41C spill off the Mississippi Delta in March 1970. Orientation of oil slicks is closely controlled by local wind direction; slicks usually form 10 deg to 40 deg to the right of the wind. Winds producing large, well-developed oil slicks are integrally related to easterly migrating high-pressure systems. Wind shifts associated with various sectors of migrating high-pressure cells quickly realign new slicks and actively dissapate old ones. Density fronts, both ambient and quasi-stationary, also play important roles in determining slick movement and size. Tides and tidal currents apparently played no significant role in movement or dispersion of the oil slicks. An easily utilized regression model for slick area and orientation as a function of wind velocity and local conditions is also presented. (Sinha - OEIS)
W76-09310

PROCEEDINGS OF JOINT CONFERENCE ON PREVENTION AND CONTROL OF OIL SPILLS, MARCH 13-15, 1973, WASHINGTON, D.C.,
American Petroleum Inst., Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-09312

A SALT MARSH MICROCOSM: AN EXPERIMENTAL UNIT FOR MARINE POLLUTION STUDIES,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5C.
W76-09318

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 11-12, 1975, SAVANNAH, GEORGIA.
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
Report of Conference held at Savannah, Georgia, December 11-12, 1975. 93 p, January 1975.

Descriptors: *Environmental effects, *Resources development, Water resources, Coasts, *Continental Shelf, Estuaries, Beaches, Food processing industry, Recreation, Planning, Management, Offshore platforms, Drilling, Oil pollution, Economics, South Carolina, North Carolina, Georgia, Virginia, Florida.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact, Seafood processing.

The report on the Conference on Marine Resources of the Coastal Plains States is a compilation of eighteen papers. The purpose of the Conference was to serve as a means through

LIBRARY U. OF F. ORGANIC CHEMICAL ...

which Federal, State, and local government administrators, scientific researchers, and representatives from private industry, as well as private citizens, could address some of the major coastal and marine issues facing the Coastal Plains States. The Conference brought together leaders in marine fields from both inside and outside the Coastal Plains Region and having many different backgrounds and approaches to the problems addressed. These participants exchanged recent findings and ideas, and through the wider dissemination of this Report, much of this information is being made available to a much greater audience. Subjects covered in separate sections are: marine research and advisory capabilities; seafood processing; access to beaches and estuarine waters; Federal-State planning for marine fisheries; and offshore impacts of OCS development. Pertinent papers are abstracted and will be found distributed in the SWRA series. (See W76-09330 thru W76-09332) (Sinha-OEIS)
W76-09329

THE OCS FORGOTTEN LAND: TERRITORIAL SEA, NEARSHORE, AND ESTUARY,
Florida Dept. of Administration, Tallahassee. Div. of State Planning.
J. I. Jones.
In: Report of the Conference on Marine Resources of the Coastal Plains States, Savannah, Georgia, December 11-12, 1975. p 73-75, January 1975.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, *Water quality control, *Resources development, *Water pollution effects, Estuaries, Coasts, Coastal plains, Waste disposal, North Carolina, South Carolina, Georgia, Florida.
Identifiers: *Outer Continental Shelf, *Offshore technology, Territorial seas, Nearshore, Water pollution prevention.

The Southeastern States are gravely concerned about the environmental and other impacts which may impinge upon these areas as a result of OCS petroleum development activities. The unique geographic position occupied by the non-Federal OCS, occurring as it does between the OCS developmental activity and the shoreline, dictates a high level of interest and concern by the States. Its natural productivity, coupled with its environmental vulnerability and fragility are additional reasons for concern. Finally, its utilization as a recreational and fisheries resource, as well as a major area for waste disposal, provide legitimate reasons for a high level of State concern regarding this region. It should be emphasized that, in the National interest and for State needs and benefits, those States involved in the South Atlantic OCS leasing desire timely, orderly and well-considered development of the petroleum resource offshore their respective boundaries, there being no desire to hinder or delay such development. There is, however, the recognition that under present temporal and fiscal constraints the problem of impact evaluation of the non-Federal OCS is not being adequately addressed, and that this omission must be corrected through cooperative state and Federal action. (See also W76-09329) (Sinha-OEIS)
W76-09330

THE ROLE OF ENGINEERING IN MINIMIZING OFFSHORE IMPACTS,
Duke Univ., Durham, N. C. Dept. of Civil Engineering.
B. J. Muga.
In: Report of the Conference on Marine Resources of the Coastal Plains States, Savannah, Georgia, December 11-12, 1975. p 77-79, January 1975.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, *Resources development, Water pollution effects, Water quality control, Hazards, Safety, Land reclamation.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact, Water pollution prevention, Mooring, Offloading, Collisions.

The purpose of this presentation is to draw attention, by the use of several examples, to the question of how offshore impact can be minimized through creative engineering. This requires that one be very wary, and even skeptical, of both traditional and 'far out' engineering solutions because there is an advanced technology, developed within recent years at great expense, which is available and appropriate for ocean and nearshore applications. Several examples of both poor and beneficial developments, illustrating some aspects of this technology are shown. These examples indicate: how a land reclamation project can be undertaken which is compatible with the existing natural structures - in this case a coral reef; how recent developments in mooring and offloading systems can be utilized to minimize ship meetings, and therefore the risk of collision and resulting pollution; and how certain developments in new ship constructions and ship operations minimize further the risk of pollution from dirty ballast water. (See also W76-09329) (Sinha - OEIS)
W76-09331

OFFSHORE PETROLEUM DRILLING AND PRODUCTION,
Exxon Co., New Orleans, La. Southeastern Div.
R. R. Hickman.
In: Report of the Conference on Marine Resources of the Coastal Plains States, Savannah, Georgia, December 11-12, 1975. p 81-84, January 1975.

Descriptors: *Continental Shelf, *Environmentl effects, Water resources, *Resource development, *Water pollution effects, *Water quality control, *Fossil fuels , Water pollution sources, Operations, Safety, Regulations, Oil industry, Atlantic Ocean.
Identifiers: *Outer Continenental Shelf, *Offshore technology, Enironmental impact, Water pollution prevention.

The representative from the Exxon Company presents a brief history of offshore operations - explaining their scope and diversity, examines those areas on the Atlantic Outer Continental Shelf where the greatest potential hydrocarbon resources are thought to exist. Offshore petroleum operations are providing important energy supplies to the United States. The industry has been operating offshore for 27 years. More than 19,000 wells have been drilled and more than 6.5 million barrels of oil and 32.6 trillion cubic feet of gas have been produced. In all phases of this activity, including exploration, field development and production, environmental protection is a key consideration. Protective measures include personnel training, elaborate safety equipment, automatic controls, and back-up equipment. An overall good record of past performance offshore will be enhanced in the future by continuing technological improvement, by effective regulation, and by the industry's determination to protect the environment wherever it operates. (See also W76-09329) (Sinha - OEIS)
W76-09332

SIXTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 6-8, 1974, HOUSTON, TEXAS. PREPRINTS, VOLUME II,
Offshore Technology Conference, Dallas, Tex.
Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II, 1974. 1100 p, figs, tabs, refs.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, Resources development, *Water pollution effects, Exploration, Exploitation, Oil pollution, Waves(Water), Offshore platforms, Drilling, Dredging, Nuclear powerplants, Engineering structures.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Environmental impact, Mooring.

The second volume is a collection of 92 papers prepared for presentation at the Sixth Annual Offshore Technology Conference held in Houston Texas, May 6-8, 1974. The Sponsor Societies for the Conference are the American Institute of Mining, Metallurgical, and Petroleum Engineers (Society of Mining Engineers,The Metalurgical Society and Society of Petroleum Engineers), American Association of Petroleum Geologists, American Institute of Chemical Engineers, American Society of Mechanical Engineers, American Society of Civil Engineers, Marine Technology Society, Society of Exploration Geophysicists, and Society of Naval Architects and Marine Engineers. Perinent papers are abstracted separately and will be found in the SWRA series. (See W76-09334 thru W76-09336) (Sinha - OEIS)
W76-09333

WATER POLLUTION ASPECTS FROM WASTE DRILLING MUD DISPOSAL IN CANADA'S ARCTIC,
Environmental Protection Service, Ottawa (Ontario).
W. J. Bryant, J. R. Goldburn, and S. E. Hrudey.
In: Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas, Preprints, Volume II, 1974. Paper No. OTC 2044, p 95-106, 6 fig, 2 tab, 10 ref.

Descriptors: *Water quality control, *Waste disposal, *Drilling fluids, Environmental effects, Water pollution sources, Fossil fuels, *Waste treatment, *Waste water disposal, Continental Shelf, Exploration, Waste water treatment, Resources development, *Canada, Arctic.
Identifiers: *Outer Continental Shelf, *Offshore technology, Petroleum, Hydrocarbons, Environmental impact, Beaufort Sea.

Current oil and gas exploration drilling in Canada's Arctic poses potential water pollution hazards to the sensitive environment of the north. Much of this drilling is now concentrated in low lying areas subject to flooding, such as the Mackenzie Delta, and in late 1973 drilling began in the shallow regions of the Beaufort Sea. This industrial activity can constitute a source of water pollution if drilling fluids are discharged to adjacent surface waters. A literature review has revealed little information on the water pollution characteristics of drilling fluids. In order to identify appropriate environmental controls, an industry/government research program was established in 1973 to determine the magnitude of the problem, and, as a result of these investigations, to develop effluent standards and guidelines for the disposal of waste drilling fluids. This paper describes the studies being conducted and highlights the results of the 1973 work. On the basis of the results obtained to date, indications are that water base drilling fluids constitute a wastewater with characteristics capable of causing water pollution. Furthermore, such wastes have been demonstrated to be acutely toxic to fish. (See also W76-09333) (Sinha - OEIS)
W76-09334

BEACH-OFFSHORE DREDGING: SOME ENVIRONMENTAL CONSEQUENCES,
London Univ. (England).
I. P. Jolliffe.
In: Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II, 1974. Paper No. OTC 2056, p 257-265, 5 fig, 22 ref.

Descriptors: *Dredging, *Environmental effects, Water resources, Resources development, *Water pollution effects, Channel improvement, Hydraulic mining, Coasts, Beaches, Navigation, Beach erosion.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact, Beach nourishment.

Improving technology makes it possible to redistribute sediments in a fairly controlled manner to the overnall advantage of coastal users; for instance, in beach nourishment programs, in the transference of material from the accreting to the eroding flank of a harbor entrance, and in the maintenance dredging of a harbor-approach channel. In contrast, there are many instances in which sediments are deliberately removed from coastal systems, and are not necessarily being replaced; for example, in the removal of beach-nearshore material or material normally resident in the deeper water offshore, for industrial and other purposes. All dredging and dumping practices have some environmental consequences. If carried out without due regard for hydraulic and ecological consequences, serious repercusions may result. Coastal dredging generally falls into the following categories: beach-offshore dredging for beach nourishment, beach dredging for industrial purposes, nearshore-offshore dredging for navigational purposes, and offshore dredging for industrial purposes. (See also W76-09333) (Sinha - OEIS)
W76-09335

ENVIRONMENTAL STUDIES FOR MAJOR OFFSHORE DEVELOPMENTS,
Dames and Moore, New York.
J. M. Heckard, and D. L. Woodford.
In: Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II, 1974. Paper No OTC 2097, p 635-640, 4 ref.

Descriptors: *Environmental effects, *Oil spills, *Water pollution sources, *Water quality control, *Fossil fuels, Resources development, Continental Shelf, Pollutants, Legislation, Evaluation.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Environmental impact, *Environmental design, Liquid natural gas, Site selection, Licensing.

Major offshore developments initiated or planned in recent years to ease the energy crisis include mono-buoys and docking islands for VLCCs and offshore nuclear power plants. Legislative requirements for environmental studies needed for licensing of such facilities is discussed as well as the scope of work needed for comprehensive environmental evaluations. Emphasis is placed on special considerations such as oil and LNG spills and movements, and dredging. Experience gained in ongoing studies will be of importance in planning similar projects. The objective of this paper is to address environmental conservation in light of new and major offshore developments. (See also W76-09333) (Sinha-OEIS)
W76-09336

SEPARATION PROCESSES USED FOR POLLUTION CONTROL IN THE PULP AND PAPER INDUSTRY,
Foundation of Canada Engineering Corp. Ltd., Halifax (Nova Scotia).
For primary bibliographic entry see Field 5D.
W76-09340

INTACT MANURE PACK HALTS SEEPAGE,
Ground Water Age, Vol. 10, No. 8, p 20, April, 1976. 1 fig.

Descriptors: *Pollution abatement, *Water pollution, Nitrates, Observation wells, Odor, Soil contamination, Seepage control, Farm wastes, Feed lots.
Identifiers: *Manure pact, *Feedlots, Colorado State Uniersity.

Agricultural Research Service soil scientists and agricultural engineer Harold R. Duke, in cooperation with Colorado State University, have shown that cattle feedlots do not pollute soil and ground water if there is an intact manure pack, and carrying capacity averages about one animal per two-hundred square feet. An intact manure pack essentially eliminated water infiltration and movement of contaminants through the soil to the ground water. Contamination was determined by analysis of nitrate nitrogen concentration found in ground water samples extracted from monitoring wells. (Gass-NWWA)
W76-09344

COUNTERMEASURES TO CONTROL OIL SPILLS IN WESTERN CANADA,
EBA Engineering Consultants Ltd., Edmonton (Alberta).
P. L. Hall, and H. Quam.
Ground Water, Vol. 14, No. 3, p 163-169, May-June 1976. 12 fig, 7 ref.

Descriptors: *Water pollution, *Water pollution sources, *Water pollution treatment, *Oil-water interfaces, Federal government, Local governments, Interagency cooperation, Legislation, Regulation, Administration, Industries, Education, *Canada, *Oil spills.
Identifiers: Environmental oil-leak detection, Government-industrial cooperation, Western Canada.

Increasing concern over ground-water pollution from hydrocarbons is being expressed by governments and industries in western Canada. The Manitoba government has recently held public hearings on the subject and is now working with the petroleum industry to develop new legislation concerning the handling of refined petroleum products. The petroleum industry has developed a series of 'oil spill manuals' which describe procedures for controlling leaks and spills of petroleum products. Emphasis is now being placed on education and prevention, and hydrogeologists are involved in developing training manuals and educational films. (Heiss-NWWA)
W76-09346

EPA STANDARDS FOR DRINKING WATER BECOME EFFECTIVE IN JUNE, 1977.
For primary bibliographic entry see Field 5F.
W76-09356

CATHODIC PROTECTION WELLS AND GROUND WATER POLLUTION,
California State Dept. of Water Resources, Sacramento.
E. A. Ritchie.
Ground Water, Vol. 14, No. 3, p 146-149, May-June, 1976. 3 fig, 5 ref.

Descriptors: *Cathodic protection, *Water pollution, *Hydraulic conductivity, Groundwater, Infiltration, Wells, California, *Corrosion.
Identifiers: *Cathodic protection wells, Contamination(Abandoned wells), Vertical sealing.

The cathodic protection well can endanger groundwater quality by providing a path for pollutants to reach usable water supplies. Cathodic protection wells alleviate electrolytic corrosion of pipelines, tanks and other installations situated in a corrosive environment. This is done by redirecting the current to a substitute anode which then deteriorates, instead of the structure being protected. Cathodic protection wells normally are from 100 to 500 feet in depth and 8 to 10 inches in diameter. To prevent cathodic protection wells from acting as conveyances for pollutants, they must be properly designed and constructed, and when their useful lives are over, properly destroyed. California has developed, and is implementing, standards covering these areas as part of its program for groundwater basin protection. (Heiss-NWWA)
W76-09357

MAKING THE WORLD SAFE FOR GROUND WATER,
For primary bibliographic entry see Field 5B.
W76-09360

SEVENTH ANNUAL OFFSHORE TECHNGLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME II.
Offshore Technology Conference, Dallas, Tex.
Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II, 1975. 921 p, figs, tabs, refs.

Descriptors: *Offshore platforms, *Environmental effects, Resources development, *Instrumentation, *Pipelines, *Water pollution sources, *Water quality control, Continental Shelf, Engineering structures, Harbors, Energy conversion, Buoys, Oil industry, Water resources, Waves(Water), Hurricanes, Geophysics, Currents(Water), Manganese, Cathodic protection.
Identifiers: *Outer Continental Shelf, *Offshore technology, Ocean thermal energy, Solar energy, Energy sources, Offshore generating systems, North Sea, Batteries, Submersibles, Semisubmersibles, Nodules.

The second volume contains papers OTC 2245 to OTC 2335 of the proceedings of the Seventh annual Offshore Technology Conference held May 5-8, 1975 at Houston, Texas. The Sponsor societies for the Conference are the American Institute of Mining, Metallurgical and Petroleum Engineers (Society of Mining Engineers, The Metallurgical Society and Society of Petroleum Engineers), American Association of Petroleum Geologists, American Institute of Chemical Engineers, American Society of Mechanical Engineers, American Society of Civil Engineers, Institute of Electrical and Electronic Engineers, Marine Technology Society, Society of Exploration Geophysicists, and Society of Naval Architects and Marine Engineers. Pertinent papers are abstracted separately and will be found in the SWRA series. (See also W76-09372 thru W76-09373) (Sinha - OEIS)
W76-09371

DEVELOPMENT OF A WATER QUALITY INSTRUMENTATION PACKAGE FOR LONG-TERM OPERATION FROM BUOYS AND OTHER UNATTENDED MARINE PLATFORMS,
National Marine Fisheries Service, Washington, D.C. Data Buoy Office.
W. B. Waff, P. A. Wolfgram, and J. P. Rohling.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975. Houston, Texas. Preprints, Volume II, 1975. No. OTC 2299, p 529-536, 10 fig.

Descriptors: *Fouling, *Environmental effects, *Water quality control, Resources development, *Offshore platforms, *Buoys, *Oil pollution, *Water pollution, *Instrumentation, Continental Shelf, Toxicity.
Identifiers: *Outer Continental Shelf, *Offshore technology, Transducers.

Development of an instrumentation package to measure gross water parameters from buoy and other unattended marine platforms is discussed. Parameters measured are dissolved oxygen, conductivity, chlorophyll, pH, turbidity, and temperature. Off-the-shelf transducers were integrated into a prototype system with emphasis during development centered on the problems of limited power, reliability, and marine fouling. The approach and solutions to these problems are discussed including lab and field test results of antifoulants. The conclusion reached from the field testing is than an antifoulant must be tailored to the specific life goals of a system. The toxin release rate must be rapid enough to provide the degree of fouling retardation required; however, the release rate must be paced so that the life of the antifoulant is compatible with the life goals of the system. A compromise between these conflicting factors must be reached. In addition increasing the toxin concentration in the water near the sensitive transducer areas by increasing the adjacent

LIBRARY U. OF A. ARCHIVAL COPY

surface areas that may be covered with antifoulants should aid in retarding fouling. (See also W76-09371) (Sinha - OEIS)
W76-09372

ON THE RISK ASSESSMENT OF OFFSHORE STRUCTURES,
Technische Hochschule, Munich (West Germany).
G. I. Schueller.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II, 1975. No OTC 2334, p 903-908, 4 fig, 10 ref.

Descriptors: *Offshore platforms, Engineering structures, *Water quality control, Resources development, *Environmental effects, Hurricanes, Continental Shelf, Storm surge, Waves(Water), Design criteria, Assessments, *Risks, Estimating.
Identifiers: *Outer Continental Shelf, *Offshore technology, Wave heights.

A reliability approach for the selection of design criteria of rigid fixed offshore platforms under wave actions is presented. Severe storm occurrence probabilities using the uniform Poisson process are calculated. The load intensity is described by the distribution of wave heights generated by severe storms. The estimated design life and the reliability required can be used as input parameter of the model. The procedure outlined in this paper recognizes the uncertainties under which design decisions for rigid fixed offshore platforms have to be made. The method takes into account the stochastic nature of storm occurrences as well as the statistical distribution of wave heights generated by these storms. The reliability function as defined by Freudenthal et al is used as a risk criterion. The advantage of the method is the possibility of linking the design life and the design wave height to the risk the engineer encounters by selecting two of the parameters. The concept is versatile with respect to the selection of different stochastic storm occurrence models and the statistical distribution of the load intensities for various sites. The method can be adapted to a non-deterministic wave height - wave force relationship easily. (See also W76-09371) (Sinha - OEIS)
W76-09373

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME III.
Offshore Technology Conference, Dallas, Tex.
Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. 878 p, fig, tabs, refs.

Descriptors: *Environmental effects, *Offshore platforms, Resources development, Water resources, *Water quality control, *Oil spills, *Oil pollution, Continental Shelf, Engineering structures, Exploration, Exploitation, Harbors, Coasts, New Jersey, Virginia, Islands, Navigation.
Identifiers: *Outer Continental Shelf, *Offshore technology, Artificial islands, Superports, Port Islands, Industrial ports.

The third volume contains papers OTC 2336 to OTC 2431 of the proceedings of the Seventh annual Offshore Technology Conference held May 5-8, 1975 at Houston, Texas. The Sponsor societies for the Conference are the American Institute of Mining, Metallurgical and Petroleum Engineers (Society of Mining Engineers, The Metallurgical Society and Society of Petroleum Engineers), American Association of Petroleum Geologists, American Institute of Chemical Engineers, American Society of Mechanical Engineers, Marine Technology Society, Society of Exploration Geophysicists, and Society of Naval Architects and Marine Engineers. Pertinent papers are abstracted separately and will be found in the SWRA series. (See also W76-09375 thru W76-09388) (Sinha - OEIS)
W76-09374

EVALUATION OF MULTI-PURPOSE INDUSTRIAL-PORT ISLANDS: SEA ISLAND STRUCTURE ENGINEERING RESEARCH STUDY,
Harris (Frederick R.), Inc., New York.
J. Bonasia.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2336, p 9-21, 4 fig, 13 ref.

Descriptors: *Environmental effects, *Offshore platforms, Resources development, Water resources, Water quality control, *Oil spills, *Oil pollution, Continental Shelf, Engineering structures, Exploration, Harbors, Coasts, New Jersey, Virginia, Islands, Navigation.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Artificial islands, *Superports, Port Islands, Industrial ports.

A research program was initiated by the National Science Foundation's Research Applied to National Needs Program to evaluate the economic, engineering, legal and environmental feasibility of artificial, manmade industrial/port islands located off the U.S. Atlantic and Gulf Coasts. The Civil Engineering considerations of the study included an examination of site selection factors, (foundations, geology, bathymetry, currents, etc.), design factors, (hurricanes, ship collision, sea defense design, etc.), operational and layout factors, (industrial layout, harbor facilities, storage areas, etc.), and construction technology (equipment, source of fill material, costs, etc.). The study concluded that a manmade multi-purpose offshore industrial port/island is technically feasible to construct ten to eleven nautical miles off either the New Jersey or Virginia coasts. The island facilities would be designed to incorporate all pollution prevention and control measures for each industry requiring such measures. Petroleum tankers, both crude and product, would be boomed during loading and discharge. In addition, contingency plans could possibly provide for booming the harbor entrance and exit in the event of an oil spill to prevent oil from escaping outside the harbor. (See also W76-09374) (Sinha - OEIS)
W76-09375

OFFSHORE MULTI-USE PORT ISLANDS AND THEIR ENVIRONMENT,
Delaware Univ., Newark.
L. Watling.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2337 p 23-37, 2 tab, 64 ref.

Descriptors: *Environmental effects, Resources development, Water resources, *Offshore platforms, *Water quality control, *Water pollution sources, *Oil pollution, Continental Shelf, Engineering structures, Ecosystems, Primary productivity, Metals, Monitoring.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Artificial islands, *Port islands, *Superports, Biological effects, Substratum.

Environmental problems associated with the construction and operation of an off-shore multi-use island have been considered. Environmental Protection Agency proposed water quality criteria were reviewed. Other aspects of the oceanic environment not covered by the EPA criteria are discussed and recommended criteria given. These include: sound, salinity, temperature, light penetration, turbidity, substratus, and ecosystem dynamics. The impact of the construction and maintenance of an island meeting these criteria is not discussed. No recommendation concerning the effects of island construction and operation on ecosystem dynamics can be made at this time. However, it is strongly recommended that a model be developed for the ecosystem in the vicinity of a proposed island site and that this model be used to monitor changes in the system during constuction and subsequent operation of the island. (See also W76-09374) (Sinha - OEIS)
W76-09376

INDUSTRY CANDIDATES AND GENERAL LOCATIONS FOR ARTIFICIAL INDUSTRIAL-PORT ISLANDS,
Texas A and M. Univ., College Station.
D. M. Bragg, N. C. Whitehorn, and B. G. Schmidt.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 175. No. OTC 2338. p 36-47, 5 fig.

Descriptors: *Water quality control, Resources development, Water resources, *Environmental effects, Offshore platforms, Continental Shelf, Islands, Power plants, Design criteria, Industrial plants.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Artificial islands, *Port islands, Industrial port islands.

Recent problems encountered by energy-conversion and raw material-reduction industries in obtaining plant sites in coastal regions of the United States have adversely affected programs designed to increase this country's electric-generating and oil-refining capabilities. At the same time that demand for refined petroleum, electric power and other energy forms is at near-record levels, restrictive legislation in many states has cast doubts as to our ability to satisfy this demand in future years. Offshore artificial islands could very well provide relief for some of the growing pains presently being endured by many segments of industry. The heat sink needs of power generating, the impact of refinery emissions on nearby areas, and the real or imagined hazards of nuclear power plants could all be relieved if these installations were located on artificial islands placed some distance offshore. In addition, deepwater ports could be established adjacent to bulk-using operations such as steel mills and phosphate fertilizer plants without the necessity for dredging deep channels through estuarine environments. Artificial islands offshore could become a viable solution,especially in the middle Atlantic region where the problem is most severe. (See also W76-09374) (Sinha - OEIS)
W76-09377

ADAPTING INDUSTRIAL PROCESSES FOR MULTI-PURPOSE INDUSTRIAL PORT ISLANDS,
Gilbert Associates, Inc., Reading, Pa.
B. Yeich.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975 No OTC 2339. p 51-63, 4 fig, 5 tab, 5 ref.

Descriptors: *Water quality control, *Resources development, *Water resources, *Environmental effects, Offshore platforms, Continental Shelf, Islands, Power plants, Design criteria, Industrial plants.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Artificial islands, *Port islands, Industrial port islands, Heat sinks.

The objectives of the process description and adaptation study were to quantitatively describe an example industrial complex in terms of those variables that effect the design of the island, to investigate the concept of industry integration as a means f optimizing an off-shore island as a site for the industry tenants , and to identify areas in which new technology developments would enhance the offshore island as a site for industry tenants. The report describes the processes that would most likely be incorporated by each candidate industry, describes, as an example, one scheme of process integration for the candidate industries, and identifies promising areas of

research and development that would improve the adaptability of industrial processes to an off-shore island site. The island would be removed from land that may have alternative uses related to human habitation, recreation, or environmental conservation. A man-made island presents the opportunity to structure the site so as to maximize use of the air and sea within the limits of environmental acceptability. For example, it would appear that the ocean around a man-made island could be used as a heat sink with minimum impact on established wild-life habitats. The coincidental existence of an industrial complex, deep water terminal, and absence of threatened coastal habitats may provide a unique degree of freedom in integrating processes. (See also W76-09374) (Sinha - OEIS)
W76-09378

EVALUATION OF SEISMICITY AND EARTHQUAKE SHAKING AT OFFSHORE SITES,
Geological Survey, Anchorage, Alaska.
R. A. Page.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2354. p 179-190, 9 fig, 11 ref.

Descriptors: *Seismic studies, *Offshore platforms, *Oil pollution, *Seismic design, *Water quality control, *Environmental effects, Resources development, Water pollution sources, Continental Shelf, *Earthquakes, Engineering structures, Alaska, Evaluation.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Gulf of Alaska.

Many new continental shelf areas bordering the United States are being considered for oil and gas lease sales. Among the areas under consideration are several along the Pacific Coast that are characterized by high levels of earthquake activity. Successful development of petroleum and other mineral resources in such areas requires that earthquake hazards in the offshore environment be carefully assessed and that fixed offshore structures be designed to resist earthquakes and related geologic and hydrologic effects. Information concerning the probable location and magnitude of future earthquakes, the probability of surface faulting, the expected nature of ground shaking, the likelihood of ground failure such as liquefaction and sliding, and the probability of a tsunami are needed. This paper discusses various methods and techniques used to evaluate seismicity and ground shaking at offshore sites. The discussion is illustrated with examples from the continental shelf area in the Gulf of Alaska which is characterized by frequent earthquakes in the magnitude 8 range. Among the hazards to be considered are severe ground shaking, tsunamis, sudden faulting of the sea floor and earthquake-induced ground failure, including submarine slides and turbidity current flows. (See also W76-09374) (Sinha - OEIS)
W76-09379

ENVIRONMENTAL SITE ASSESSMENT FOR A MASSACHUSETTS BAY DEEPWATER OIL TERMINAL,
Raytheon Oceanographic and Environmental Services, Bedford, Mass.
G. V. Cox.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2382. p 471-488, 5 fig, 8 tab, 6 ref.

Descriptors: *Environmental effects, Resource developments, Water resources, Water quality control, Water pollution sources, *Ports, Assessments, Continental Shelf, Islands, Fisheries, Navigation, Massachusetts.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Artifical islands, *Deepwater oil terminals, Superports, Port islands, Site selection, Biological effects, *Massachusetts Bay.

The selection of candidate deepwater petroleum terminal sites from an area bounded by Boston Harbor on the south and the New Hampshire border on the north was the object of this investigation. Four zones in the study area were defined, and one site in each area was selected for environmental evaluation. Three additional sites further offshore were also included. Sites have been ranked on the basis of available information and recommendations for ancillary actions have been made. Consideration is given to the following aspects in site selection; meteorology; waves; currents; living resources; and navigation. The study objectives include identifying areas off the Massachusetts coast which can be utilized for deepwater port operations, defining areas which provide the best balance between least risk and least cost, and determining what type of deepwater port terminal design can be employed to provide best availability and least environmental impact. (See also W76-09374) (Sinha - OEIS)
W76-09380

MASS TRANSPORT AND DISPERSION OFF A TIDAL INLET,
Tetra Tech, Inc., Pasadena, Calif.
C. J. Sonu, and L. D. Wright.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2383. p 489-498, 10 fig, 6 ref.

Descriptors: Water pollution sources, Pollutants, *Tidal effects, *Environmental effects, Resources development, Water resources, Continental Shelf, Inlets(Waterways), Land breezes, Sea breezes, *Dispersion, Diffusion, Florida, Lagoons, Jetties, Gulf of Mexico.
Identifiers: *Outer Continental Shelf, Longshore currents, *Mass transport.

A field study was undertaken in order to investigate the interplay among tide, water density distribution, longshore currents, waves and winds associated with a tidal inlet. The study site was East Pass, located at the eastern end of Santa Rosa Island adjacent to Destin, Florida. East Pass connects the Gulf of Mexico with the Choctawhatchee Bay, a hypopycnal lagoon with a surface area of approximately 138 square miles with water depths generally less than 3 m. Pollutants moving with undiluted offshore water can approach a tidal inlet for most part of the tidal cycle. During flooding tide, a wave-induced longshore current arriving from the adjacent surf zone is readily entrained into the inlet, whereas an ambient cross current, either driven by tide or sea breeze, tends to bypass the inlet by deflecting seaward at the jetty. During ebb tide, these currents can still operate in strength in the underlayer, by-passing the inlet beneath the buoyant jet or approaching the inlet under a laterally expanding effluent along the adjacent surf zone. The effluent discharging with the jet can undergo strong buoyant expansion into the adjacent coast, forming a partially diluted effluent pool against the shore under a sea breeze. The land breeze and the instability at the density boundary between this nearshore effluent pool and the undiluted offshore water are the two most important factors affecting the eventual dispersion and diffusion of the tidal inlet effluent. (See also W76-09374) (Sinha - OEIS)
W76-09381

THE OFFSHORE ECOLOGY INVESTIGATION,
Gulf Universities Research Consortium, Gulfport, Miss.
J. M. Sharp, and J. W. Tyson.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2384. p 499-504.

Descriptors: *Ecology, *Oil pollution, *Fossil fuels, *Environmental effects, Water quality control, *Ecosystems, Assessments, Continental Shelf, Offshore platforms, Resources development, Water resources, Louisiana, Drilling, Production, Louisiana, Bays.
Identifiers: *Outer Continental Shelf, *Offshore technology, Water pollution prevention, Environmental impact, Timbalier Bay(LA).

The Offshore Ecology Investigation (OEI) was initiated to assess the environmental/ecological impact of petroleum drilling and production off the coast of Louisiana. During the past two years, eight synoptic field sampling and data collecting exercises were completed in Timbalier Bay, Louisiana and offshore to a depth of about 100 feet. The collective investigations are directed to the determination of the possible effects of petroleum drilling and production on these estuarine and continental shelf ecosystems. Comparisons are made between (1) the shallow water bay system and the adjoining near-shore shelf region and (2) plaform locations experiencing prolonged intensive production and both nearby and distant control locations having experienced no drilling or production activity thus far. Seventy-nine percent of the investigations demonstrated either no harmful impact or abeneficial impact and 21 percent of the investigations required further interpretation but did not demonstrate harmful impact. The need for further interpretation arises from one or more of several reasons: insufficient data; internally inconsistent results reported; data reported by others; or the reporting mechanism did not provide sufficient information to allow a decision. It would seem from the evidence provided that no harmful impact on the environment from production or drilling is demonstrated. (See also W76-09374) (Sinha - OEIS)
W76-09382

NEW YORK ALTERNATIVE DUMPSITE ASSESSMENT - RECONNAISSANCE STUDY OF SURFICIAL SEDIMENTS,
National Oceanic and Atmospheric Administration, New York. Marine Ecosystems Analysis Program.
G. L. Freeland, and D. J. P. Swift.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2385. p 505-511, 6 fig, 6 ref.

Descriptors: *Waste disposal, *Water pollution sources, Resources development, *Environmental effects, Water resources, Sediments, *Sediment transport, Continental Shelf, New York, Sewage sludge, Sewage disposal, Sludge disposal, Evaluation.
Identifiers: *Outer Continental Shelf, *Ocean dumping, *Dumpsites, New York Harbor, New York Bight, Environmental Impact.

Preliminary evaluation of the potential for deposition of dumped materials, primarily sewage sludge, were made at two sites 60 nm from New York Harbor in 20 to 30 fm water depths. Since sludge particle density is barely over 1.0, geological data were analysed for potential deposition and transport of fines in particular in addition to the sand-sized fraction. Results suggest a net southwestward bottom sediment transport, intensifying during winter storms. Both dumpsites are floored by sand, predominately medium-grained (0.25 to 0.5 mm). At the northern dumpsite, moderate sediment transport is indicated to the south and west over a gently sloping bottom incised by broad, low-gradient, pre-existing valleys. Evidence of more active sediment transport to the southwest is indicated at the southern dumpsite. (See also W76-09374) (Sinha - OEIS)
W76-09383

HYDROCARBONS IN WATER AND SEDIMENT SAMPLES FROM COAL OIL POINT AREA, OFFSHORE CALIFORNIA,
Exxon Production Research Co., Linden, N.J.
For primary bibliographic entry see Field 5B.
W76-09384

LIBRARY U. OF A. MARINE SCIENCE

INFLUX OF PETROLEUM HYDROCARBONS INTO THE OCEAN,
Coast Guard, Washington, D. C.
C. C. Bates, and E. Pearson.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2390. p 535-544, 4 tab, 27 ref.

Descriptors: *Oil pollution, *Environmental effects, *Oil spills, Resources development, Water resources, *Water pollution sources, Continental Shelf, Monitoring, Seepage, Exploration, Exploitation, United Nations, Oceans, Organic compounds, *Path of pollutants.
Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, Natural seepage, Earthwatch, Global monitoring, World Ocean.

Four definitive studies have been published in the past five years regarding the influx of petroleum hydrocarbons (PHC) into the world ocean. The first three studies--those by the Massachusetts Institute of Technology (1970), University of Oklahoma (1973), and the U.S. Coast Guard (1973)--omitted the contribution of PHC from natural seepage, coastal municipal wastes, and direct urban runoff outside the riverine systems. The fourth study by a National Academy of Sciences Panel (1975) now includes these factors and concludes that approximately 6.1 million metric tons of PHC--or about 0.25% of that produced--entered the ocean annually in the 1971-1972 time frame. Major PHC sources were calculated to be: Marine Transport-33%; river run-off-27%; coastal activities-18%; atmospheric fallout-10%; natural seeps-10%; and offshore petroleum production-2%. A definite need exists to proceed with the United Nations 'Earthwatch' effort relative to systematic and standardized monitoring globally of marine pollution by PHC in order to resolve the many unknowns still existing in regards to the inputs, fates, and effects of hydrocarbons in the marine environment. (See also W76-09374) (Sinha - OEIS)
W76-09385

GEOTECHNICAL ASPECTS OF ROCK BORROW FOR LARGE BREAKWATERS,
Dames and Moore, New York.
I. Watson, J. A. Fischer, and C. M. Urlich.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2392. p 553-563, 2 fig, 2 tab, 9 ref.

Descriptors: Powerplants, *Nuclear powerplants, *Breakwaters, Engineering structures, Environmental effects, Resources development, Water resources, *Water pollution sources, *Water quality control, Continental Shelf, Rocks, United States, Atlantic Ocean, Gulf of Mexico.
Identifiers: *Outer Continental Shelf, *Floating powerplants, Offshore powerplants, *Offshore technology, *Rock borrow, Rockfill breakwaters, U.S.East Coast, Gulf Coast.

A state of the art of investigations to secure rock borrow for the breakwaters proposed to protect offshore nuclear power plants is presented. Considerations relating to the geological, geotechnical, and design suitability of rock are discussed within the framework of economics, and the environmental impact of quarrying and transporting rock to potential sites on the East and Gulf coasts of the U.S. The methodology outlined has application to the construction of all large rockfill breakwaters. The selection of suitable sources of rock borrow for the construction of breakwaters to protect floating nuclear power plants or other important offshore structures should be based on intensive investigations. These should be undertaken well in advance of finalizing the breakwater design. Although the quantities of rock for floating nuclear power plants breakwaters are not large in comparison with certain earth/rockfill dams, the requirements on quality in terms of the safety criteria specified by the Atomic Energy Commission are stringent. (See also W76-09374) (Sinha - OEIS)
W76-09386

EVALUATION OF OFFSHORE BREAKWATER STABILITY UNDER WAVE ACTION,
Dames and Moore, New York.
J. A. Fischer, and B. T. D. Lu.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2394. p 577-590, 4 fig, 38 ref.

Descriptors: Powerplants, *Nuclear powerplants, *Breakwaters, Engineering structures, Environmental effects, Resources development, *Soil strength, Water resources, Water pollution sources, *Water quality control, Continental Shelf, Rocks, Stability, Storm surge, Waves(Water), Foundation investigations, Soils, United States.
Identifiers: *Outer Continental Shelf, *Floating powerplants, *Offshore powerplants, *Offshore technology, Rock borrow, Rockfill breakwaters, U.S. East Coast, Gulf Coast, *Wave action.

Attacking storm waves affect the overall design of any offshore breakwater used as a protective structure. Methods and considerations required to evaluate the stability of an offshore breakwater under design storm wave action is described. The following various storm wave effects are of concern: the possibility of wave forces physically causing damage to the breakwater embankment materials; the stability of the breakwater against horizontal sliding; the stability of the breakwater embankment against slope failure; and the effect of continuing storm waves on the strength and stability of the foundation soils. The characteristics of wave and breakwater configuration must be considered in determining the design magnitudes of breaking wave force and hydrostatic pressure acting on the breakwater. In addition, the rapid drawdown conditions of the water level as the wave retreats outside the breakwater may be critical and should be considered in the analyses. Both wedge and conventional circular failure types of stability analyses should be utilized in analyzing the slope stability of an offshore breakwater. The procedures described are part of the necessary stability considerations in the design of a breakwater to protect a floating nuclear generating plant (FNP), and are also applicable to the design of any important offshore breakwater or gravity structure. (See also W76-09374) (Sinha - OEIS)
W76-09387

EFFECT OF OFFSHORE STRUCTURES ON SHORELINE EVOLUTION, ATLANTIC GENERATING STATION,
Army Engineers Waterways Experiment Station, Vicksburg, Miss.
R. W. Whalin, R. D. Carver, and D. D. Davidson.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2431, p 873-886, 7 fig, 2 tab, 5 ref.

Descriptors: Powerplants, *Nuclear powerplants, *Breakwaters, Engineering structures, *Environmental effects, Resources development, Water resources, Water pollution sources, *Water quality control, Continental Shelf, Stability, Models, Waves(Water), Currents(Water), Erosion, Beaches, New Jersey.
Identifiers: *Outer Continental Shelf, *Floating powerplants, *Offshore powerplants, *Offshore technology, *Wave action, Shoreline evolution, Longshore currents, Breaker zone, Nearshore, Accretion, Environmental impact.

A distorted scale hydraulic model investigation was performed to determine the potential effect, if any, of a proposed offshore nuclear power plant on shoreline evolution. Model measurements of current patterns and breaking wave characteristics (height, depth and angle to shoreline) were used to calculate longshore transport rates in the potentially affected areas. It appears that construction of the proposed offshore nuclear powerplant and breakwater will not significantly alter current patterns within the breaker zone, significantly alter longshore current velocities or transport rates north and south of the inlet, and have a significant effect on shoreline evolution in the area under consideration. The distorted scale model provided adequate information to make the conclusions set forth in this investigation which are that the proposed construction would have a negligible effect on future shoreline evolution. (See also W76-09374) (Sinha - OEIS)
W76-09388

SELF-PURIFICATION OF SMALL FRESHWATER STREAMS: PHOSPHATE, NITRATE, AND AMMONIA REMOVAL,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.; and Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
R. H. S. McColl.
N Z J Mar Freshwater Res. 8(2), p 375-388, 1974.

Descriptors: *Self purification, *Phosphates, *Nitrates, *Ammonia, Nutrients, Absorption, Algae, Photosynthesis, StreaM, Effluents, Temperature, Sediments.

Uptake of stream nutrients by organisms or sediments of the stream bed is affected by the nutrient loading to which the stream is accustomed. In a stream with nutrient-poor waters, added phosphate and ammonia were removed rapidly and efficiently at water temperatures within the range 4.5-15.0C on passing over a mat of filamentous algae and trapped sediment. Nitrate was removed less efficiently or not at all. In another stream where nutrients were abundant phosphate and nitrate from a sewage outfall were not significantly removed by the stream bed flora up to 100 m downstream at summer temperatures. Na was used as an inert marker to measure the dilution of added nutrients or sewage effluent by the stream waters; electrical conductivity was rejected as a measure because it is influenced by photosynthesis. Studies of nutrient run-off should take account of stream-bed removal when the effects of run-off on eutrophication of lakes are being considered.--Copyright 1975, Biological Abstracts, Inc.
W76-09398

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

AGRICULTURAL WATER DEMANDS IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-08841

MODELS FOR EVALUATION OF FRESHWATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 4A.
W76-08921

MOUNTAINOUS WINTER PRECIPITATION: A STOCHASTIC EVENT-BASED APPROACH,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2B.
W76-09062

6B. Evaluation Process

RECREATION USE PATTERNS AND USER ATTITUDES ON THE SNAKE RIVER,
Washington State Univ., Pullman. Dept. of Forestry and Range Management.
L. L. Shew, and M. P. Werner.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 768, $5.50 in paper copy, $2.25 in microfiche. Washington Water Research Center, Pullman, Completion Report, March 1976. 114 p, 4 fig, 25 tab, 56 ref, 6 append. OWRT A-050-WASH(1) 14-31-0001-3848.

Descriptors: Recreation, *Attitudes, Planning, Land use, *Recreation demand, Social needs, Economics, Idaho, *Washington.
Identifiers: *Snake River(Wash).

The Snake River, in its natural state, has provided various types of recreation opportunities to both local residents and visitors. The conversion of the free-flowing river to slackwater impoundments behind a chain of dams and their associated developments will undoubtedly have an impact on the recreation use patterns in the area and the types of recreation user groups attracted to the area. The main objectives of the study were to: (1) conduct a base study on the recreation users and uses; (2) gather socioeconomic data pertaining to the recreation users of the Snake River Canyon within the study area; (3) determine the recreational activities and use patterns within the defined study area; (4) identify and describe the types of recreation users in the area based on their attitudes towards recreation; and (5) correlate the activities and use patterns with the socioeconomic data. Eighteen recreation activities were identified. The recreationists were predominately young to middle aged and more highly educated than the national average. The percentage of persons recreating alone was also higher than the national average, and the study showed higher percentages for groups of friends on a recreation outing and lower percentages for families as compared to national statistics. The total use figure produced by the study was 85,871 visitor days. Results showed that a diversity of recreation opportunities existed in this area before impoundment, and along with this diversity were certain environmental elements which appealed to recreationists. Proper diversity of recreation areas can be maintained by encouraging development and use which complements rather than competes for similar recreation opportunities. This diversity is one of the key elements to recreation enjoyment by a variety of recreation user groups. This principle should be observed in the planning efforts of agencies which are genuinely concerned about recreation in the area.
W76-08751

USER CHARGES FOR INLAND WATERWAYS: A REVIEW OF ISSUES IN POLICY AND ECONOMIC IMPACT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4A.
W76-08847

MODELS FOR EVALUATION OF FRESHWATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 4A.
W76-08921

METHODS OF ESTIMATING RESIDENTIAL LAND USE FOR WATER RESOURCES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Economics.
For primary bibliographic entry see Field 4C.
W76-08924

IMPACT OF CHANGES IN IRRIGATION WATER MANAGEMENT IN EASTERN IDAHO,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3F.
W76-08925

INDUSTRIAL DEVELOPMENT THROUGH WATER-RESOURCES PLANNING,
Department of Commerce, Washington, D. C.
For primary bibliographic entry see Field 3E.
W76-09034

WATER RESOURCES POLICY ISSUES - 1975.
Oregon State Univ., Corvallis. Water Resources Research Inst.
SEMIN WR 020-75, July 1975. 96 p.

Descriptors: *Water resources development, *Water policy, *Federal government, Costs, Cost repayment, Legislation, Cost sharing, Inland waterways, Flood control, Irrigation programs, Local governments, Water quality, Water pollution control, Pacific Northwest U.S., Electric power production, Washington, Oregon, River flow, Columbia River, Institutional constraints.
Identifiers: Zero discharge, Snake River(Wash).

Historically the federal government's policy has been to assume all or a considerable portion of the costs for water resources development. The National Water Commission's report of 1973 made sweeping changes in these policies by requiring non-federal interests to bear an appropriate share of costs. The Commission also concluded that the 'zero discharge' goal is impractical and unattainable. The review by Congress of the Water Resources Council's definition of the federal water policy as stated in its 'Principles and Standards' poses the question whether the policy of the federal government is to encourage or discourage water resource development. How these policies affect the Pacific Northwest in relation to power development, marketing and revenues; river flows, pollution, and state institutions were considered in this seminar. Specific contributions deal with energy generation in the Western States, water requirements for energy production, pollution from non-point sources and its control, protection of fish habitats in forest lands, interstate water diversion, protection of wild rivers, water conservation in irrigated agriculture, and the future availability of water and its impact on food production demands. (See W76-09231 thru W76-09237) (Auen-Wisconsin).
W76-09230

WATER REQUIREMENTS FOR ENERGY,
For primary bibliographic entry see Field 3E.
W76-09231

POLLUTION FROM NON-POINT SOURCES,
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5B.
W76-09232

FISH HABITAT IN FOREST LANDS,
Pacific Northwest Forest and Range Experiment Station, Corvallis, Oreg. Forestry Sciences Lab.
For primary bibliographic entry see Field 8I.
W76-09233

WATER DIVERSION AND THE MORATORIUM,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 4A.
W76-09234

PROTECTION OF FREE-FLOWING RIVERS,
Oregon State Univ., Corvallis. Dept. of Geography.
For primary bibliographic entry see Field 6E.
W76-09235

WATER CONSERVATION AND IRRIGATED AGRICULTURE,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-09236

WATER AND FOOD PRODUCTION DEMANDS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 6D.
W76-09237

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

USER CHARGES FOR INLAND WATERWAYS: A REVIEW OF ISSUES IN POLICY AND ECONOMIC IMPACT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4A.
W76-08847

COSTS OF BIOLOGICAL WASTE WATER PURIFICATION (DIE KOSTEN DER BIOLOGISCHEN ABWASSERREINIGUNG),
For primary bibliographic entry see Field 5D.
W76-09016

COST OF PRODUCING CROPS IN THE IRRIGATED SOUTHWEST, PART V: UTAH,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 3F.
W76-09063

PROCESSES MAKE SEWAGE COME CLEAN MORE CHEAPLY.
For primary bibliographic entry see Field 5D.
W76-09154

MONOGRAPH OF THE EFFECTIVENESS AND COST OF WATER TREATMENT PROCESSES FOR REMOVAL OF SPECIFIC CONTAMINANTS. VOL. 1. TECHNICAL MANUAL,
Volkert (David) and Associates, Bethesda, Md.
For primary bibliographic entry see Field 5F.
W76-09227

CAPABILITIES AND COSTS OF TECHNOLOGY ASSOCIATED WITH THE ACHIEVEMENT OF THE REQUIREMENTS AND GOALS OF THE FWPCA OF 1972 FOR PULP AND PAPER INDUSTRY.
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 5G.
W76-09229

WATER CONSERVATION AND IRRIGATED AGRICULTURE,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-09236

PRIVATE WELLS PROVE TO BE A BETTER BUY,
For primary bibliographic entry see Field 4B.
W76-09343

COST ESTIMATION.
For primary bibliographic entry see Field 4B.
W76-09354

LIBRARY U. OF I. UNIVERSITY OF IDAHO

6D. Water Demand

AGRICULTURAL WATER DEMANDS IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-08841

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN SELECTED COAL-ENERGY AREAS OF UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-09148

WATER RESOURCES POLICY ISSUES - 1975.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-09230

WATER REQUIREMENTS FOR ENERGY,
For primary bibliographic entry see Field 3E.
W76-09231

WATER AND FOOD PRODUCTION DEMANDS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. Boersma.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p 81-93. 3 fig, 6 tab.

Descriptors: *Agriculture, *Irrigation, *Water supply, Water demand, Energy, Soil-water-plant relationships.
Identifiers: Food production, Energy requirements.

The importance of water for food production is considered in relation to the availability of fresh water and its place of occurrence. Of the earth's 32 billion acres of land, only 25%, or 8 billion acres, are suitable for cultivated crops, with only about 14% of the farmland in irrigation. Most of the land where crops can be economically grown without supplemental irrigation are now in use. The food energy yield from corn grain resulting from the input of cultural energy is substantially smaller under irrigated conditions than under non-irrigated production. The ratio of energy yield to energy input has decreased to about 2.2. The expansion of irrigated agriculture is feasible on a small scale but appears questionable on a large scale because of the high energy requirement. Mankind may learn to use the food energy available in a more efficient manner and not discharge much of the crop energy as waste. Recycling systems that include the use of textured vegetable proteins can be visualized. The present economic unfeasibility of desalination of oceanic water for agriculture may be reversed by developments in applying solar energy for desalination and may solve the restricted water supply for agriculture. (See also W76-09230) (Auen-Wisconsin)
W76-09237

HYDROLOGICAL PROBLEMS ASSOCIATED WITH DEVELOPING GEOTHERMAL ENERGY SYSTEMS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-09260

6E. Water Law and Institutions

RESPONSIBILITIES OF OFFSHORE DRILLING REGULATIONS,
Geological Survey, Metairie, La.
For primary bibliographic entry see Field 5G.
W76-08918

PUBLIC OPINION AND THE ENVIRONMENT: ECOLOGY, THE COASTAL ZONE, AND PUBLIC POLICY,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 6G.
W76-09035

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3E.
W76-09065

A GUIDE TO STATE PROGRAMS FOR THE RECLAMATION OF SURFACE MINED AREAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5G.
W76-09142

CRITERIA FOR SELECTING A WATER QUALITY MODEL FOR 208 PLANNING,
Hydrocomp Inc., Atlanta, Ga.
For primary bibliographic entry see Field 5G.
W76-09212

QUALITY ASSURANCE FOR GROUNDWATER,
For primary bibliographic entry see Field 5G.
W76-09213

WATER DIVERSION AND THE MORATORIUM,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 4A.
W76-09234

PROTECTION OF FREE-FLOWING RIVERS,
Oregon State Univ., Corvallis. Dept. of Geography.
R. E. Pfister.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p. 63-72. 1 fig., 8 ref.

Descriptors: *Wild rivers, *Protection, *Wild Rivers Act, *Water policy, Legislation, State governments, Federal government, Conservation, Management, Competing uses, Recreation, Pacific Northwest U.S.

The federal and state legislation designating and protecting free-flowing rivers and the challenges facing the implementation of this policy at the national and state level are discussed. Management and administration are challenged by not only the difficulties associated with the protected area but also with the various activities occurring outside of the designated area. For example, within the designated wild area of the Rogue River in Oregon, the major problem was related to seasonal use and the growth trend in recreation. The rapid increase in recreational use forced the Governor's office to appoint a Rogue River Study Group to review questions about management of the wild river area and the options for controlling use to minimize social and environmental problems. The study group identified 18 problem areas that need investigation. Designation of many wild and scenic rivers has to be weighed on a benefit-cost analysi based on the comparative value for several com peting uses, such as hydroelectric power, summe homes and lodges, or other development-oriente options, when classifying a river as wild or scenic (See also W76-09230) (Auen-Wisconsin).
W76-09235

EPA STANDARDS FOR DRINKING WATE BECOME EFFECTIVE IN JUNE, 1977.
For primary bibliographic entry see Field 5F.
W76-09356

6F. Nonstructural Alternatives

IMPLICATIONS OF ZONING AS AN URBA WATER MANAGEMENT MEASURE,
Georgia Univ., Athens. Dept. of Real Estate.
C. F. Floyd, and M. J. Rowan.
Available from the National Technical Informa tion Service, Springfield, Va 22161, as PB-253 76 $5.50 in paper copy, $2.25 in microfiche. Georg Environmental Research Center, Atlanta, Repo ERC 0576, March 1976. 101 p, 8 fig, 15 tab, 16 re 2 append. OWRT B-094-GA(2) 14-31-0001-4153.

Descriptors: *Land use, Regional economic *Urbanization, *Zoning, Computer models, Geo gia, Flood plain zoning, *Land developmen Management, *Environmental effects, Model st dies, Cities.
Identifiers: Georgia Transportation Planning Lan Use model, *Land use zoning.

The objectives were threefold. The first was to im prove the data base of the Georgia Transportatio Planning Land Use model regarding (1) existin land use and (2) suitability of land for develo ment. This model was developed to assist th Georgia Department of Transportation in analy ing the non-user impacts of transporation facili improvements along rural and semi-rural co ridors. The impacts analyzed include employmen population, housing and land use. The second ob jective was to modify and strengthen the land u submodel to enable it to better analyze the impa of transportation facility improvements on lan use change. The third objective was to use th model to analyze the impact of restrictive land u policies on economic development and land us The project was quite successful in achieving th first two objectives. It was less successful in mee ing the third, that of actually using the Georg Transporation Planning Land Use model t analyze the impacts of restrictive land use zonin This occurred not because of a fault in the mod but because restrictive land use zoning puts litt or no constraint on economic development in th type of area analyzed. The available land supp even if restrictive zoning practices remove som of the land from the developable category is qui large in relationship to projected development f into the future.
W76-08755

FLOOD PLAIN INFORMATION: MARICOP COUNTY, ARIZONA, VOLUME I, INDIA BEND WASH REPORT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08806

FLOOD PLAIN INFORMATION: MARICOP COUNTY, ARIZONA, VOLUME II, CAV CREEK REPORT,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08807

FLOOD PLAIN INFORMATION: MARICOP COUNTY, ARIZONA, VOLUME IV, WICKEN BURG REPORT.
Army Engineer District, Los Angeles, Calif

For primary bibliographic entry see Field 4A.
W76-08808

FLOOD PLAIN INFORMATION: MARICOPA COUNTY ARIZONA, VOLUME V, NEW RIVER REPORT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08809

FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08810

SPECIAL FLOOD HAZARD INFORMATION: MILL CREEK-GEKELER SLOUGH, LA GRANDE, OREGON.
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 4A.
W76-08811

FLOOD PLAIN INFORMATION: RUSH CREEK-PETALUMA RIVER TO U. S. HIGHWAY 101, MARIN COUNTY, CALIFORNIA.
Jordon/Mathis and Associates, San Francisco, Calif.; and Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08812

FLOOD PLAIN INFORMATION: KINGS RIVER, SANGER, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08813

FLOOD PLAIN INFORMATION: DRY CREEK AND TRIBUTARIES, ROSEVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08814

FLOOD PLAIN INFORMATION: GUADALUPE RIVER, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08815

FLOOD PLAIN INFORMATION: UMATILLA RIVER TRIBUTARIES, MCKAY, TUTUILLA AND WILDHORSE CREEKS, PENDLETON, OREGON AND VICINITY.
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 4A.
W76-08816

FLOOD PLAIN INFORMATION: COW CREEK, PALO CEDRO, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08817

FLOOD PLAIN INFORMATION: DARDENNE AND BELLEAU CREEKS, ST. CHARLES COUNTY, MISSOURI.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-08818

FLOOD PLAIN INFORMATION: ST. CHARLES COUNTY, MISSOURI, PART 2, PERUQUE CREEK.
Russell and Axon, St. Louis, Mo.; and Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-08819

FLOOD PLAIN INFORMATION: MIDDLE RIVER ROUGE, NORTHVILLE, MICHIGAN.
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W76-08820

FLOOD PLAIN INFORMATION: SAPPA CREEK, OBERLIN, KANSAS.
Army Engineer District, Kansas City, Kans.
For primary bibliographic entry see Field 4A.
W76-08821

FLOOD PLAIN INFORMATION: ARKANSAS RIVER, DERBY-MULVANE, KANSAS.
Army Engineer District, Tulsa, Oklahoma.
For primary bibliographic entry see Field 4A.
W76-08822

A CRITICAL STUDY OF FLOOD PROTECTION PLANNING IN THE SUSQUEHANNA RIVER BASIN: 1936-1972,
Cornell Univ., Ithaca, N. Y.
E. H. Preston, and C. D. Gates.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 775, $5.00 in paper copy, $2.25 in microfiche. Cornell University Water Resources and Marine Sciences Center, Technical Report No. 100, April 1976. 65 p, 2 fig, 9 tab, 23 ref. OWRT A-045-NY (4) 14-31-0001-4032

Descriptors: *Flood protection, *Comprehensive planning, *River basins, Pennsylvania, Dams, Flood control, Environment, Communication, History, Projects, Risks, New York, Reservoirs, Flood damage, Planning agencies, Effects, *Priorities, Social needs, Social values, Social change, Social participation, Coordination, Information exchange, Flood plains.
Identifiers: *Public participation, *Susquehanna River Basin, Coordination committee, Local, State, Public opinion.

This study considers the history of flood protection planning in the susquehanna River Basin prior to June 1972, with special emphasis on the leadership role of the U. S. Corps of Engineers. The formation, procedures and outlines of the comprehensive plan developed by the Susquehanna River Basin Coordinating Committee (SRBCC) are described. The efforts of a University research group to establish two-way communication between the public and the planners, specifically to encourage public response to a draft plan through a series of workshops and public forums, are summarized. The expansion of the role of State and local planning agencies in flood protection planning in the New York and Pennsylvania portions of the basin during the decade prior to 1972, culminated in the creation of the Susquehanna River Basin Commission. Public opinion showed a gradual shift in high priority concerns, from structural flood protection measures, to environmental quality, and finally to flood plains management. The long delay in construction of the two large dams (Tioga Hammond and Cowanesque) in Pennsylvania results from a long history of local opposition until Hurricane Agnes in June 1972. Finally, the concept of flood risk and the problems inherent in insuring a general understanding of it by the public are reviewed. The study concludes that flood protection planning in the Susquehanna River Basin during the period 1936-1972 was adversely affected by the reordering of the priorities of both planners and public that occurred during the last third of the period. As protection of environmental resources replaced the development of resources as a top priority, structural protection measures lost their appeal to both planners and public.
W76-08846

6G. Ecologic Impact Of Water Development

IMPLICATIONS OF ZONING AS AN URBAN WATER MANAGEMENT MEASURE,
Georgia Univ., Athens. Dept. of Real Estate.
For primary bibliographic entry see Field 6F.
W76-08755

RATIONALE FOR A WATER POLLUTION CODE PART 1: THE WASTE SYSTEM AND THE NATURAL SYSTEM,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W76-08839

A CRITICAL STUDY OF FLOOD PROTECTION PLANNING IN THE SUSQUEHANNA RIVER BASIN: 1936-1972,
Cornell Univ., Ithaca, N. Y.
For primary bibliographic entry see Field 6F.
W76-08846

ENVIRONMENTAL EFFECTS OF COOLING SYSTEMS AT NUCLEAR POWER PLANTS,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-08848

ENVIRONMENTAL ASPECTS OF THE COOLING SYSTEMS OF THERMAL POWER STATIONS: REPORT ON THE SEMINAR HELD AT ZURICH, MAY CONCLUSIONS AND RECOMMENDATIONS, (LES ASPECTS D'ENVIRONMENT DES SYSTEMS DE REFROIDISSEMENT DES CENTRALLES THERMIQUES),
Economic Commission for Europe (UN), Geneva (Switzerland). Div. of Energy.
C. Lopes-Polo.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 25-34, 11 ref.

Descriptors: *Thermal effects, *Environmental effects, Nuclear powerplants, *Conferences, Heat budget, Air pollution effects.
Identifiers: Cooling systems.

The paper reviews the main question considered at the Seminar on Environmental Aspects of the Cooling systems of Thermal Power Stations and reports on the conclusions reached at that seminar. The questions considered were (1) the overall thermal balance of the atmosphere and residual heat from electricity generation; (2) air-cooling systems and their consequences for the environment; and (3) the comparative economics of different cooling systems. (See also W76-08848) (Chilton-ORNL)
W76-08850

AQUATIC PHYSIOLOGY OF THERMAL AND CHEMICAL DISCHARGES,
Battelle Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5C.
W76-08880

TEMPERATURE SELECTION BY FISH--A FACTOR IN POWER-PLANT IMPACT ASSESSMENTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-08882

PREDICTING THE ECOLOGICAL CONSEQUENCES OF THERMAL POLLUTION

LIBRARY U. OF A. Universal Library

FROM OBSERVATIONS ON GEOTHERMAL HABITATS,
Wisconsin Univ. Madison, Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W76-08883

PUBLIC OPINION AND THE ENVIRONMENT: ECOLOGY, THE COASTAL ZONE, AND PUBLIC POLICY,
California Univ., Santa Barbara.
C. C. Hetrick, C. J. Lieberman, and D. R. Ranish.
Available from the National Technical Information Service, Springfield, Va 22161, as COM 75-10840, $3.50 in paper copy. Coastal Zone Management Journal, Vol. 1, No. 3, p 275-289, 1974. 2 tab.

Descriptors: *Environment, Political aspects, *Political constaints, *Surveys, *Coasts, Evaluation, Costs, Governments, Psychological aspects, Ecology, *California.
Identifiers: *Public opinion, Environmental concern, *Coastal zone, *Public policy, Casual factors, Perceived impact, *Santa Barbara(CA).

A sample survey was undertaken to understand citizen opinion on coastal zone usage and planning within a broad context of public attitudes regarding environmental policy and related political issues. Of the 523 persons interviewed, 73% thought environmental concerns were serious problems; 18% thought there were problems but not serious; 6% stated there were no environmental problems. This shows a high degree of concern, but within the context of other problems, environment was ranked third as a problem for Santa Barbara County and fourth for the nation. Population and crime are ranked higher in the county, and for the nation these two factors plus poverty are ranked above the environment. People were generally reluctant to spend additional tax money on environmental problems. Education and age, along with political participation, were major variables associated with concern for the environment. It is believed that causal inference should be limited to education and age. That younger respondents show more environmental concern can be explained in part by recent environmental activism. Also, better educated people generally tend to receive more information which increases the likelihood of awareness of problem. Another variable is the perceived impact of problems which can help to explain the age and education variables in that younger persons tend to have a bigger stake in the future, and better-educated persons tend to perceive more impacts of problems. Incentives, other than economic, will be necessary to mobilize people around intangible environmental problems. (Smith-North Carolina)
W76-09035

DESERT ECOSYSTEMS: HIGHER TROPHIC LEVELS,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 2A.
W76-09064

THE NATURE AND CAUSES OF DESERTIZATION,
International Livestock Centre for Africa, Addis Ababa (Ethiopia).
For primary bibliographic entry see Field 4C.
W76-09069

THE SAHEL: TIME FOR A NEW APPROACH,
For primary bibliographic entry see Field 4C.
W76-09070

A GUIDE TO STATE PROGRAMS FOR THE RECLAMATION OF SURFACE MINED AREAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5G.
W76-09142

NORTHERN GREAT PLAINS RESOURCE PROGRAM. SURFACE RESOURCE WORK GROUP--REGIONAL PROFILE.
Northern Great Plains Resource Program, Denver, Colo.
For primary bibliographic entry see Field 4C.
W76-09228

OCEAN DUMPING--A RATIONAL APPROACH TO AN INTERNATIONAL PROBLEM,
Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-09304

MINERAL RESOURCE MANAGEMENT OF THE OUTER CONTINENTAL SHELF.
Geological Survey, Reston, Va.
M. V. Adams, C. B. John, R. F. Kelly, A. E. La Pointe, and R. W. Meurer.
Circular No. 720, 1975. 36 p, 11 fig, 15 tab, 20 ref.

Descriptors: *Continental Shelf, *Environmental effects, *Resources development,Oil, Gases, Water resources, Management, Leases, Exploration, Exploitation, Resource allocation, Fossil fuels, Natural gas, OPtimum development plants, Safety, Water pollution sources.
Identifiers: *Outer Continental Shelf, Oil and gas, Mineral resources, Environmental impact.

Management of the mineral resource of the Outer Continental Shelf has been a function of the Geological Survey. This circular explains the procedures which are involved in leasing procedures, evaluation of resources, and supervision of production operations on leased lands of the Outer Continental Shelf. Baseline studies are conducted in frontier areas to establish an environmental benchmark against which future measurements can be compared to detect possible adverse effects resulting from exploration and development activities. Resource conservation and efforts to increase operational margins of safety are explained. The particular resources dealt with in this circular are oil and gas. Statistical data are included. (Sinha - OEIS)
W76-09306

ECOLOGICAL EFFECTS OF OFFSHORE CONSTRUCTION,
Marine Science Inst., Bayou La Batre, Ala.
G. A. Rounsefell.
Journal of Marine Science, Vol 2, No 1, 1972. 213 p, 254 ref. DACW72-71-C-0002.

Descriptors: *Continental Shelf, *Resources development, *Environmental effects, Water resources, *Water pollution effects, Offshore platforms, Engineering structures, Deep water habitats, Buoys, Barriers, Excavation, Exploration, Exploitation, Storage, Bibliographies.
Identifiers: *Outer Continental Shelf, Offshore technology, Environmental impact, Site selection, Artificial islands, Tidal dams, Ecological effects, Floating airports, Floating cities, Artificial reefs.

A literature survey is presented to set forth current knowledge of environmental effects of offshore construction with reference to artificial islands, buoys, floating bridges, underwater habitations, floating airports, floating cities, underwater pipelines, tunnels, artificial reefs, hurricane barriers, tidal dams, subsea storage of oil and other commodities, offshore platforms, and deep harbor excavation by blasting. An annotated bibliography is included as an appendix. It is pointed out that it is impossible to carry on any type of construction without disturbance. In particular, where islands are constructed, the extent and permanence of damage depends on many factors. Careful site selection may lessen damages and in some instances may bring benefits that will offset or even outweigh any damages. Strong factors in site selection are depth of water, range of tides, predicted storm surges, and probable wave action. The author suggests that the greatest dangers lie in the placement of artificial islands too closely adjacent to estuaries where they can significantly effect water exchange, and in the proliferation of water cooled nuclear power plants. (Sinha - OEIS)
W76-09307

REPORT ON THE HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE SPOIL DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5E.
W76-09309

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 11-12, 1975, SAVANNAH, GEORGIA.
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
For primary bibliographic entry see Field 5G.
W76-09329

OFFSHORE MULTI-USE PORT ISLANDS AND THEIR ENVIRONMENT,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5G.
W76-09376

THE OFFSHORE ECOLOGY INVESTIGATION,
Gulf Universities Research Consortium, Gulfport, Miss.
For primary bibliographic entry see Field 5G.
W76-09382

7. RESOURCES DATA

7A. Network Design

ON THE COMPONENTS OF TIME SERIES; THE REMOVAL OF SPATIAL DEPENDENCE,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Applied Mathematics.
For primary bibliographic entry see Field 2B.
W76-08803

DESIGN OF NATIONWIDE WATER-QUALITY-MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-09209

ANALYTICAL CHEMISTRY IN WATER POLLUTION CONTROL,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5A.
W76-09221

7B. Data Acquisition

IMPROVED PROCEDURE FOR ION EXCHANGE EXPERIMENTS WITH SOILS USING LEACHING TUBES, AND HANDLING OF WATER REPELLENT SOILS, (IN GERMAN),
For primary bibliographic entry see Field 2G.
W76-08762

THE TIME STABILITY OF DISSOLVED MERCURY IN WATER SAMPLES-I. LITERATURE REVIEW,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-08767

INTERCONTINENTAL COMPARISON OF EVAPORATION ESTIMATES,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W76-08800

WATER RETENTION BY CORE AND SIEVED SOIL SAMPLES,
Agricultural Research Service, Bushland, Tex.
For primary bibliographic entry see Field 2G.
W76-08802

APPARATUS AND METHOD FOR MAKING SNOW WITH UNIFORM DROP SIZE,
Hedco, Inc., Paramus, N.J. (Assignee).
G. C. Dewey.
U.S. Patent No. 3,948,442, 4 p, 4 fig, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 222, April 6, 1976.

Descriptors: *Patent, *Snow, Snow cover, Crystals, Skiing, Snow management, Application equipment.
Identifiers: Snow-making equipment.

An airless snow-making machine is provided in which ice nuclei and water drops are formed separately, commingled, and discharged to form snow-like crystals. The water drops are uniform and are formed by cyclically disturbing linear water streams discharged from an orifice plate of a nozzle assembly. The cyclic disturbance effects the breaking off of water drops of uniform size from the fluid streams. (Sinha - OEIS)
W76-09051

CONDITIONS FOR USING A TENSIONPLATE AS A LYSIMETER, (IN GERMAN),
Agricultural Univ., Wageningen (Netherlands). Lab. of Agricultural Chemistry.
For primary bibliographic entry see Field 2G.
W76-09082

EXPEDIENT TECHNIQUE OF PERMANENT OBSERVATIONS -- AN INDISPENSABLE TOOL ON STUDYING THE LIMNOLOGY OF RIVERS,
W. Schmitz.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2020-2027, 1975. 11 fig., 10 ref.

Descriptors: Methodology, *Sampling, *Laboratory tests, *Data collections, *On-site data collections, *Monitoring, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand, Oxygen sag, Chlorides, Rivers, Limnology, *Pollutant identification.
Identifiers: *Neckar River(Germany).

An economical and effective method of collecting comparable chemical and physical data in rivers is described. Data are presented on chemical and physical conditions in the River Neckar and the sampling apparatus is depicted. (Katz)
W76-09106

REPRESENTATIVE ANALYTICAL WASTE WATER SAMPLES. NOTE I--A NEW SAMPLER SIGNIFICATIVA DI CAMPIONI ANALITICI DI ACQUE REFLUE. NOTA I -- NUOVO DISPOSITIVO DI CAMPIONAMENTO),
For primary bibliographic entry see Field 5A.
W76-09186

A NEW STRATIFIED PLANKTON SAMPLER FOR SHALLOW WATERS, (IN SPANISH),
La Plata Univ. (Argentina). Instituto del Museo.
A. A. Ringuelet, and L. A. Bulla.
Physis Aguas Cont Org Secc B. 33(87), p 241-246, 1974.

Descriptors: *Sampling, Plankton, Shallow water, Stratification, *Chemical stratification, Pollutant identification.
Identifiers: *Plankton samplers, *Biological stratification(Plankton).

A new sampler to be used mostly in studies on biological and chemical stratification in shallow waters is described. Basically it is a pump with a newly designed suction head. It provides a sample from a very thin stratum (12 cm thick). The depth and volume can be adjusted very precisely, and it can take very large samples in a short time.--Copyright 1975, Biological Abstracts, Inc.
W76-09193

AN EVALUATION OF ERTS DATA FOR OCEANOGRAPHIC USES THROUGH GREAT LAKE STUDIES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2H.
W76-09244

A LIGHT WEIGHT CORER FOR SAMPLING SOFT SUBAQUEOUS DEPOSITS,
University Coll., Dublin (Ireland). Dept. of Zoology.
For primary bibliographic entry see Field 2J.
W76-09266

AN AUTOMATIC RELEASE INSTRUMENT WITH UNDERWATER BUOY FOR MARKING OF FIELD EQUIPMENT,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
L. Hakanson, L. Edlund, and R. Uhrberg.
Water Resources Research, Vol. 12, No. 2, p 309-312, April 1976. 6 fig, 1 ref.

Descriptors: *Instrumentation, Equipment, *Timing, *Buoys, Underwater, Sedimentation rates, Sampling, Electrical equipment, Research equipment, Limnology, Lakes, Sediments, Bottom sediments.
Identifiers: *Buoy release instrumentation, Timing devices, Automatic release instrument.

In practical fieldwork one often encounters the problem of marking registration instruments placed below the water surface. Marking buoys can for various reasons disappear if they are placed visibly, valuable equipment and data thus being lost. In this paper a new technique and a new instrument for marking field equipment were introduced. The instrument, which in principle consists of an anchor, a buoy, an electronic circuit with a clock, and a release mechanism, is to be placed on the bottom. After a predetermined time span the clock triggers the release mechanism, and the buoy and the instrument float to the surface, where they can be collected with good accuracy in time. (Sims - ISWS)
W76-09268

DEVELOPMENT OF A WATER QUALITY INSTRUMENTATION PACKAGE FOR LONG-TERM OPERATION FROM BUOYS AND OTHER UNATTENDED MARINE PLATFORMS,
National Marine Fisheries Service, Washington, D.C. Data Buoy Office.
For primary bibliographic entry see Field 5G.
W76-09372

A NEW DEVICE FOR SUBSAMPLING PLANKTON SAMPLES,
South Carolina Marine Resource Research Inst., Charleston.
V. G. Burrell Jr, W. A. Van Engel, and S. G. Hummel.
J Cons Cons Int Explor Mer. 35(3), p 364-366, 1974.

Descriptors: *Plankton, *Sampling, Instrumentation, Distribution, Pollutant identification.

With the device described, an even distribution of plankters may be obtained prior to splitting, and plankton that adhere to the apparatus may be washed unbiased into the two aliquots. Another feature of the device allows concentration of the sample during splitting. A complete description of the construction and use of the splitter is given. -- Copyright 1975, Biological Abstracts, Inc.
W76-09396

A METHOD FOR THE RAPID SORTING OF PLANKTON INTO A NUMBER OF SIZE GROUPS,
Oslo Univ. (Norway). Inst. of Marine Biology; and Olso Univ. (Norway). Dept. of Limnology.
L. A. Kirkerud.
J Cons Cons Int Explor Mer. 35(3), p 367-369, 1974.

Descriptors: Plankton, *Sampling, Methodology, *Zooplankton, *Sieves, Instrumentation, Pollutant identification.

There is a demand for a rapid and reliable method to separate zooplankton into different species and size groups and to meet this need, a system of sieves names the 'sieve carousel' was constructed. The sieve carousel is, in principle, a circular trough with the sieves mounted around the edge and rotating about an inclined axis. A complete description is provided.--Copyright 1975, Biological Abstracts, Inc.
W76-09397

7C. Evaluation, Processing and Publication

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME I, INDIAN BEND WASH REPORT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08806

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME II, CAVE CREEK REPORT,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08807

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME IV, WICKENBURG REPORT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08808

FLOOD PLAIN INFORMATION: MARICOPA COUNTY ARIZONA, VOLUME V, NEW RIVER REPORT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08809

FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08810

SPECIAL FLOOD HAZARD INFORMATION: MILL CREEK-GEKELER SLOUGH, LA GRANDE, OREGON.
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 4A.
W76-08811

LIBRARY U. OF I. URBANA-CHAMPAIGN

FLOOD PLAIN INFORMATION: RUSH CREEK-PETALUMA RIVER TO U. S. HIGHWAY 101, MARIN COUNTY, CALIFORNIA.
Jordon/Mathis and Associates, San Francisco, Calif.; and Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08812

FLOOD PLAIN INFORMATION: KINGS RIVER, SANGER, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08813

FLOOD PLAIN INFORMATION: DRY CREEK AND TRIBUTARIES, ROSEVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08814

FLOOD PLAIN INFORMATION: GUADALUPE RIVER, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08815

FLOOD PLAIN INFORMATION: UMATILLA RIVER TRIBUTARIES, MCKAY, TUTUILLA AND WILDHORSE CREEKS, PENDLETON, OREGON AND VICINITY.
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 4A.
W76-08816

FLOOD PLAIN INFORMATION: COW CREEK, PALO CEDRO, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08817

FLOOD PLAIN INFORMATION: DARDENNE AND BELLEAU CREEKS, ST. CHARLES COUNTY, MISSOURI.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-08818

FLOOD PLAIN INFORMATION: ST. [illegible] COUNTY, MISSOURI, PART 2, PERUQUE CREEK.
Russell and Axon, St. Louis, Mo.; and Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-08819

FLOOD PLAIN INFORMATION: MIDDLE RIVER ROUGE, NORTHVILLE, MICHIGAN.
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W76-08820

FLOOD PLAIN INFORMATION: SAPPA CREEK, OBERLIN, KANSAS.
Army Engineer District, Kansas City, Kans.
For primary bibliographic entry see Field 4A.
W76-08821

FLOOD PLAIN INFORMATION: ARKANSAS RIVER, DERBY-MULVANE, KANSAS.
Army Engineer District, Tulsa, Oklahoma.
For primary bibliographic entry see Field 4A.
W76-08822

URBAN RUNOFF MODELLING,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Div.
For primary bibliographic entry see Field 4A.
W76-09033

INDUSTRIAL DEVELOPMENT THROUGH WATER-RESOURCES PLANNING,
Department of Commerce, Washington, D. C.
For primary bibliographic entry see Field 3E.
W76-09034

MOUNTAINOUS WINTER PRECIPITATION: A STOCHASTIC EVENT-BASED APPROACH,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2B.
W76-09062

COMPARATIVE EVALUATION OF YEARLY CLIMATIC FACTORS WITH THE FIVE YEARS AVERAGES FOR FUDHALIYA AGRO-METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W76-09066

COMPARATIVE EVALUATION OF CLIMATIC FACTORS AND CONDITIONS AT FUDHALIYA AGRO-METEOROLOGICAL STATION AND BAGHDAD AIRPORT METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W76-09067

HYDROLOGIC UNIT MAP--1974, STATE OF MINNESOTA.
Geological Survey, Reston, Va.
Hydrologic Unit Map, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Minnesota, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Minn), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Minnesota that are basically hydro[illegible]ic in nature. The Cataloging Units shown will [illegible] Cataloging Units previously used by [illegible] Survey in its Catalog of Information on [illegible] (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-09131

GROUND-WATER LEVELS AND CHEMICAL QUALITY OF GROUND WATER IN LINCOLN, MONTANA,
Geological Survey, Helena, Mont.
K. R. Wilke.
Open-file map 76-333, April 1976. 4 sheets.

Descriptors: *Water pollution sources, *Septic tanks, *Groundwater movement, *Water levels, *Montana, Data collections, *Maps, Water wells, Water supply.
Identifiers: *Lincoln(Mont).

Maps and tables describe chemical quality and water levels of groundwater in Lincoln, Montana. Residents of this unincorporated town have individual wells and septic tanks. Groundwater level below land surface ranged from 2 to 10 feet (0.6 to 3 metres) in September 1974 and June 1975. Groundwater samples had low concentrationsof nitrite plus nitrate, total ammonia, and phosphate. Nitrite plus nitrate (as nitrogen) ranged from 0.01 to 0.53 mg/litre and averaged 0.13 mg/litre for 37 samples in October 1974, and ranged from 0.05 to 0.75 mg/litre and averaged 0.22 mg/litre for 30 samples in May 1975. Groundwater in the Lincoln area does not appear to be significantly degraded by septic-tank effluent. (Woodard-USGS)
W76-09132

STATISTICS OF DATA TRANSFER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-09133

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1974 IN DADE COUNTY FLORIDA,
Geological Survey, Tallahassee, Fla.
J. E. Hull.
Open-file report FL-75012, 1975. 128 p, 43 fig, 8 tab, 8 ref.

Descriptors: *Basic data collections, *Groundwater, *Surface waters, *Hydrologic data, Streamflow, Water yield, Water levels, Aquifers, Withdrawal, Saline water intrusion, Rainfall, Bays, *Florida.
Identifiers: Dade County(Fla), Biscayne Bay(Fla).

This report is ninth in a series documenting the annual hydrologic conditions in Dade County, Florida. The hydrologic conditions in Dade County for the 1974 water year (October 1, 1973 to September 30, 1974) are summarized in tables, graphs, and maps. During the 1974 calendar year rainfall was 18.53 inches below the long-term average. Groundwater levels ranged from 0.1 foot above to 0.4 foot below average. In the 1974 water year, the combined average daily discharge from eight major streams and canals that flow into Biscayne Bay was 890 cfs, 230 cfs below the combined average daily flow for the 1973 water year. The combined average daily flow through the Tamiami Canal outlets was 760 cfs, 58 cfs below that of the 1973 water year. The 1974 position of the salt front in the coastal part of the Biscayne aquifer was about the same as in 1973 except at Miami International Airport and Homestead Air Force Base where the salt front had encroached farther inland. (Woodard-USGS)
W76-09135

GROUND-WATER DATA FOR SUNFLOWER COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
B. E. Wasson.
Mississipi Board of Water Commissioners, Jackson, County Report No 2, 1975. 30 p, 3 fig, 3 tab, 9 ref.

Descriptors: *Groundwater resources, *Water quality, *Basic data collections, *Well data, *Chemical analysis, Aquifers, Water wells, Hydrologic data, Drillers logs, Sites, Maps, *Mississippi.
Identifiers: Sunflower County(Miss).

This is one in a series of groundwater basic-data reports being prepared for the 82 counties concerning information about the availability and quality of water in Mississipi. Data compilation and report preparation were by the U.S. Geological Survey in financial cooperation with the Mississipi Board of Water Commissioners. The data for this report (Sunflower County) are presented in three tables: (1) records for nearly 700 wells, (2) chemical analyses, and (3) sand intervals from

electric logs. Three maps show the locations of the wells for which data are presented in the tables. (Woodard-USGS)
W76-09140

GROUND-WATER DATA FOR CARROLL COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
J. A. Callahan.
Mississippi Board of Water Commissioners, Jackson, County Report No 3, 1975. 26 p, 3 fig, 3 tab, 8 ref.

Descriptors: *Groundwater resources, *Water quality, *Basic data collections, *Well data, *Chemical analysis, Aquifers, Water wells, Sites, Maps, Hydrologic data, Drillers logs, *Mississippi.
Identifiers: Carroll County(Miss).

This is one in a series of groundwater basic-data reports being prepared for the 82 counties concerning information about the availability and quality of water in Mississippi. Data compilation and report preparation were by the U.S. Geological Survey in financial cooperation with the Mississippi Board of Water Commissioners. The data for this report (Carroll County) are presented in three tables: (1) well records, (2) chemical analyses, and (3) sand intervals from electric logs. Three maps show the locations of the wells for which data are presented in the tables. (Woodard-USGS)
W76-09141

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN CHAMBERS, LIBERTY, AND MONTGOMERY COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
W. L. Naftel, B. Fleming, and K. Vaught.
Texas Water Development Board, Austin, Report 202, March 1976. 62 p, 3 fig, 12 tab, 3 ref.

Descriptors: *Hydrologic data, *Groundwater resources, *Water levels, *Chemical analysis, *Drillers logs, Texas, Well data, Aquifer characteristics, Water quality, Water chemistry, Basic data collections.
Identifiers: *Chambers County(Tex), *Liberty County(Tex), *Montgomery County(Tex).

Reports describing the groundwater resources of Chambers, Liberty, and Montgomery Counties were prepared and published in 1971, 1968, and 1971, respectively. Wesselman and Aronow (1971), in describing the resources of Chambers County, tabulated records of wells, drillers' logs, water-level measurements, and chemical analyses gathered during the course of their study. This report presents data (1966-74) collected since the investigation by Wesselman and Aronow (1971) and updates records tabulated by Anders and others (1968) in Liberty County, and by Popkin (1971) in Montgomery County. These records are being collected in cooperation with the Texas Water Development Board to evaluate the groundwater resources of the greater Houston-Galveston region. (Woodard-USGS)
W76-09144

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS,
Geological Survey, Little Rock, Ark.
R. K. Knott.
Open-file report, May 1976. 16 p, 2 tab.

Descriptors: *Streamflow, *Flow rates, *Gaging stations, *Arkansas, Water quality, Networks, Sites, Programs.

This is a brief summary of the objectives, accomplishments, and work plans of the cooperative program between the Arkansas Department of Pollution Control and Ecology and the U.S. Geological Survey. Also presented are stream discharge data collected at about 80 sites for the water year 1975. Several discharges for miscellaneous dates in the 1974 water year are included. The station numbers and names were devised and assigned by the Arkansas Department of Pollution Control and Ecology. (Woodard-USGS)
W76-09145

RESULTS OF PHYTOPLANKTON SAMPLING AT NATIONAL STREAM QUALITY ACCOUNTING NETWORK STATIONS IN MONTANA--1975 WATER YEAR,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 5A.
W76-09146

LOW-FLOW CHARACTERISTICS AND MEAN ANNUAL DISCHARGE OF NORTH BRANCH MANITOWOC RIVER AT POTTER, WISCONSIN,
Geological Survey, Madison, Wis.
B. K. Holmstrom.
Open-file report 76-204, April 1976. 11 p, 2 fig, 1 plate, 4 tab, 2 ref.

Descriptors: *Streamflow, *Low flow, *Average flow, *Pre-impoundment, *Data collections, Hydrologic data, *Wisconsin.
Identifiers: *Potter(Wisc), *North Branch Manitowoc River(Wisc).

The low-flow characteristics presented are the annual minimum 7-day mean flows at the 2-year recurrence interval and 10-year recurrence interval. The flows were determined just downstream from the confluence of the three streams forming the North Branch Manitowoc River, at Potter, Wisc., and, based on natural-flow conditions, are 0.0 cfs (0.0 cu m/sec). Observations made in October 1974 showed that low natural discharge of the three streams forming the North Branch Manitowoc River was 0.0 cfs (0.0 cu m/sec). A discharge of 0.30 cfs (0.008 cu m/sec) was measured in the tributary from Hilbert but this was predominantly effluent from the sewage-treatment plant and a cheese factory in Hilbert. The mean annual discharge at Potter is 27 cfs (0.76 cu m/sec). This was based on the estimated and recorded discharge for June 1, 1974, to May 31, 1975, for the North Branch Manitowoc River at Potter site and an adjustment based on the long-term mean annual discharge at gaging station Sheboygan River at Sheboygan. These estimates will help the Wisconsin Department of Natural Resources evaluate a proposed impoundment for wildlife on the North Branch Manitowoc River at Potter. (Woodard-USGS)
W76-09147

DESIGN OF NATIONWIDE WATER-QUALITY-MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-09209

ANALYTICAL CHEMISTRY IN WATER POLLUTION CONTROL,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5A.
W76-09221

WATER MONITORING - JIM BRIDGER PROJECT - SWEETWATER COUNTY, WYOMING,
Fox (F. M.) and Associates, Inc., Wheat Ridge, Colo.
For primary bibliographic entry see Field 5A.
W76-09349

FUNDAMENTAL GEOLOGIC PRINCIPLES,
T. E. Gass.
Water Well Journal, Vol. 30, No. 4, p. 28-29, April 1976, 3 fig.

Descriptors: *Geologic formations, *Sedimentary structures, Sedimentary rocks, Erosion, Wells, *Logging(Recording).
Identifiers: Law of Uniformitarianism, Law of Superposition, Law of Original Horizontality, Law of Truncation by Erosion or Dislocation, Law of Faunal Succession, Geologic processes, Well log interpretation.

The Laws of Uniformitarianism and Superposition are basic to all contemporary geologic theory. Uniformitarianism, as originally proposed by James Hutton, states that the physical laws which operate in the present, probably have operated throughout the geologic past. The Law of Superposition says that in any pile of sedimentary strata, that has not been disturbed, the strata on top will be the youngest and the lower most strata will be the oldest. Similarly, the Laws of Original Horizontality, Truncation by Erosion or Dislocation, and Faunal Succession describe ongoing geologic processes. A working knowledge of these laws and processes will aid in interpretation of well logs. (Heiss-NWWA)
W76-09362

8. ENGINEERING WORKS

8A. Structures

DIFFUSER DESIGN,
Simons (H. A.) International Ltd., Vancouver (British Columbia).
F. J. Shumas.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975 Preprinted Proceedings I(Montreal, P.Q.), p 17-24. 10 fig, 14 ref.

Descriptors: *Outlets, *Design, *Hydraulic engineering, Theoretical analysis, Equations, Hydraulic structures, Pulp wastes, Equipment, Discharge(Water), Effluents, Waste water disposal, Waste disposal.
Identifiers: *Diffusers.

This article summarizes some of the more practical theory and equations used in the design of diffuser systems to meet the hydraulic and effluent disposal parameters required with regard to waste water discharge into different receiving environments. Reference is made to actual pulp mill disposal systems in oceans, estuaries, lakes, and rivers, as well as to some of the unusual circumstances that had to be overcome to optimize a system design. Example calculations are also given in the appendices on the analysis used in the systems design. (Witt-IPC)
W76-09291

ECOLOGICAL EFFECTS OF OFFSHORE CONSTRUCTION,
Marine Science Inst., Bayou La Batre, Ala.
For primary bibliographic entry see Field 6G.
W76-09307

FEATURES OF VARIOUS OFFSHORE STRUCTURES,
Raymond Technical Facilities, Inc., New York.
J. Peraino, B. L. Chase, T. Plodowski, and L. Amy.
Available from the National Technical Information Service, Springfield, Va. 22161, as NTIS AD-A012 843, $5.50 in paper copy, $2.25 in microfiche. United States Army Coastal Engineering Research Center Miscellaneous Paper No. 3-75, April -1975. 113 p, 62 fig, 3 tab, refs.

Descriptors: *Continental shelf, *Environmental effects, Water resource development, Structures,

LIBRARY U. OF I. URBANA-CHAMP...

*Coastal structures, *Offshore platforms, *Breakwaters, Lighthouses, Waves(Water), Ocean waves, Currents(Water), Winds, Construction, Construction materials, Construction costs, Foundations, Scour, Biota, Aesthetics, Northeast U. S., California, Louisiana, Alaska, North Carolina.
Identifiers: *Outer Continental Shelf, Offshore technology, Environmental impact, *Offshore structures, Artificial islands, Underwater foundations, Chesapeake Bay Bridge Tunnel, Diamond Shoale Light Station, Cape Hatteras(NC), Cook Inlet(AK).

Various offshore structures described as any permanent fixed structure in an ocean or estuarine location essentially unconnected to shore are classified and evaluated from the technical, environmental and economic aspects. Gravity structures include the Chesapeake Bay Bridge Tunnel, various permanent drilling islands off the California coast and offshore breakwaters off northeastern United States and California. Pile supported structures include Diamond Shoale Light Station, Cape Hatteras, NC: offshore production and gathering facilities off Louisiana; and two types of drilling-production platforms - 'Monopod' platform, Cook Inlet, Alaska, and Platform B off Louisiana. Type of construction, location, physical environment, design data, structural performance, biota, aethetics, engineering, construction, contractors, construction date and construction costs are given for each structure and numerous references are listed for each structure. (Sinha-OEIS)
W76-09311

THE ROLE OF ENGINEERING IN MINIMIZING OFFSHORE IMPACTS,
Duke Univ., Durham, N. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-09331

SIXTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 6-8, 1974, HOUSTON, TEXAS. PREPRINTS, VOLUME II,
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09333

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME II.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09371

8B. Hydraulics

TECHNIQUES OF DEEP WELL DRILLING,
Exxon Co., Houston, Tex. Operations Dept.
S. E. Loy, III.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 11-22, 8 fig, 2 tab.

Descriptors: *Deep wells, *Oil wells, *Drilling equipment, *Drilling fluids.
Identifiers: *Drilling pipe, *Casing strings, Blowout prevention, Abnormal pressure.

The pressing need for new petroleum reserves makes it necessary to drill deeper horizons. Rigs used on a deep well must be large enough to handle drill pipe strings as much as 5 miles long. It also must have enough horsepower to hold and move the weight of the drill string, and run mud pumps. The average rig horsepower rating is about 1,000. Larger rigs have horsepower ratings as high as 4,000. The drilling pipe must be strong enough to withstand downhole pressures exceeding internal pressures of 15,000 psi. Casing strings also must withstand high downhole pressure Drilling fluids must be modified for deep drilling pressures, as well as temperature. Standard drilling fluids tend to degenerate both physically and chemically under deep hole conditions. Both water based and oil based fluids can be used with the addition of special pressure contact and weighting materials. The abnormal pressure zone is another deep drilling problem requiring special casing methods and drilling fluids. The deep, abnormal pressure well can be drilled successfully, but the planning and technology used must be more detailed than the average depth well. (See also W76-08889) (Heiss-NWWA)
W76-08890

TECHNIQUES OF SHALLOW WELL DRILLING,
Layne Atlantic Co., Norfolk, Va. Water Resources Div.
R. R. Peters.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well Drilling Operations, May, 1975. p 27-38, 1 fig.

Descriptors: *Water wells, Technology, Construction, Resource development.
Identifiers: *Drilling methods, Ground water reserve protection.

Water well drilling began approximately 600 B. C. with the cable tool machine. Since then, rotary, reverse circulation, and air drilling techniques have been developed. These techniques have done much to increase well drilling efficiency. More sophisticated drilling fluids aid todays water well contractor in drilling difficult formations in less time than ever before. Using modern techniques and materials, and combined with present day hydrogeologic knowledge, it is possible to plan, drill and develop water wells of excellent quality. The individual well driller bears the burden of protecting ground water reserves by careful construction methods. It is also the drilling contractors job to promote the water well industry by using the available technology to complete the best water wells possible. (See also W76-08889) (Heiss-NWWA)
W76-08891

DIMENSIONING OF UNDERGROUND SEWER PIPELINES MADE OF PLASTIC TUBES (RASCHET PODZEMNYKH KANALIZATSIONNYKH TRUBOPROVODOV IZ POLIMERNYKH TRUB),
A. V. Sladkov, and A. A. Otstavnov.
Plasticheskie Massy, No. 10, p 65-67, 1975. 2 fig, 3 ref.

Descriptors: *Sewerage, *Sewers, *Pipelines, Pipes, Plastic pipes.
Identifiers: *Pipe sizes, *Nomograms.

Nomograms for the dimensioning of plastic tubes for underground sewer systems and for the determination of wall thicknesses and maximum depth are presented. These are applicable to sewer pipes made of high-density and low-density polyethylene, non-plasticized PVC, and polypropylene for diameters of 160-630 mm. Compared with sewer pipes made of asbestos cement and other conventional ceramic materials, plastic pipes require reduced slope (by 35-50%), and have higher throughput capacity (by about 30%) at the same free cross-section. This results in a reduction of the required earthworks. (Takacs-FIRL)
W76-08962

GIANT MOLE TO DIG SANITARY DISTRICT TUNNELS,
For primary bibliographic entry see Field 5D.
W76-08963

WATER CONTROL SOLVES TOUGH SEWER PROBLEM,
Highway and Heavy Construction, Vol. 119, No. 2, p 34-35, 38, Februar, 1976. 2 fig.

Descriptors: *Sewers, *Flood control, *Construction, *Outfall sewers, Texas, Drainage systems, Tunnels, Storm runoff, Installation.

A complex sewer project in Houston, Texas, involved three methods of controlling flood water drainage and wet subsurface sands. The job consisted of tunnels 78 ft, 168 ft, and 145 ft long in the state right-of-way as part of Houston's Almeda Road Sewer Outfall Project. In the construction of the 145 ft tunnel, the existence of a 10 by 6 ft concrete box culvert nine feet above the proposed tunnel required the control of surface runoff. Flow had to be diverted over and around the work shaft to prevent flooding, and a dirt cofferdam was constructed to permit surface runoff to bypass the tunnel area. In addition, the concrete box culvert was intersected by a 24 inch storm sewer on the east and a 30 inch storm sewer on the west. Steel pipe had to be placed through the culvert to the cofferdam and the two storm sewers were connected during the tunnel construction. Other problems involved the wet subsurface soil conditions, which were alleviated with the installation of an educator system of 21 wellpoints at each end of the tunnel. With extensive planning for both the runoff control and the dewatering system, the Almeda Road Storm under which the system was installed. (Kramer-FIRL)
W76-08967

STEPPED BAFFLED TRASH RACK FOR DROP INLETS,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
W. R. Gwinn.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 97-107, January-February 1976. 4 fig, 6 tab, 1 ref.

Descriptors: *Spillways, *Drops(Structures), *Intakes, *Trash racks, Hydraulics, Erosion, Sediments, Model studies, Hydraulic models, Weirs, Flow, Discharge(Water), Reservoirs, Structures, Hydraulic structures, Hydraulic engineering.
Identifiers: *Drop inlets.

Various forms of the baffle rack were tested to study their hydraulic performance. Hydraulic coefficients for a drop inlet entrance were determined with various racks installed. Clear water and trash-laden flows were run. Tests were made without a sediment fill in the reservoir and with the sediment filled to crest of the spillway. The scour holes which developed in the sediment fill beneath the rack were measured to determine the average flow velocity under the rack. Studies were also made of the stability of preshaped scour holes both with and without riprap linings. Models of baffled, covered-top drop inlets with entrance racks of various forms performed satisfactorily when subjected to trash-laden flows. The larger racks were more efficient hydraulically than smaller racks since they had smaller entrance-loss coefficients both for clear water and trash-laden flows. Rigid trash had little or no effect on the capacity of covered top drop inlets equipped with a baffle trash rack. Flexible trash reduced the discharge significantly in the weir-flow range, but not in the pipe-flow range. (Sims-ISWS)
W76-09250

A THEORY OF FLOW RESISTANCE FOR VEGETATED CHANNELS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-09252

PRESSURE FLUCTUATIONS IN SUBMERGED UMP,
ndian Inst. of Tech., Bombay. Dept. of Civil En-ineering.
. Narasimhan, and V. P. Bhargava.
ournal of the Hydraulics Division, American ociety of Civil Engineers, Vol. 102, No. HY3, roceedings Paper 12004, p 339-350, March 1976. 7 g, 8 ref, 2 append.

escriptors: *Hydraulic jump, *Submergence, Sluice gates, Hydraulics, Model studies, Energy issipation, Erosion, Froude number, Velocity, ressure, Jets.
dentifiers: *Submerged jump, *Surface rolling, ressure fluctuation.

lean velocities and pressures in the submerged mp downstream of a sluice gate have been in-estigated. The empirical relationship between the te of expansion of the jet and the rate of decay f the maximum velocity have been obtained. The sults were compared with those of classical wall t profiles. The magnitudes and variation pattern f pressure fluctuations along the channel bottom a free hydraulic jump have been found to agree ith those of earlier investigators. The main mphasis was on the measurement of pressure uctuations in a submerged hydraulic jump and its lationship with the efflux Froude number and ubmergence. It has been shown that the pressure uctuations along channel bottom in a submerged ydraulic jump are lower than that in a free jump - significant characteristic which may be con-dered in designing a mobile bed channel, since it overns the inception and rate of erosion of the annel bed. Although a free jump is preferred ver a submerged jump from energy dissipation onsiderations, the erosive power of a free jump ay sometimes be more than that of a submerged mp due to the large intensities of pressure fluc-ations encountered on the beds in the former. ingh-ISWS)
76-09265

EVENTH ANNUAL OFFSHORE TECHNOLO-Y CONFERENCE, MAY 5-8, 1975, HOUSTON, EXAS. PREPRINTS, VOLUME III.
ffshore Technology Conference, Dallas, Tex.
or primary bibliographic entry see Field 5G.
76-09374

VALUATION OF OFFSHORE BREAKWATER TABILITY UNDER WAVE ACTION,
ames and Moore, New York.
or primary bibliographic entry see Field 5G.
76-09387

FFECT OF OFFSHORE STRUCTURES ON HORELINE EVOLUTION, ATLANTIC ENERATING STATION,
rmy Engineers Waterways Experiment Station, cksburg, Miss.
or primary bibliographic entry see Field 5G.
76-09388

C. Hydraulic Machinery

OWER FACTORS AND ELECTRICAL DE-ANDS OF CENTER-PIVOT IRRIGATION ACHINES,
gricultural Research Service, Lincoln, Nebr. orth Central Region.
r primary bibliographic entry see Field 3F.
76-08770

LLEVILLE PLANT USES 15 PUMPS IN UR STATIONS,
ater and Pollution Control, Vol. 114, No. 3, p 26- March, 1976.

Descriptors: *Pumping plants, *Pumps, *Pumping, *Sewers, Treatment facilities, Centrifugal pumps, Hydraulic equipment, Waste water treatment, Canada.

The facilities of Belleville, Ontario, for water pollution control serve a population of only 30,000. It has a large pumping capacity, however, with 15 pumps transporting sewage to the treatment plant and transferring it within the plant. Three of the four pumping stations are used in bringing sewage to the treatment plant. One of these has a constant-speed sewage pump and a centrifugal pump, both driven by electric motors. Another pumping station contains a constant-speed centrifugal pump, a centrifugal pump with variable speed, and a dual-driven pump, with individual electric motors. The third pumping station transporting sewage to the plant, located at the plant, also has three pumps: a constant-speed centrifugal pump, a variable-speed centrifugal pump, and a third centrifugal sewage pump. The plant itself contains two centrifugal pumps for sludge transfer, with individual motors and a centrifugal pumps for sludge transfer, with individual motor. The digester control building has a water pumping unit and sump pump, and there are two timer-controlled raw sludge pumps in the grit building. (Snyder-FIRL)
W76-08969

MOBILE SEWER CLEANING MACHINE,
C. J. Prange.
Canadian Patent 984,809. Issued March 2, 1976. Patent Office Record, Vol. 104, No. 9, p 55, March, 1976.

Descriptors: *Sewers, *Patent, *Cleaning, Equipment.
Identifiers: *Sewer cleaning machines.

A patent has been granted for a new mobile sewer cleaning machine. The support vehicle has a rearwardly open hose reel compartment. A cleaning hose reel is mounted in the compartment and rotates about a horizontal axis. The reel is fashioned in a drum with a diameter of at least twice the size of its axial width. A hose guide roller is mounted on the support vehicle behind and below the reel compartment and is positioned between the sides of the drum. Thus, during the winding, the hose will coil along the entire width of the drum without additional guidance. (Kramer-FIRL)
W76-08973

ELECTRIC EQUIPMENT FOR MUKOGAWA SEWAGE TREATMENT PLANT, HYOGO PREFECTURE (HYOGOKEN MUKOGAWA SHORIJO NO DENKI SETSUBI),
Hanshin City Improvement Bureau (Japan).
For primary bibliographic entry see Field 5D.
W76-09000

PRESSURE AND FLOW REGULATION DEVICE,
Rain Bird Sprinkler Mfg. Corp., Glendora, Calif. (Assignee).
For primary bibliographic entry see Field 3F.
W76-09049

METHOD AND DEVICE FOR ATTACHING SHUT-OFF CONTROL VALVE TO DISTRIBUTING WATER PIPE SUCH AS SERVICE PIPE WITHOUT STOPPING PASSAGE OF WATER THERETHROUGH,
Yano Giken Co., Ltd. Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 3F.
W76-09050

PRESTON SEWAGE LIFT STATION MEETS FLUCTUATION IN FLOW,
Water and Pollution Control, Vol. 114, No. 3, p 20-21, March, 1976. 2 fig.

Descriptors: *Sewage treatment, *Pumps, *Pipes, *Pipe flow, Pipelines, Waste water treatment, Ozone, Canada.
Identifiers: Sewage lift station, Ontario(Canada).

A new sewage lift station is to be constructed in the Preston, Ontario, area. The residential area plans further development, and flow during the next ten years may vary from one million gpd to 20 million gpd. To provide for the large fluctuation, engineers had to consider pipeline diameters and estimate pump duties. Selected Napier-Reid pumps should meet possible changes from low to high flows in relatively equal stages. When the sewage lift station is in operation, flows will be screened before entering the sump; screenings will be removed by a dumbwaiter to the disposal exit. Air abstracted from the station is to be treated with ozone before discharge. A fresh air inlet is provided, in the direction of the base of the wet well, for the benefit of maintenance operators. (Kramer-FIRL)
W76-09160

HYDRAULIC CALCULATION OF SLUDGE PIPELINES IN WASTE WATER TREATMENT PLANTS (DE HYDRAULISCHE BEREKENING VAN SLIBWATERLEIDINGEN OP RIOOL-WATERZUIVERINGSTALLATIES),
F. J. Noz.
Procestechniek, Vol. 30, No. 26, p 871-876, December, 1975. 2 fig, 2 tab, 13 ref.

Descriptors: *Pipelines, *Sludge, Hydraulics, Waste water treatment, Treatment facilities, Equipment, Pipes, Flow rates, *Design criteria, Model studies, *Pipelines.
Identifiers: *Sludge pipelines.

Hydraulic calculation and recommendations for the design of sludge pipelines in waste water treatment plants are presented with special regard to parameters influencing the sludge flow. The formulas proposed by Bingham and Babbitt-Caldwell are discussed. A minimal flow speed of 0.60 m/sec, and optimal speeds between 1.50-2.40 m/sec are recommended for gravity pipelines. The minimal pipe diameter should be 10-15 cm. Gas pockets should be avoided. Pump stations should be provided with centrifugal pumps for primary sludge and for large pipe diameters, or with reciprocating pumps with non-clogging impellers. The suction pipe should have a minimal diameter of 0.15-0.20 m, and the delivery pipe should be at least 0.10-0.20 m in diameter. The suction opening of the pump should be at least 0.60 m below the lowest water level. (Takacs-FIRL)
W76-09208

COMPUTER CONTROL OF SEWAGE AND RAIN WATER PUMPS AT SEWAGE TREATMENT PLANT (GESUISHORIJO NO OSUI, AMAMIZU PONPU NO KEISANKI SEIGYO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
K. Shinnai, M. Machida, and Y. Negoro.
Toshiba Rebyu, (Toshiba Review), Vol. 31, No. 1, p 27-29, January, 1976. 3 fig, 1 tab, 3 ref.

Descriptors: *Sewage treatment, *Pumps, *Rain water, *Sewage, Control systems, Computers, *Automatic control.

A new computer control method for sewage and rain water pumps in a sewage treatment plant is detailed. The sewage and rain water pumps are similar in that pump well level must be controlled. However, sewage is pumped into an activated sludge process facility, while rain water is pumped into receiving waters. A harmonious, rational and simple control method for the two types of pumps is described. (Kramer-FIRL)
W76-09215

LIBRARY U. OF I. URBANA-CHAMPAIGN

COMBINATION RIGS,
Ground Water Age, Vol. 10, No. 8, p 19, 39, 40, April, 1976. 2 fig.

Descriptors: *Drilling equipment, *Rotary drilling, Drilling, Water wells.
Identifiers: *Percussion drilling, *Combination rigs, Lost circulation, High speed drilling.

Combination rigs combine the equipment for both rotary and percussion drilling in one rig. There are numerous advantages to having a combination rig. When the drill operator comes up against a situation such as lost circulation in rotary drilling he can switch to the cable tool method of drilling with the same rig and continue drilling without wasting time and money attempting to seal off the area where the lost circulation occurred. Another advantage of the combination rig is high speed drilling. The operator has the option to use the fastest drilling method for each particular formation encountered. In addition if repairs are required on part of the drilling apparatus, in some cases, the operator can drill with the part of the rig which does not require that equipment. (Gass-NWWA)
W76-09345

PUMPS.
Irrigation Age, Vol. 10, No. 5, p 10, 39-40, 45, February, 1976.

Descriptors: *Pumps, *Pump turbines, *Centrifugal pumps, Irrigation engineering, Irrigation water, Irrigation wells, Irrigation design, Water delivery, Water reuse.
Identifiers: *Irrigation pumps, *Pump specifications, *Pump performance, Pump design, Submersible pumps, Injector pumps.

Pump brands marketed today provide a wide variety of pumps for irrigation. The electric vertical turbine pump is the most popular with centrigual pumps not far behind. Capacities ranging from 0.25 to 75,000 gallons per minute are available. Life capacities and horsepower ratings also vary over a broad spectrum. Specific types of pumps vary from company to company, each having technical innovations developed by that company. (Heiss-NWWA)
W76-09351

IS YOUR PUMP A CANDIDATE FOR INEFFICIENCY.,
For primary bibliographic entry see Field 3F.
W76-09352

WATER FOR THE IVORY COAST.
Ground Water Age, Vol. 10, No. 6, p 26, February, 1976.

Descriptors: *Rotary drilling, Water wells, *Africa.
Identifiers: *Hollow-bore auger, Low cost water well construction, West Africa.

A large-scale drilling program has been initiated throughout several small communities on the Ivory Coast of West Africa. The Acker Drill Company trained local people to operate and maintain equipment. A top drive rotary rig was used to drill pilot wells using augers instead of conventional methods. A custom built hollow-bore auger was rotated to water-bearing sands at a depth of approximately seventy-five feet. A plastic pipe and strainer were installed through the six inch hollow bore. The annulus was filled with gravel around the drop pipe. Clay was used as grouting material to seal against surface run-off contamination. Wells of this nature are popular in this area due to their simplicity, low cost, and rapid installation. (Heiss-NWWA)
W76-09355

8D. Soil Mechanics

FISH TOXICITY OF DISPERSED CLAY DRILLING MUD DEFLOCCULANTS,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.
For primary bibliographic entry see Field 5C.
W76-08896

GEOTECHNICAL ASPECTS OF ROCK BORROW FOR LARGE BREAKWATERS,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09386

8E. Rock Mechanics and Geology

FEATURES OF VARIOUS OFFSHORE STRUCTURES,
Raymond Technical Facilities, Inc., New York.
For primary bibliographic entry see Field 8A.
W76-09311

8F. Concrete

WELL COMPLETION - TECHNIQUES AND METHODS,
Dowell Div., Tulsa, Okla.
For primary bibliographic entry see Field 8G.
W76-08894

PENNSYLVANIA SEWER PLACED IN CROWDED DITCH,
Engineering News-Record, Vol. 196, No. 10, p 40, March 4, 1976. 1 tab.

Descriptors: *Sewers, *Construction costs, *Concrete pipes, *Installation, *Interceptor sewers, Pennsylvania, Costs, Rivers, Engineering structures, Pennsylvania.

The contract for installing 3730 linear feet of concrete interceptor sewer pipe along the Little Juniata River, near Altoona, Pennsylvania, has been awarded to Ernest P. Renda, Incorporated. The firm plans to place 48-inch diameter pipe in lengths of up to twenty feet along a 400 foot-wide ditch parallel to the river. The completed line will be within 30 feet of the shore line. At one point of the sewer, a 430 foot-long section will be installed 12 feet under the riverbed for a crossing. The estimated cost of the project is $1,123,000. (Kramer-FIRL)
W76-08965

PIPELAYING 'HORSE' PREASSEMBLES AND HELPS INSTALL OCEAN OUTFALL,
Water and Sewage Works, Vol. 123, No. 2, p 50-51, February, 1976.

Descriptors: *Pipelines, *Installation, *Pipes, *Joints(Connections), *Concrete pipes, California, Sewers, Outfall sewers, Oceans.

A pipelaying horse that can preassemble pipe joints and install the preassembled sections underwater is being used to construct the ocean sewer outfall for Santa Barbara, California. The project involves installing 8,726 ft of reinforced concrete pipe, in lengths of 24 ft. Pieces of pipe are stockpiled on pipe racks onsite to provide backup and ease problems associated with unloading incoming pipe. Construction of the ocean sewer outfall is expected to cost over $4.5 million. Sheeting for the project was manufactured in Europe by the British Steel Corporation. Two types of ballast rock will be used. A crane barge is used with the pipelaying horse. A rock sled is towed along the pipe by the crane for ballasting the pipe. A walking platform is used instead of the crane barge for the portion of the work near shore. The platform will first install a sheetpile cofferdam. It will then lay pipe in the same way as the horse. The walking platform makes it unnecessary to construct a long trestle near the shore. A temporary rail system on top of the sheetpiling will carry pipe and rock near the shore. (Snyder-FIRL)
W76-08970

8G. Materials

STRUCTURAL PERFORMANCE OF BURIED PLASTIC DRAIN TUBING,
Utah State Univ. Logan. Engineering Experiment Station.
R. K. Watkins, O. K. Shupe, and L. S. Willardson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No 6, p 1082-1084, 1088, November-December 1975. 6 fig, 5 ref.

Descriptors: Drainage, *Drains, *Drainage practices, *Plastic pipes, Plastics, Backfill, Tubes, Performance, On-site tests, Tests, Pipes.
Identifiers: *Drainage tubing, *Structural performance(Drains).

Structural performance tests of corrugated high density polyethylene plastic drain tubing in soil showed that ring deflection is influenced primarily by settlement of the soil around the tubing and secondarily by bedding. The tubing deflects mostly during the backfilling operation. Excessive ring deflection initiates wall buckling and reversal of curvature. Care in forming bedding and in placing sidefill material reduces ring deflection. Reversal of curvature and wall buckling are not total structural failures but do represent performance limits for the tubing. (Skogerboe-Colorado State)
W76-08771

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN WELL DRILLING OPERATIONS.
Environmental Protection Agency, Washington D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W76-08889

TECHNIQUES OF DEEP WELL DRILLING,
Exxon Co., Houston, Tex. Operations Dept.
For primary bibliographic entry see Field 8B.
W76-08890

TECHNIQUES OF SHALLOW WELL DRILLING,
Layne Atlantic Co., Norfolk, Va. Water Resources Div.
For primary bibliographic entry see Field 8B.
W76-08891

SOLUTIONS FOR SOME PROBLEMS RESULTING FROM REFREEZING OF PERMAFROST AROUND A WELLBORE,
Atlantic Richfield Co., Plano, Tex. Production Research Center.
T. K. Perkins, G. R. Wooley, and F. W. Ng.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 39-59, 7 fig, 2 tab, 13 ref.

Descriptors: *Borehole geophysics, *Permafrost, *Well casings, Frozen ground, Oil wells.
Identifiers: *Freezing pressures, Well casing collapse, Thermally insulated casing.

Two potential problems arise from well drilling in arctic regions where permafrost extends deep below the land surface. A thawed area results from circulating drilling mud that becomes heated from the earth below the permafrost. Production of hot oil also causes thawing of the ground surrounding the borehole. The thawed area can reach a radi-

20 feet or more. If the wells are not produced mediately after completion, or if production is errupted, the thawed region around the rehole will begin to refreeze. Serious damage to e exterior and interior casing can occur when reezing of the surrounding ground and liquids hin the drill string take place. Field experiments ve shown that there are mechanisms available to intain positive pore pressures in thawing re- ns around the wellbore. Freezing pressures will e until excess fluid can be dissipated or until the zen soil can be pushed back at a rate nearly ıal to the rate at which excess volume is being ated by the refreezing process. Pressures esti- ted for normal operating conditions are in a ge that can be tolerated if the proper casing is ected. If freezable fluids are removed, the cas- interior can be washed and the casing can be ed with gelled oil thereby eliminating freezing blems. (See also W76-08889) (Heiss-NWWA)
6-08892

ILLING FLUID PRINCIPLES AND OPERA- ONS,
Industries, Inc., Houston, Tex. Baroid Div.
. Simpson.
Conference Proceedings on Environmental ects of Chemical Use in Well-Drilling Opera- s, May, 1975. p 61-71, 11 tab.

scriptors: *Drilling fluids, *Wells, Muds, ntonite, Bactericides.
ntifiers: *Water base muds, *Polymer muds, l base muds, Barite, Diesel oil, Lignite, nosulfonate.

lling fluids are substances which are introduced a borehole for a combination of purposes: (1) ransport drill cuttings to the surface; (2) control nation pressures; (3) maintain borehole stabili- (4) protect productive formations; (5) protect bit and drill string from corrosion; and (6) cool lubricate the bit and drill string. The basic es of drilling fluids are; air or gas, clear water rine, water muds (clay base and polymer) and ased muds. Air or gas drilling is used when low nation pressures exist, when strong, com- nt formations are present, and when no highly neable formations containing water or oil are nd downhole. Clear-water drilling fluid is used normal or subnormal formation pressures, n no highly permeable formations are encoun- d and where no extremely water sensitive e formations exist. Conditions which dictate ing with oil based muds include: extremely er sensitive shale formations; drilling in deep formations; drilling in abnormally pressured nations containing hydrogen sulfide; encoun- g formation temperatures exceeding 400 ees fahrenheit; and when productive forma- s are subject to damage by water. (See also -08889) (Heiss-NWWA)
-08893

LL COMPLETION - TECHNIQUES AND THODS,
ell Div., Tulsa, Okla.
. Braunlich.
Conference Proceedings on Environmental cts of Chemical Use in Well-Drilling Opera- , May, 1975. p 73-100, 31 fig.

riptors: *Well casings, Cement grouting, crete additives, Equipment, Fractures, Wells.
tifiers: *Well completion methods, *Casing gs, Production casing perforation, Well stimu- n, Hydraulic fracturing, Acidizing.

completion can be broken down into several operations: cementing; perforating; and ılation of the producing formation. Cementing es the steel casing pipe as well as protecting solating the rock formations drilled through. tive materials are mixed with the cement to the cement for the specific environment in h it will harden. Float shoes, float collars, centralizers, scratchers and well wiper plugs are all important auxiliary equipment pieces for cementing casing in the well. Perforation of the casing is performed in order to create passages through which oil and gas from the production formation can pass. Perforation is accomplished by exploding bullets, or jet charges in the production casing. Fracturing and acidizing are extensively used for well stimulation. Fracturing is accomplished by pumping a water-base, oil-base or acid-base fluid into the formation at a rate higher than it can accept. The high pressures generated cause parting or cracking of the formation. The other method of stimulation is acidizing, which is done in one of two ways. The acid is injected at a high rate and pressure so as to fracture the formation, or it is injected at a low enough rate and pressure to force the acid into the port structure, thus improving permeability into the borehole. (See also W76-08889) (Heiss-NWWA)
W76-08894

TOXICITY STUDY - DRILLING FLUID CHEMICALS ON AQUATIC LIFE,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.
For primary bibliographic entry see Field 5C.
W76-08895

EFFECT OF DRILLING FLUID COMPONENTS MIXTURES ON PLANTS AND SOILS,
Utah State Univ., Logan. Dept. of Soil Chemistry.
For primary bibliographic entry see Field 5C.
W76-08897

THERMAL DEGRADATION OF DRILLING MUD ADDITIVES,
Halliburton Co., Duncan, Okla. Chemical Research and Development Dept.
L. L. Carney, and L. Harris.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 203-217, 2 fig, 8 ref.

Descriptors: *Drilling fluids, *Thermal properties, Stability, Chemical degradation wells.
Identifiers: *Lignosulfonates.

Ninety-eight percent of wells drilled in 1974 had bottom hole temperatures of less than 250 degrees farenheit. Drilling fluids must be designed for temperatures exceeding 250 degrees. The characteristics of drilling fluids are influenced by additives that are organic in nature. High Temperatures cause degradation of the drilling fluid. Reactions are catalyzed or expedited by the increases in temperature and pressure of the drilling environment. The reactions of neutralization and hydrolysis are very important for drilling fluid stability. Selected drilling fluids are grouped in three temperature classes; additives which do not perform above 250 degrees farenheit, additives which do not perform well above 350 degrees farenheit, and additives which are stable above 350 degrees farenheit. These temperature groups exhibit separate temperature stabilities and degradation products. A wide spectrum of analytical tools have been used to gauge the formation of these degradation products in respect to the temperature increases. Lignosulfonate is used as an example of a drilling mud additive. (See also W76-08889) (Heiss-NWWA)
W76-08901

CHEMICAL APPLICATIONS IN OIL AND GAS WELL-DRILLING AND COMPLETION OPERATIONS,
Bartlesville Energy Research Center, Okla.
G. A. Collins.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 231-256, 9 fig, 7 tab, 8 ref.

Descriptors: *Oil wells, *Drilling fluids, *Water pollution, Groundwater corrosion, Brines.
Identifiers: Calcium precipitators, Corrosion inhibitors, Thinning agents, Density controllers, Defoamers, Flocculating agents, Lubricants, Viscosifers, Water-base drilling fluids, Oil-base drilling fluids, Drilling fluid costs, Crude oil.

This is a research study of the affects of chemicals used in oil and gas drilling operations on ground water. Chemicals are used in drilling fluids and well-completion additives to control bacteria, calcium, corrosion, density, dispersion, emulsion, foam, filtrate reduction, flocculation, heavy shale, lost circulation, lubrication, pH, surface activity and viscosity. Some of these drilling fluid and additive constituents, if improperly handled or in the event of an accident, could contaminate ground water. Although contamination of potable ground waters by drilling operations is possible, experience has shown this to be the exception rather then the rule. (See also W76-08889) (Heiss-NWWA)
W76-08903

TOXICITY AND ENVIRONMENTAL PROPERTIES OF CHEMICALS USED IN WELL-DRILLING OPERATIONS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5C.
W76-08906

THE TOXICITY OF DRILLING FLUIDS, THEIR TESTING AND DISPOSAL,
Alberta Energy Resources Conservation Board, Edmonton.
For primary bibliographic entry see Field 5D.
W76-08911

THE HANDLING AND TREATING OF WATER-BASED DRILLING MUDS,
Sun Oil Co., Richardson, Tex. Production Service Lab.
For primary bibliographic entry see Field 5D.
W76-08912

HANDLING AND TREATMENT OF OIL-BASE DRILLING MUDS,
Oil Base Inc., Houston, Tex.
W. C. McMordie.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 505-509.

Descriptors: *Drilling fluids, Waste disposal, Drilling, Wells.
Identifiers: *Oil-base drilling fluids, Diesel oil, Drilling applications.

Oil-base drilling muds are specially designed fluids used for specific drilling applications, usually in the bottom 2,000 to 3,000 ft. of boreholes. Oil-based muds normally contain diesel oil, inorganic solids, surface active agents, asphalt and water. These specialized fluids are very expensive and account for only 5 to 10 percent of the total mud usage. Handling of oil-based muds requires treatment of both the mud itself and cuttings. The mud is kept in a closed system while drilling and is returned to the mud plant after use. Cuttings are either containerized for shipment to the mud plant, washed or burned to remove the oil coating. (See also W76-08889) (Heiss-NWWA)
W76-08913

FIBERGLASS FIGHTS SO3 ATTACK ON SEWERS,
Water and Sewage Works, Vol. 123, No. 2, p 60-61, February, 1976.

Descriptors: *Sewers, *Construction [illegible]ials, *Manholes, Plastics, *Corrosion control, Fiber[illegible] Hydrogen sulfide, Sulfides.
Identifiers: Fiberglass reinforced plastic.

LIBRARY U. OF A. ORONO, MAINE

Three types of manhole-wetwell construction are used in Hillsborough County, Florida: reinforced concrete with 20 mil protective coating of coal tar epoxy for both sides; brick with acid-proof mortar; and the more innovative fiberglass reinforced plastic. Fiberglass products, while priced higher than competitive materials, have been designed to last for longer periods. Fiberglass is especially useful in combatting severe hydrogen sulfide corrosion. The Hillsborough County has installed fiberglass products in a residential area sewer project, operating since December 1975. Submersible wetwell units were chosen and contractors reported faster and easier installation for these types of manholes. An important feature of the fiberglass manholes and wetwells was their toughness and strength. Other area projects incorporating fiberglass included the use of manhole liners that are straight sections of 42 inch inner diameter fiberglass-reinforced plastic pipe to repair deteriorated brick manholes. (Kramer-FIRL)
W76-08964

STORM SEWER PIPE JOINTS TIGHT AFTER TEN YEARS,
Domingue, Szabo and Associates, Inc., Lafayette, La.
E. Domingue.
Public Works, Vol. 107, No. 3, p 59, March, 1976.

Descriptors: *Joints(Connections), *Pipes, *Sewers, *Storm runoff, Construction materials, Plastics, Louisiana, Evaluation, Laboratory tests.
Identifiers: Storm sewers.

A systematic testing and evaluation program was instituted by the Louisiana Department of Highways involving materials used for the construction of storm sewer pipes. Selected for inspection in 1973 was a 5700 foot storm sewer system in Lafayette which had been constructed in 1964 and 1965. The sewer pipe had been designed using a preformed, flexible plastic gasket in extruded 'rope' form, packaged between protective paper wrappers, sized in cross section to pipe diameter. The system had been designed to provide a drainage system which would handle runoff and remain watertight for as long as technologically possible. The 1973 inspection included the collection of samples for laboratory testing. The Ram-Nek flexible plastic gasket material in the pipeline was found to show no sign of deterioration, loss of flexibility or loss of adhesion to the concrete joint surfaces after a period of nearly ten years. Thus, it is planned to continue using this method and material for sealing reinforced concrete pipe in future installations. (Kramer-FIRL)
W76-08966

PROBLEM: LOW HEADROOM, SOLUTION: PIPE ARCH,
Water and Sewage Works, Vol. 123, No. 3, p 100, March, 1976. 5 fig.

Descriptors: *Sewers, *Pipelines, *Steel pipes, Construction materials, Storm sewers, Wisconsin.
Identifiers: Corrugated steel pipe arch.

The moving of the Marshfield clinic, (Marshfield, Wisconsin), presented a sewerage problem in that the farmland to which the clinic was moving was flat, contained a small stream and would not be easy to drain. A main line 1,267 foot storm sewer would have a drop of only two feet from an initial four foot depth and would have to carry 72,000 gpm. Since conventional round pipe would have been sticking out of the ground, a corrugated steel pipe arch shape was selected. The storm sewer contains 730 feet of 65 by 40 inch corrugated steel pipe arch; the rest of the sewer is 72 by 44 inch pipe. The soil is sandy stony plastic clay which does not present any corrosion problems. The choice of currugated steel pipe was economical and is considered as the permanent pipe in this location. As of 1975, Marshfield had 162,917 feet of storm sewer, 27,413 feet of which were corrugated steel. (Orr-FIRL)
W76-08968

SEWAGE PIPE FITTING,
A. Tetreault.
Canadian Patent 985,331. Issued March 9, 1976. Patent Office Record, Vol. 104, No. 10, p 10-72, March, 1976.

Descriptors: *Sewage treatment, *Patents, *Pipes, *Pipelines, Equipment, Waste treatment.

A sewage pipe fitting was patented consisting of a main body with a stack inlet at its top and a stack outlet at its bottom and one or more lateral stack inlets, preferably located between ventilating means. A first and a second arm are included in the ventilating means. Both are attached to and communicate with a main branch vent pipe. The ventilating means are provided so that a vent pipe independent of a sewage down pipe is unnecessary. (Synder-FIRL)
W76-08996

COATINGS FOR WASTEWATER TREATMENT PLANTS,
Gilbert Associates, Inc., Reading, Pa.
D. M. Berger.
Public Works, Vol. 107, No. 2, p 68-70, February, 1976.

Descriptors: *Waste water treatment, *Treatment facilities, *Corrosion control, *Corrosion, *Coatings, Coal tar coatings, Zinc, Steel, Concrete plants, Lead, Cleaning.
Identifiers: Coal tar epoxy, Rubber based coatings, Vinyl copolymer solutions.

Water treatment and water pollution control plants must meet corrosion control demands rarely found in other types of construction. The choice of the proper coating should depend on the environment, the substrate being protected, the climate, and attractiveness. They must meet the requirements of an economical service life, reduced maintenance expenditures, and required decorative characteristics. Various materials are discussed. Coal tar epoxy works well on submerged concrete and metal. Zinc-rich primers protect steel in the same way that galvanizing does, can be easily applied, and the treated steel suffers less damage in transport. Vinyl copolymer solutions are most commonly used to provide color to submerged surfaces. Since the lead in lead based paints can react with hydrogen sulfide, chlorinated rubber based coatings are preferred. These types of coatings will also work well in rooms below ground level where moisture is a constant problem. Proper surface preparation is essential since any sort of dirt, moisture or grease can Affect the adhesion of the coating. Steel must be cleaned of all rust, mill scale and surface contaminants. Sandblasting, centrifugal blasting or pickling are recommended procedures. Concrete must be aged at least 28 days under good conditions and should also be cleaned of surface contaminants. Spray application is the most preferred method because of its uniformity. Appropriate measures must be taken in confined spaces to provide fresh air and to avoid explosive solvent vapor air mixtures. (Pinto-FIRL)
W76-09014

SEWER CLEANER FLUSHES OUT ACIDS,
C. Eadens.
Water and Sewage Works, Vol. 123, No. 3, p 65, March, 1976. 2 fig.

Descriptors: *Sewers, *Cleaning, Pieplines, Repairing, Indiana.
Identifiers: High velocity hydraulic sewer cleaning, Television inspection.

A truck-mounted high velocity hydraulic sewer cleaner was used to clean inactive reuse water and acid sewer lines around gun powder production facilities at the Charlestown, Indiana, Army Ammunition Depot. During full-scale powder production at the height of the Vietnam War, these lines had been used as catch-alls for spills and leaks from the acid transmission lines used in the manufacturing. Acid built-up over the years had corroded through the pipes and concrete casings and had begun to penetrate adjacent clay pipe water reuse lines which fed the powder-producing equipment. In addition to removing a 34-year accumulation of dirt, grease, brick and tile, the cleaning had to be 100 percent effective so that the damaged pipe could be efficiently repaired. The 8500 feet of line was cleaned in only 50 working days. Conventional cleaning techniques would have required three or four times as much time, and would have been less efficient. The procedure required the operator to position the street-level sewer cleaning equipment at the manhole downstream with the hose reel above the opening. The high pressure water jets from a special high pressure hose flushed the sewer clean, forcing the debris down the line into the manhole. After the sewer was completely cleaned, a closed circuit television camera was pulled through the sewer, beaming photos of the inside of the line to a video monitor. A chemical grouting packer was used in conjunction with the TV inspection to repair faulty joints and leaks. (Orr-FIRL)
W76-09032

WIRE ROPE,
R. B. McDannald.
Water Well Journal, Vol. 30, No. 4, p. 30-31, April, 1976, 2 tab.

Descriptors: *Drilling equipment, Cost comparisons.
Identifiers: Hemp rope, Manilla rope, *Wire cable, Cable characteristics, *Cable tool drilling, Cable maintenance.

Wire rope is one of the integral parts of any cable tool drilling operation. Originally, hemp or manilla rope was used. The natural fiber ropes had disadvantages of a short operational life, high internal and external wear, limited spooling capacities and high replacement cost. Wire rope or steel cable became popular when drillers recognized its greater strength, reduced friction, smaller diameter and lower cost. A swiveling rope socket was added to relieve the constant need to turn the rope by hand to achieve a round, straight hole. Today cables are manufactured in various sizes and designs. Cable life still depends on care and preventive maintenance on the job and during storage. (Heiss-NWWA)
W76-09359

FUNDAMENTAL GEOLOGIC PRINCIPLES,
For primary bibliographic entry see Field 7C.
W76-09362

HOW TO GET GOOD SAMPLES BY ROTARY DRILLING,
Virginia Supply and Well Co., Atlanta, Ga.
H. R. Barlitt.
The Johnson Drillers Journal, Vol. 48, No. 1, p. 5, January-February, 1976, 5 fig, 1 tab.

Descriptors: *Rotary drilling, *Subsurface investigation, *Sampling, Data collections, Logging, Wells, *Electrical well logging, *Test wells.

Rotary drilling is an economical and fast method of drilling test wells. The advantages of rotary drilling become greater as the depth of drilling increases. The depth to static water level usually cannot be measured in a rotary-drilled test hole without installation of casing and removal of drilling mud. Good samples provide information for proper design of the production well. Accurate

test drilling by the rotary method depends on ntrol of the drilling procedure. The best possible rmation samples must be obtained. Since the ro- y method allows electric logging, the drillers log n be augmented with electric logs. (Heiss-WWA)
76-09363

. Fisheries Engineering

LF-REGULATION OF THE POPULATION ID BIOMASS OF SCHOOLS OF YEARLING RP, (IN RUSSIAN),
ademiya Nauk SSSR, Sverdlovsk. Inst. of Plant d Animal Ecology.
r primary bibliographic entry see Field 2I.
76-08832

CLIMATION OF RAINBOW TROUT TO SEA ATER,
nstaffnage Marine Research Lab., Oban otland).
r primary bibliographic entry see Field 2L.
76-09125

SH HABITAT IN FOREST LANDS,
cific Northwest Forest and Range Experiment tion, Corvallis, Oreg. Forestry Sciences Lab.
Mills.
'Water Resources Policy Issues - 1975,' ninar conducted by the Water Resources search Institute, Oregon State Univ., Corvallis, y 1975 (SEMIN WR 020-75), p. 33-38.

scriptors: *Forest watersheds, *Protection, nadromous fish, *Stream fisheries, Pacific rthwest U.S., Economic impact, Lumbering, rest management, Oregon, Washington, gislation, Road construction, Land manage- nt.

me problems and progress dealing with protec- n of anadromous fish habitats in upland forest tersheds, particularly in Oregon and Washing- , are delineated. In some of the more produc- e areas the annual values of sport and commer- l fisheries are as high as $270,000 per mile. velopment of specialized equipment (skyline ding, directional tree falling), practices such as ffer strips or streamside management zones, delines, policy statements, and other directives iated internally as a result of new legislation l public pressures are developing better land nagement practices during lumbering opera- is where stream courses are involved. The gon Forest Practices Act is having considera- impact on timber harvest and related road con- ction on state and private lands. The Forest vice's 'Streamside Management Unit delines' has issued a new policy statement ling with fish habitat protection for all National est lands in Oregon and Washington. A mas- e road network in most Northwest watersheds es serious problems of sedimentation; old ds remain as liabilities during storm events and reasing use. More emphasis must be placed on protection of small headwater drainages as the lity of a stream system is a function of all its utaries. (See also W76-09230) (Auen-Wiscon-
6-09233

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

WOOD PRESERVATIVES: THEIR DEPLETION AS FUNGICIDES AND FATE IN THE ENVIRONMENT,
Canadian Forest Service, Ottawa (Ontario). Eastern Forest Products Lab.
For primary bibliographic entry see Field 05B.
W76-09275

10F. Preparation Of Reviews

THE TIME STABILITY OF DISSOLVED MERCURY IN WATER SAMPLES-I. LITERATURE REVIEW,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 05A.
W76-08767

LIBRARY U. OF I. URBANA-CHAMP...

SUBJECT INDEX

SORPTION
Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

Mercury Content of Biota in Coastal Waters in Hawaii,
W76-08776 5C

Potential Effects of Oil Drilling and Dumping Activities on Marine Biota,
W76-08907 5C

Zinc Nutrition of Rice in Relation to Iron and Manganese Uptake Under Different Water Regimes,
W76-08974 3F

Mercury Uptake in Rooted Higher Aquatic Plants; Laboratory Studies,
W76-09111 5C

The Availability of 137-CS to Fishes from Interested Clays,
W76-09118 5C

Endrin Toxicity and Distribution in Freshwater: A Review,
W76-09122 5C

CLIMATION
Acclimation of Rainbow Trout to Sea Water,
W76-09125 2L

ID DICHROMATE DIGESTION
An Improved Determination of Chemical Oxygen Demand in Water and Wastes by a Simplified Acid Dichromate Digestion,
W76-09203 5A

ID MINE WATER
Physiological Effects of Sublethal Levels of Acid Water on Fish,
W76-08927 5C

IDIC WATER
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

Reclamation of Acidified Lakes - Middle and Clohi, Sudbury, Ontario,
W76-09108 5G

Laboratory Experiments to Determine the Limits of Tolerance of Flagellates to Some Abiotic Factors,
W76-09110 5C

IDIFIED LAKES
Reclamation of Acidified Lakes - Middle and Clohi, Sudbury, Ontario,
W76-09108 5G

IDS
Potentially Beneficial Uses of Sulfuric Acid in Southwestern Agriculture,
W76-08766 3F

RYLAMIDE
The Effect of Certain Synthetic Macromolecular Substances on the Physico-Chemical Properties of Soil and on the Fertilizer Utilization Coefficient, (In French),
W76-08981 2G

TINOMYCETES
Isolation and Characterization of Actinopolyspora Halophila, Gen. ET SP. Nov., An Extremely Halophilic Actinomycete,
W76-08837 5C

ACTINOPOLYSPORA HALOPHILA
Isolation and Characterization of Actinopolyspora Halophila, Gen. ET SP. Nov., An Extremely Halophilic Actinomycete,
W76-08837 5C

ACTIVATED CARBON
Processes Make Sewage Come Clean More Cheaply.
W76-09154 5D

Effects of Activated Carbon Addition to the Activated Sludge Process (Wplyw dodatku wegla aktywnego do procesu osadu Czynnego),
W76-09175 5D

Experimental Report for Regeneration of Activated Carbon and Recalcination of Lime Sludge (Kasseitan, sekkai-oden no saisei jikken hokoku),
W76-09223 5D

Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon,
W76-09298 5D

ACTIVATED SLUDGE
The Effects of a Synthetic Chili Waste on Biological Sewage Treatment Plant Operations,
W76-08845 5D

Biological Purification of Waste Waters,
W76-08971 5D

Waste Water Purification,
W76-08972 5D

Activated Sludge Plant,
W76-08980 5D

Measurement of the Oxygenation Capacity in Waste Water Treatment Plants using Completely Mixed Activated Sludge (Mesure De La Capacite D'Oxygenation Dans Les Stations De Traitement A Boues Activees En Melange Integral),
W76-09006 5D

Treatment of Waste Water Containing Mercurials by Activated Sludge. I. Mechanism of Removal of Mercurials in waste Water (Kassei odei ni yoru suigin ganyu haisui no shori ni kansuru kenkyu. I Kassei odei no suigin jokyo kiko),
W76-09017 5D

Treatment of Waste Water Containing Mercurials by Activated Sludge. 2. Mercury Volatilization and the Capacity of Activated Sludge for Waste Water Containing Mercurials (Kasseiodei ni yoru suigin ganyu haisui no shor ni kansuru kenkyu. 2),
W76-09018 5D

Processes Make Sewage Come Clean More Cheaply.
W76-09154 5D

The Use of Oxygen in the Treatment of Waste Water,
W76-09167 5D

Sewerage Project on Upstream Area of the Yamato River,
W76-09168 5D

Microbiology and Activated Sludge,
W76-09172 5D

Effects of Activated Carbon Addition to the Activated Sludge Process (Wplyw dodatku wegla aktywnego do procesu osadu Czynnego),
W76-09175 5D

Conditioning Improves Sludge Filterability,
W76-09181 5D

The Nature of Activated Sludge Flocs,
W76-09188 5D

Monitoring Dissolved-Oxygen Content to Assure Clean Wastewater,
W76-09202 5A

Quality Control in Sewage Treatment Plant (Gesuishorijo no shishutsu seigyo),
W76-09205 5D

Design Procedure for a Contact Stabilization Activated Sludge Process,
W76-09211 5D

Study on the Balance of Heavy Metals in Activated Sludge Treatment Process (Gesui shori shisetsu ni okeru jukinzokurui no shushi ni kansuru kenkyu),
W76-09222 5A

Kinetics and Control Tests of Nitrification-Denitrication Process, Part I: Kinetics,
W76-09365 5D

Kinetics and Control Tests of Nitrification-Denitrification Process, Part II: Respiration and Control Tests,
W76-09366 5D

ACUTE TOXICITY
Acute Toxicity of Well-Drilling to Rainbow Trout,
W76-08899 5A

ADENOSINE TRIPHOSPHATE
Improved Methodology for ATP Determination in Marine Environments,
W76-08958 5C

AERATED LAGOONS
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards Experimental Studies,
W76-09157 5D

AERATION
Biological Purification of Waste Waters,
W76-08971 5D

Current Aeration Techniques--An Overview,
W76-09009 5D

Double Funnel with Baffle Cascade Aeration Unit,
W76-09027 5D

Method for Biologically Treating Sewage and an Installation for Carrying out the Method,
W76-09047 5D

Effects of Activated Carbon Addition to the Activated Sludge Process (Wplyw dodatku wegla aktywnego do procesu osadu Czynnego),
W76-09175 5D

Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W76-09292 5D

AERIAL PHOTOGRAPHY
Photographic Analysis of Water Quality Changes,
W76-09199 5A

LIBRARY U. OF A. ...

AEROBIC BACTERIA
The Effects of a Synthetic Chili Waste on Biological Sewage Treatment Plant Operations,
W76-08845 5D

AEROBIC CONDITIONS
Studies on Phosphorylation Coupled with Denitrification and Aerobic Respiration in Pseudomonas Denitrificans,
W76-08823 5C

AEROBIC DIGESTION
Aerobic Sewage Treatment System,
W76-08982 5D

AEROBIC TREATMENT
The Use of Oxygen in the Treatment of Waste Water,
W76-09167 5D

Removal of Faecal Coliform from Waste Water by Proper Aerobic Biological Treatment,
W76-09171 5D

AFRICA
The Sahel: Time for a New Approach,
W76-09070 4C

Rainfall Trends in the West African Sahel,
W76-09269 2B

Water for the Ivory Coast.
W76-09355 8C

AGRICULTURAL CHEMICALS
River Pollution by Anticholinesterase Agents,
W76-08782 5C

AGRICULTURAL WATER DEMAND
Agricultural Water Demands in North Carolina,
W76-08841 3F

AGRICULTURE
Agricultural Water Demands in North Carolina,
W76-08841 3F

Water Conservation and Irrigated Agriculture,
W76-09236 3F

Water and Food Production Demands,
W76-09237 6D

AGROCLIMATOLOGY
Comparative Evaluation of Yearly Climatic Factors with the Five Years Averages for Fudhaliya Agro-Meteorological Station,
W76-09066 2B

Comparative Evaluation of Climatic Factors and Conditions at Fudhaliya Agro-Meteorological Station and Baghdad Airport Meteorological Station,
W76-09067 2B

AIR FLOW
Vertical Flow of Air and Water with a Flux Boundary Condition,
W76-09251 2G

AIR HUMIDITY
Effect of Air Humidity on Stomatal and Mesophyll Conductivity of Bean Leaves at Two Soil Moisture Levels, (In Russian)
W76-09097 2I

AIR POLLUTION
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

Indicators of Air and Water Quality are Tackled by CEQ for Consistency,
W76-08838 5A

Canadian Experience with the Reduction of Mercury at Chlor-Alkali Plants,
W76-09273 5G

AIR-WATER INTERFACES
Intercontinental Comparison of Evaporation Estimates,
W76-08800 2D

Vertical Flow of Air and Water with a Flux Boundary Condition,
W76-09251 2G

AL-HAMAD PLAIN (IRAQ)
Hydrogeological Conditions of Al-Hamad Area, Iraq,
W76-09068 2F

ALASKA
Environmental and Intrinsic Control of Filtering and Feeding Rates in Arctic Daphnia,
W76-08933 5C

ALCOHOLS
The Significance of Isomery in Hygienic Standardization of Industrial Contaminations of Water Bodies, (In Russian),
W76-08864 5A

ALGAE
Ciliate Associations (Ciliata) in the Pradnik Stream, Which is Polluted by Residual Waters of a Dairy, (In French),
W76-08777 5C

Observations of Colonial Multiplication in a Rapidly Growing Alga, Gonium Multicoccum Pocock (Volvocaceae),
W76-08826 5C

Changes in the Algal Flora of East Harbor, Ottawa County, Ohio, Since 1900,
W76-08834 5C

Investigations on the Phytoplankton and Some Environmental Parameters of the Shattal-Arab (Iraq), (In German)
W76-09084 2L

Biochemical Characteristics of Spirulina Platensis (GOM.) Geitl.: I. Water-Soluble Group B Vitamins, (In Ukranian),
W76-09091 2I

Study of Algoflora of Contaminated Water Bodies, (In Ukranian),
W76-09093 5C

The Application of the Scanning Electron Microscope to Freshwater Phytoplankton Taxonomy and Morphology,
W76-09225 5A

Effects of Color and Toxic Constituents of Bleached Kraft Mill Effluent on Algal Growth,
W76-09300 5C

The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

ALGAL ASSAYS
Identification of Nitrogen as a Growth-Limiting Nutrient in Wastewaters and Coastal Marine Waters Through Continuous Culture Algal Assays,
W76-09195 5A

ALGAL CONTROL
The in Vitro Sensitivity of Some Species of Chlorophyceae to a Selected Range of Herbicides,
W76-08824 5C

ALGAL GROWTH
Algal Growth Potential of Six Norwegian Waters Receiving Primary, Secondary and Tertiary Sewage Effluents,
W76-08794 5C

Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth,
W76-08842 5D

ALGICIDES
The in Vitro Sensitivity of Some Species of Chlorophyceae to a Selected Range of Herbicides,
W76-08824 5C

ALGOLOGICAL
Microbiological and Algological Survey of A Primary Stage of Eutrophication in a Stream, (In French),
W76-09399 5C

ALUM SLUDGE
Sewage Treatment with Activated Fly-Ash and Regenerated Alum Sludge,
W76-09183 5D

ALUM-TREATED WASTEWATER
Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth,
W76-08842 5D

AMINO ACIDS
Amino Acid Uptake and Respiration by Marine Heterotrophs,
W76-08955 5C

AMMONIA
Determination of Ammonia and Kjeldahl Nitrogen by Indophenol Method,
W76-09201 5A

Self-Purification of Small Freshwater Streams: Phosphate, Nitrate, and Ammonia Removal,
W76-09398 5G

AMMONIA REMOVAL
Ammonia Removal by Use of Clinoptilolite,
W76-09180 5D

AMMONIUM
Ammonia Removal by Use of Clinoptilolite,
W76-09180 5D

AMMONIUM COMPOUNDS
Leaching Losses of Ammonium and Nitrate in the Reclamation of Sand Spoils in Cornwall,
W76-08760 3C

AMMONIUM SALTS
Leaching Losses of Ammonium and Nitrate in the Reclamation of Sand Spoils in Cornwall,
W76-08760 3C

AMPHIPODA
Responses of Arctic Marine Crustaceans to Crude Oil and Oil-Tainted Food,
W76-09123 5C

ANACYSTIS NIDULANS
Valyl tRNA's of Anacystis Nidulans,
W76-08827 5C

ANADROMOUS FISH
Fish Habitat in Forest Lands,
W76-09233 8

ANAEROBIC CONDITIONS
Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

ANAEROBIC DIGESTION
Anaerobic Digestion of Solid Waste and Sewage Sludge into Methane,
W76-09153 5D

ANALYTICAL TECHNIQUES
Improved Procedure for Ion Exchange Experiments with Soils Using Leaching Tubes, and Handling of Water Repellent Soils, (In German),
W76-08762 2G

The Relationship Between Heat Conductance and the Moisture Content of the Soil, (In Dutch),
W76-08769 2G

Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

Assay of Nitrate Reductase from Plasmolyzed Marine Phytoplankton,
W76-08943 5C

Improved Methodology for ATP Determination in Marine Environments,
W76-08958 5C

Simultaneous Spectrophotometric Determination of Nickel and Cobalt in Mixtures with 3-Hydroxypicolinealdehyde Azine,
W76-09042 5A

Chemiluminescent Method of Determining Manganese in Natural Waters, (In Russian),
W76-09077 2K

Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

Instrumentation for Analyzing TOD (Instrumentelle TSB-Analytik),
W76-09185 5A

Improved Method for the Phosphate Determination in Waste Water (Verbesserte Methode Zur Phosphatbestimmung im Abwasser),
W76-09190 5A

The Phenol-Sulfuric Acid Test,
W76-09191 5A

Nitrogen and Phosphorus Levels in Soils Beneath Sewage Disposal Ponds,
W76-09197 5A

Factors Affecting the Extraction and Analysis of Polynuclear Aromatic Hydrocarbons in Water,
W76-09200 5A

An Improved Determination of Chemical Oxygen Demand in Water and Wastes by a Simplified Acid Dichromate Digestion,
W76-09203 5A

The Application of the Scanning Electron Microscope to Freshwater Phytoplankton Taxonomy and Morphology,
W76-09225 5A

Interaction Between Surfactant and Dye IV. Application of the Acridine Orange Method to the Survey of Pollution of Alkylbenzene Sulfonate in Rivers and the Survey of Water Pollution in Kinokawa,
W76-09364 5A

ANIMAL BEHAVIOR
Behavioral Impairment Produced by Exposure to Subclinical Amounts of Methylmercury Chloride,
W76-09037 5C

Responses of Arctic Marine Crustaceans to Crude Oil and Oil-Tainted Food,
W76-09123 5C

ANIMAL PHYSIOLOGY
Behavioral Impairment Produced by Exposure to Subclinical Amounts of Methylmercury Chloride,
W76-09037 5C

The Effect of Lead on Mouse Brain Development,
W76-09038 5C

ANION EXCHANGE
Phosphate Determinations in Waters Using an Anion Exchange Resin,
W76-09370 5A

ANTARCTIC OCEAN
Primary Production and the Factors Controlling Phytoplankton Growth in the Antarctic Seas,
W76-08942 5C

ANTIBIOTICS (PESTICIDES)
An Investigation of Antibiotic and Drug Residues in Fish,
W76-09124 5C

AQUACULTURE
Acclimation of Rainbow Trout to Sea Water,
W76-09125 2L

AQUATIC ALGAE
Two Blooms of Gymnodinium Splendens (Lebour). A Large Naked Dinoflagellate,
W76-08937 5C

AQUATIC ENVIRONMENT
Heavy Metals in the Aquatic Environment.
W76-09272 5B

AQUATIC FUNGI
Ecology of an Annual Saprolegnia Sp. (Phycomycete) Outbreak in Wild Brown Trout,
W76-08786 5C

AQUATIC LIFE
Studies Carried out in France on the Ecological Consequences of Open-Circuit Cooling in Thermal Power Stations, (Etudes Realisees en France sur Les Consequences Ecologiques de la Refrigeration des Centrales Thermiques en Circuit Ouvert),
W76-08875 5C

Environmental Conditions and Productivity in the Terminos Lagoon, Campeche, Mexico, (In Spanish),
W76-08900 2L

A Method for Estimating the Toxicity of Chlorinated Discharges,
W76-08928 5C

AQUATIC MICROORGANISMS
Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms,
W76-08752 5B

AQUATIC PLANT SUCCESSION
The Peripheral Flood Zones of Gniewkowo Lowland from 1969 to 1972, (In Polish),
W76-09079 2I

AQUATIC PLANTS
The Peripheral Flood Zones of Gniewkowo Lowland from 1969 to 1972, (In Polish),
W76-09079 2I

AQUATIC POPULATIONS
A Study of the Infralittoral Population of the Coast of Roussillon: III. Spatial and Seasonal Variations, (In French),
W76-08898 2L

AQUIFER CHARACTERISTICS
Movement of Chemical Contaminants in Ground Water,
W76-08905 5B

Hydrogeological Conditions of Al-Hamad Area, Iraq,
W76-09068 2F

AQUIFER STRESS
The Role of Ground Water.
W76-09353 2F

AQUIFER SYSTEMS
Transform Approach to Solution of Groundwater Flow Equations,
W76-08922 2F

AQUIFERS
Hydrologic Environmental Effects of Sprayed Sewage Effluent, Tallahassee, Florida,
W76-09134 5B

ARCTIC MARINE CRUSTACEANS
Responses of Arctic Marine Crustaceans to Crude Oil and Oil-Tainted Food,
W76-09123 5C

ARGENTINA (LAKE MASCARDI)
Thermal Structure of Lake Mascardi (Province of Rio Negro, Argentina, (In Spanish),
W76-09358 2H

ARID CLIMATES
The Nature and Causes of Desertization,
W76-09069 4C

ARIZONA
Flood Plain Information: Maricopa County, Arizona, Volume I, Indian Bend Wash Report.
W76-08806 4A

Flood Plain Information: Maricopa County, Arizona, Volume II, Cave Creek Report,
W76-08807 4A

Flood Plain Information: Maricopa County, Arizona, Volume IV, Wickenburg Report.
W76-08808 4A

A Preliminary Water and Energy Budget Analysis of Montezuma Well, Arizona,
W76-09072 4B

Late Pleistocene and Modern Plant Communities of Shinumo Creek and Peach Springs Wash, Lower Grand Canyon, Arizona,
W76-09074 2I

ARKANSAS
Discharge Data at Water-Quality Monitoring Stations in Arkansas,
W76-09145 7C

ARKANSAS RIVER (KAN)
Flood Plain Information: Arkansas River, Derby-Mulvane, Kansas.
W76-08822 4A

LIBRARY U. OF I. URBANA-CHAMP.

AROMATIC COMPOUNDS
Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms,
W76-08752 5B

ARTESIAN WELLS
A Preliminary Water and Energy Budget Analysis of Montezuma Well, Arizona,
W76-09072 4B

ARTIFICAL ISLANDS
Environmental Site Assessment for a Massachusetts Bay Deepwater Oil Terminal,
W76-09380 5G

ARTIFICIAL ISLANDS
Evaluation of Multi-Purpose Industrial-Port Islands: Sea Island Structure Engineering Research Study,
W76-09375 5G

Offshore Multi-Use Port Islands and Their Environment,
W76-09376 5G

Industry Candidates and General Locations for Artificial Industrial-Port Islands,
W76-09377 5G

Adapting Industrial Processes for Multi-Purpose Industrial Port Islands,
W76-09378 5G

ARTIFICIAL RECHARGE
Hydrologic Concepts of Artificially Recharging the Floridan Aquifer in Eastern Orange County, Florida--A Feasibility Study,
W76-09150 4B

ARTIFICIAL SUBSTRATES
Observation and Monitoring of Water Quality by use of Experimental Biological Methods,
W76-08793 5A

ASSESSMENTS
Effects of Seawater Extracts of Crude Oil on Carbon Budgets in Two Species of Mussels,
W76-09320 5C

ATLANTIC OCEAN
Possible Influence of Atmospheric Transport on the Total Mercury Content of Southeastern Atlantic Continental Shelf Surface Waters,
W76-09224 5B

Prediction of Meteorological Factors Related to Beach Erosion at New Jersey and Long Island, N.Y.,
W76-09270 2L

ATOMIC ABSORPTION
Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

ATOMIC ABSORPTION ANALYSIS
Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

ATP
Biological Effects of Primary, Secondary, and Tertiary Sewage Treatment in Lotic Analog Recipients,
W76-08792 5C

ATTITUDES
Recreation Use Patterns and User Attitudes on the Snake River,
W76-08751 6B

AUSTRALIA
Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

Wilson Inlet: A Seasonally Closed Western Australian South Coast Estuary,
W76-09390 2L

AUSTRIA
The Phragmitetea and Molinietalia Associations in the Thaya, March and Danube River Basins of Austria, (In German),
W76-09076 4A

AUTOMATIC CONTROL
Computer Control of Sewage and Rain Water Pumps at Sewage Treatment Plant (Gesuishorijo no osui, amamizu ponpu no keisanki seigyo),
W76-09215 8C

AUTOMATION
Electric Equipment for Mukogawa Sewage Treatment Plant, Hyogo Prefecture (Hyogoken mukogawa shorijo no denki setsubi),
W76-09000 5D

AVAILABLE WATER
Summary Appraisals of the Nation's Ground-Water Resources--California Region,
W76-09139 4B

AVERAGE
Comparative Evaluation of Yearly Climatic Factors with the Five Years Averages for Fudhaliya Agro-Meteorological Station,
W76-09066 2B

AVERAGE FLOW
Low-Flow Characteristics and Mean Annual Discharge of North Branch Manitowoc River at Potter, Wisconsin,
W76-09147 7C

BACILLARIOPHYTA
Study of Algoflora of Contaminated Water Bodies, (In Ukranian),
W76-09093 5C

BACTERIA
Isolation and Characterization of Actinopolyspora Halophila, Gen. ET SP. Nov., An Extremely Halophilic Actinomycete,
W76-08837 5C

Chlorination and Iodination of Poliovirus and F2,
W76-09196 5A

Effects of Selected Herbicides on Bacterial Populations in Nontreated and Treated Water,
W76-09369 5C

BACTERICIDES
An Investigation of Antibiotic and Drug Residues in Fish,
W76-09124 5C

BALANCE OF NATURE
Rationale for a Water Pollution Code Part 1: The Waste System and the Natural System,
W76-08839 5G

BANGLADESH
Limnoplankton of Some Inland Waters of Dacca City,
W76-09400 5C

BANKS
Trout Population Responses to Streamflow Fluctuation and Habitat Management in Big Roche-A-Cri Creek, Wisconsin,
W76-08789 4A

Effect of the Mozhaysk Reservoir on Soil of the Bank Area of the Surrounding Territory, (In Russian),
W76-09081 2G

BARITE
Toxicity Study - Drilling Fluid Chemicals on Aquatic Life,
W76-08895 5C

BARK
Options for the Use and Disposal of Bark,
W76-09302 5E

BASE FLOW
Transform Approach to Solution of Groundwater Flow Equations,
W76-08922 2F

BASELINE STUDIES
Sediment Transport, Turbidity, Channel Configuration, and Possible Effects of Impoundment of the Mad River, Humboldt County, California,
W76-09136 2J

Macroscopic Benthic Fauna of Three Tidal Creeks Adjoining the Rhode River, Maryland,
W76-09143 5B

BASIC DATA COLLECTIONS
Summary of Hydrologic Data Collected During 1974 in Dade County Florida,
W76-09135 7C

Ground-Water Data for Sunflower County, Mississippi,
W76-09140 7C

Ground-Water Data for Carroll County, Mississippi,
W76-09141 7C

BEACH EROSION
Prediction of Meteorological Factors Related to Beach Erosion at New Jersey and Long Island, N.Y.,
W76-09270 2L

BEANS
Effect of Drilling Fluid Components Mixtures on Plants and Soils,
W76-08897 5C

Effect of Air Humidity on Stomatal and Mesophyll Conductivity of Bean Leaves at Two Soil Moisture Levels, (In Russian)
W76-09097 2I

BEHAVIOR IMPAIRMENT
Behavioral Impairment Produced by Exposure to Subclinical Amounts of Methylmercury Chloride,
W76-09037 5C

BELLEAU CREEK (MO)
Flood Plain Information: Dardenne and Belleau Creeks, St. Charles County, Missouri
W76-08818 4A

BENTHIC FAUNA
Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

Environmental Changes in a Portion of Lake Ontario Following Pollution Abatement,
W76-09119 5C

Macroscopic Benthic Fauna of Three Tidal Creeks Adjoining the Rhode River, Maryland,
W76-09143 5B

NTHOS
Mercury Content of Biota in Coastal Waters in Hawaii,
W76-08776 5C

Biological Effects of Primary, Secondary, and Tertiary Sewage Treatment in Lotic Analog Recipients,
W76-08792 5C

Observation and Monitoring of Water Quality by use of Experimental Biological Methods,
W76-08793 5A

Digestive Activities of Carp as a Major Contributor to the Nutrient Loading of Lakes,
W76-09103 5C

Environmental Changes in a Portion of Lake Ontario Following Pollution Abatement,
W76-09119 5C

The Benthos of Pictou Harbor and Northumberland Strait, Canada -- A Measure of the Impact of Treated Kraft Pulp Mill Effluent,
W76-09294 5C

NZENE
The Significance of Isomery in Hygienic Standardization of Industrial Contaminations of Water Bodies, (In Russian),
W76-08864 5A

NZOPYRENE HYDROXYLASE
Field Evaluation of Benzopyrene Hydroxylase Induction as a Monitor for Marine Petroleum Pollution,
W76-09116 5A

RSEEM
Effect of Soil-Moisture Regimes and N and P Fertilization on Berseem Grown for Fodder,
W76-08987 3F

BLIOGRAPHIES
Endrin Toxicity and Distribution in Freshwater: A Review,
W76-09122 5C

Wood Preservatives: Their Depletion as Fungicides and Fate in the Environment,
W76-09275 5B

BROCHE-A-CRI CREEK (WISC)
Trout Population Responses to Streamflow Fluctuation and Habitat Management in Big Roche-A-Cri Creek, Wisconsin,
W76-08789 4A

BASSAY
Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

Insecticide Residues in Two Turtle Species Following Treatment with DDT,
W76-08778 5C

A Continuous Flow Bioassay Method to Evaluate the Effects of Outboard Motor Exhausts and Selected Aromatic Toxicants on Fish,
W76-08780 5C

Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

Toxicity of Some Chemical Therapeutics to the Commercial Shrimp, Penaeus Californiensis,
W76-08796 5C

Acute Toxicity of Well-Drilling to Rainbow Trout,
W76-08899 5A

Assay of Nitrate Reductase from Plasmolyzed Marine Phytoplankton,
W76-08943 5C

Leucothrix: Absence of Demonstrable Fixation of N2,
W76-08953 5C

Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo Boreas),
W76-09115 5C

Axenic Cultures of Tetrahymena Pyriformis as Toxicological Tools,
W76-09121 5A

An Investigation of Antibiotic and Drug Residues in Fish,
W76-09124 5C

Measurement of Metal Toxicity by Biochemical Oxygen Demand,
W76-09127 5A

Identification of Nitrogen as a Growth-Limiting Nutrient in Wastewaters and Coastal Marine Waters Through Continuous Culture Algal Assays,
W76-09195 5A

BIOASSAYS
River Pollution by Anticholinesterase Agents,
W76-08782 5C

Laboratory and Field Tests of Temperature Tolerance on Gambusia A. Affinis, the Western Mosquitofish,
W76-08798 5C

BIOCHEMICAL OXYGEN DEMAND
Measurement of Metal Toxicity by Biochemical Oxygen Demand,
W76-09127 5A

Comparison of Warburg and Marais Methods of Determining Oxygen Uptake Rate Constants,
W76-09189 5A

Recommendation for the Evaluation of the Biological Degradability of Effluents of Varying Origin (Vorschlag zur Beurteilung der Biologischen Abbaubarkeit von Abwaessern Unterschiedlicher Herkunft),
W76-09198 5A

BIOCHEMISTRY
Valyl tRNA's of Anacystis Nidulans,
W76-08827 5C

Glycerophosphatide Content and Composition of Trout (Salvelinus Fontinalis M.) Brain,
W76-08929 5C

Vitamins in the South Polar Seas, I. Distribution and Significance of Dissolved and Particulate Vitamin B 12, Thiamine, and Biotin in the Southern Indian Ocean,
W76-08952 5C

Leucothrix: Absence of Demonstrable Fixation of N2,
W76-08953 5C

BIOCONTROL
An Investigation of Antibiotic and Drug Residues in Fish,
W76-09124 5C

BIODEGRADATION
Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms,
W76-08752 5B

Recommendation for the Evaluation of the Biological Degradability of Effluents of Varying Origin (Vorschlag zur Beurteilung der Biologischen Abbaubarkeit von Abwaessern Unterschiedlicher Herkunft),
W76-09198 5A

Wood Preservatives: Their Depletion as Fungicides and Fate in the Environment,
W76-09275 5B

Mechanism of Conversion of Lignin and its Derivatives in Natural Waters (Mekhanizm prevrashcheniya lignina i ego proizvodnykh v prirodnoj vode),
W76-09280 5B

Degradation of Bunker C Oil under Different Coastal Environments of Chedabucto Bay, Nova Scotia,
W76-09394 5B

BIOINDICATORS
Changes in the Composition of the Plankton of the Rivers Rhine and Meuse in the Netherlands During the Last Fifty Five Years,
W76-09105 5C

Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

Axenic Cultures of Tetrahymena Pyriformis as Toxicological Tools,
W76-09121 5A

BIOLOGICAL COMMUNITIES
The Biology of the Leech Myzobdella Lugubris Infesting Blue Crabs and Catfish,
W76-08932 5C

Effects of Copper on Natural Marine Phytoplankton Communities,
W76-08947 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-09226 5C

BIOLOGICAL OXYGEN DEMAND
Studies of High-Rate Biological Treatment of Ipswich Sewage on Pilot Filters using Plastics Media,
W76-09029 5D

BIOLOGICAL STRATIFICATION (PLANKTON)
A New Stratified Plankton Sampler for Shallow Waters, (In Spanish),
W76-09193 7B

LIBRARY U. OF A. ORONO-Water...

BIOLOGICAL TREATMENT
Biological Effects of Primary, Secondary, and Tertiary Sewage Treatment in Lotic Analog Recipients,
W76-08792 5C

The Effects of a Synthetic Chili Waste on Biological Sewage Treatment Plant Operations,
W76-08845 5D

Biological Purification of Waste Waters,
W76-08971 5D

Waste Water Treatment Plant,
W76-08977 5D

Waste-Water Purification,
W76-08979 5D

Biological Treatment of Sterilised Aqueous Waste.
W76-08995 5D

Specific Pollutants in Urban Waste Waters and the Efficiency of their Purification (Spetsificheskie zagryazneniya gorodskikh stochnykh vod i effektivnost' ikh ochistki),
W76-09002 5A

Waste Water Purification Plant Uhwiesen-Dachsen (Abwasserreingungsanlage Uhwiesen-Dachsen),
W76-09005 5D

Wastewater Recycling Utilizes Pesky Nutrients,
W76-09010 5D

Costs of Biological Waste Water Purification (Die Kosten Der Biologischen Abwasser-reinigung),
W76-09016 5D

Municipal Waste Water Treatment by Rotating Disc Method (Kaiten enbaho ni yoru hisui shori),
W76-09022 5D

Studies of High-Rate Biological Treatment of Ipswich Sewage on Pilot Filters using Plastics Media,
W76-09029 5D

Method for Biologically Treating Sewage and an Installation for Carrying out the Method,
W76-09047 5D

Removal of Faecal Coliform from Waste Water by Proper Aerobic Biological Treatment,
W76-09171 5D

Evaluating Rotating Biological Contactor Performance,
W76-09173 5D

Economic Considerations in the Selection of a Biological Treatment System,
W76-09290 5D

Practical Application of the Toxicity Emission Rate Concept in a Survey of Maritime Pulp and Paper Mills,
W76-09293 5A

Separation Processes Used for Pollution Control in the Pulp and Paper Industry,
W76-09340 5D

BIOLOGY
Phase IV: Biology,
W76-09242 2L

BIOMASS
Growth and Survival of Young-of-the-Year Emerald Shiners (Notropis Atherinoides) at Different Temperatures,
W76-08779 5C

Observation and Monitoring of Water Quality by use of Experimental Biological Methods,
W76-08793 5A

Biomass Parameters and Primary Production at a Nearshore and a Midlake Station of Lake Ontario During IFYGL,
W76-08825 5C

Mollusks of the Ceratophyllum Carpets of Lake Chad: Biomasses and Seasonal Variations of the Density, (In French).
W76-09094 2H

Identification of Nitrogen as a Growth-Limiting Nutrient in Wastewaters and Coastal Marine Waters Through Continuous Culture Algal Assays,
W76-09195 5A

BIOTIC INDICES
Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

BLACK SEA OYSTERS
Interrelation Between Weight and Linear Indices in Black Sea Oysters, (In Russian),
W76-09087 2I

BLEACHING WASTES
Canadian Experience with the Reduction of Mercury at Chlor-Alkali Plants,
W76-09273 5G

Studies on Oxygen-Alkali Treatment of Ligneous Materials. Part V. Recycle and Reuse of Waste Liquor in O-PA-P Bleaching Sequence (In Japanese),
W76-09337 3E

BLOOD LEAD VALUES
Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

BLOOD OXYGEN CAPACITY
Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

BLOOD SUCKING FLIES
Problem of Blood-Sucking Flies in the Zones Affected by Big Water Reservoirs in the Ukrainian SSR, (In Russian),
W76-08991 5G

BOREAL TOADS
Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo Boreas),
W76-09115 5C

BOREHOLE GEOPHYSICS
Solutions for Some Problems Resulting from Refreezing of Permafrost Around a Wellbore,
W76-08892 8G

BOSMINA
The Crustacean Plankton of an Acid Reservoir,
W76-09109 5C

BOTTOM FISH
Digestive Activities of Carp as a Major Contributor to the Nutrient Loading of Lakes,
W76-09103 5C

Resilience of a Rocky Intertidal Fish Community in a Physically Unstable Environment,
W76-09126 5C

BRACKISH LAKES
Distribution, Circulation and Evolution o
Nutrients, Particularly Inorganic Phosphorus i
Lake Etang DeBerre: Influence of Rive
Durance Waters, (In French),
W76-09393 5I

BRACKISH WATER
Flow Injection Analysis. Part IV. Stream Sam
ple Splitting and Its Application to the Continu
ous Spectrophotometric Determination o
Chloride in Brackish Waters,
W76-09339 5A

BRANCHIOBDELLA
Infection of Broad-Clawed Crayfish wit
Branchiobdella and Control Measures Agains
them, (In Russian),
W76-09086 2I

BRANCHIOBDELLA-PENTODONTA
Infection of Broad-Clawed Crayfish wit
Branchiobdella and Control Measures Agains
them, (In Russian),
W76-09086 2I

BREAKWATERS
Features of Various Offshore Structures,
W76-09311 8

Geotechnical Aspects of Rock Borrow fo
Large Breakwaters,
W76-09386 5

Evaluation of Offshore Breakwater Stabili
Under Wave Action,
W76-09387 5

Effect of Offshore Structures on Shorelin
Evolution, Atlantic Generating Station,
W76-09388 5

BRIGHT YELLOW
Interception of Rainfall at Different Grow
Stages by the Canopy of Tobacco Plants, (
Japanese).
W76-08986 3

BRINE
Process for Electrolysis of Brine,
W76-09053 5

BRINE DISPOSAL
Subsurface Brine Disposal - Be Reasonable,
W76-09261 5

BROOK TROUT
Trout Population Responses to Streamflo
Fluctuation and Habitat Management in B
Roche-A-Cri Creek, Wisconsin,
W76-08789 4

BROWN TROUT
Ecology of an Annual Saprolegnia S
(Phycomycete) Outbreak in Wild Brown Trou
W76-08786 5

Trout Population Responses to Streamflo
Fluctuation and Habitat Management in B
Roche-A-Cri Creek, Wisconsin,
W76-08789 4

Assessment and Eradication of Heavy Me
Pollution in a Planned Urban Environment,
W76-08795 5

ULINUS-TRUNCATUS-ROHLFSI
Mollusks of the Ceratophyllum Carpets of Lake Chad: Biomasses and Seasonal Variations of the Density, (In French).
W76-09094 2H

ULLHEADS
Physiological Effects of Sublethal Levels of Acid Water on Fish,
W76-08927 5C

UNKER OIL
Degradation of Bunker C Oil under Different Coastal Environments of Chedabucto Bay, Nova Scotia,
W76-09394 5B

UOY RELEASE INSTRUMENTATION
An Automatic Release Instrument with Underwater Buoy for Marking of Field Equipment,
W76-09268 7B

UOYS
An Automatic Release Instrument with Underwater Buoy for Marking of Field Equipment,
W76-09268 7B

Development of a Water Quality Instrumentation Package for Long-Term Operation from Buoys and Other Unattended Marine Platforms,
W76-09372 5G

URMA
A Lake Population: The Intha of Lake Inle. (Southern Shan States, Burma), (In French),
W76-09361 2H

-14 TECHNIQUE
Effects of Thermal Circulation on Phytoplankton Photosynthesis,
W76-08785 5C

ABLE TOOL DRILLING
Wire Rope,
W76-09359 8G

ADMIUM
Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

ALCITE
Toxicity Study - Drilling Fluid Chemicals on Aquatic Life,
W76-08895 5C

ALCIUM ALUMINATE
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

ALCIUM CARBONATE
Reclamation of Acidified Lakes - Middle and Lohi, Sudbury, Ontario,
W76-09108 5G

ALCIUM HYDROXIDE
Reclamation of Acidified Lakes - Middle and Lohi, Sudbury, Ontario,
W76-09108 5G

CALIFORNIA
Flood Plain Information: Northeast Stream Group, Stockton, California.
W76-08810 4A

Flood Plain Information: Rush Creek-Petaluma River to U. S. Highway 101, Marin County, California.
W76-08812 4A

Flood Plain Information: Kings River, Sanger, California.
W76-08813 4A

Flood Plain Information: Dry Creek and Tributaries, Roseville, California.
W76-08814 4A

Flood Plain Information: Guadalupe River, Santa Clara County, California.
W76-08815 4A

Flood Plain Information: Cow Creek, Palo Cedro, California.
W76-08817 4A

Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

Sediment Transport, Turbidity, Channel Configuration, and Possible Effects of Impoundment of the Mad River, Humboldt County, California,
W76-09136 2J

Summary Appraisals of the Nation's Ground-Water Resources--California Region,
W76-09139 4B

Hydrocarbons in Water and Sediment Samples from Coal Oil Point Area, Offshore California,
W76-09384 5B

CAMEROON
First Observations on the Forest of Cameroon on Sandy Coastal Cordons, (In French)
W76-09100 2I

CAMPBELL ISLAND (NZ)
Chemical Analyses of Campbell Island Fresh Water,
W76-09395 2K

CANADA
Zonation of Snow Conditions in Forest-Tundra, Hudson Bay, New Quebec, (In French),
W76-08759 2C

Thermal Discharge Studies on the Great Lakes-the Canadian Experience,
W76-08869 5G

Reclamation of Acidified Lakes - Middle and Lohi, Sudbury, Ontario,
W76-09108 5G

Mercury Uptake in Rooted Higher Aquatic Plants; Laboratory Studies,
W76-09111 5C

Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

The Formation and Detection of Metal Dispersion Halos in Organic Lake Sediments,
W76-09129 2J

Canadian Experience with the Reduction of Mercury at Chlor-Alkali Plants,
W76-09273 5G

Options for the Use and Disposal of Bark,
W76-09302 5E

Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic,
W76-09334 5G

Countermeasures to Control Oil Spills in Western Canada,
W76-09346 5G

Degradation of Bunker C Oil under Different Coastal Environments of Chedabucto Bay, Nova Scotia,
W76-09394 5B

CANAL SEEPAGE
Impact of Changes in Irrigation water Management in Eastern Idaho,
W76-08925 3F

CANOPY
Wind-Driven Flow of Water Influenced by a Canopy,
W76-08801 2H

CARBAMATE PESTICIDES
River Pollution by Anticholinesterase Agents,
W76-08782 5C

CARBOHYDRATES
The Phenol-Sulfuric Acid Test,
W76-09191 5A

CARBON
Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

Nutrient Mass Balance in Columns Representing Fill Systems for Disposal of Septic Tank Effluents,
W76-09164 5E

CARBON CYCLE
Cycling of Organic Carbon in the Ocean: Use of Naturally-Occurring Radiocarbon as a Long and Short Term Tracer,
W76-08956 5C

CARBON DIOXIDE
Growth, Water Consumption, and Salt Uptake of Tomato Plants in High Humidity- High Carbon Dioxide Greenhouse Environments,
W76-09075 3C

CARBON RADIOISOTOPES
Effects of Thermal Circulation on Phytoplankton Photosynthesis,
W76-08785 5C

CARP
River Pollution by Anticholinesterase Agents,
W76-08782 5C

Self-Regulation of the Population and Biomass of Schools of Yearling Carp, (In Russian),
W76-08832 2I

Digestive Activities of Carp as a Major Contributor to the Nutrient Loading of Lakes,
W76-09103 5C

CASING STRINGS
Techniques of Deep Well Drilling,
W76-08890 8B

Well Completion - Techniques and Methods,
W76-08894 8G

LIBRARY U. OF I. URBANA-CHAMPAIGN

CATFISHES
The Biology of the Leech Myzobdella Lugubris Infesting Blue Crabs and Catfish,
W76-08932 5C

CATHODIC PROTECTION
Cathodic Protection Wells and Ground Water Pollution,
W76-09357 5G

CATHODIC PROTECTION WELLS
Cathodic Protection Wells and Ground Water Pollution,
W76-09357 5G

CELL COUNTS
Results of Phytoplankton Sampling at National Stream Quality Accounting Network Stations in Montana--1975 Water Year,
W76-09146 5A

CENTER PIVOT IRRIGATION
Power Factors and Electrical Demands of Center-Pivot Irrigation Machines,
W76-08770 3F

CENTRIFUGAL PUMPS
Pumps.
W76-09351 8C

CENTRIFUGATION
Centrifuge Preventing Air Admission During Sludge Discharge,
W76-08990 5D

Application of Centrifuges. Dewatering of Sludges from Waterworks (Applicazione Di Centrifughe. Disidratazione Di Fanghi Provenienti Da Impianti Di Potabilizzazione),
W76-09008 5F

Determining the Hydraulic Conductivity of Soil Cores by Centrifugation,
W76-09256 2G

CERATOPHYLLUM
Mollusks of the Ceratophyllum Carpets of Lake Chad: Biomasses and Seasonal Variations of the Density, (In French).
W76-09094 2H

CESIUM
The Availability of 137-CS to Fishes from Ingested Clays,
W76-09118 5C

CHAMBERS COUNTY (TEX)
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74,
W76-09144 7C

CHANNEL CATFISH
The Availability of 137-CS to Fishes from Ingested Clays,
W76-09118 5C

CHANNEL FLOW
A Theory of Flow Resistance for Vegetated Channels,
W76-09252 4A

CHEAT LAKE (WVA-PENN)
The Crustacean Plankton of an Acid Reservoir,
W76-09109 5C

CHEDABUCTO BAY (NC)
Degradation of Bunker C Oil under Different Coastal Environments of Chedabucto Bay, Nova Scotia,
W76-09394 5B

CHEMICAL ANALYSIS
Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

Environmental Aspects of Chemical Use in Well Drilling Operations.
W76-08889 5G

Ground-Water Data for Sunflower County, Mississippi,
W76-09140 7C

Ground-Water Data for Carroll County, Mississippi,
W76-09141 7C

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74,
W76-09144 7C

Chemical Analyses of Campbell Island Fresh Water,
W76-09395 2K

CHEMICAL DEGRADATION
Kinetics and Mechanisms of the Oxidative Degradation of Nitrilotriacetic Acid (NTA) in Aqueous Solutions,
W76-08843 5B

CHEMICAL DEGRADATIONS
Environmental Aspects of Chemical Use in Well Drilling Operations.
W76-08889 5G

CHEMICAL INTERFERENCE
Chemical Interference Effects in the Atomic Absorption Spectrometric Determination of Lead with Premixed Inert Gas (Entrained Air)-Hydrogen Flames.
W76-09043 5A

CHEMICAL OXYGEN DEMAND
An Improved Determination of Chemical Oxygen Demand in Water and Wastes by a Simplified Acid Dichromate Digestion,
W76-09203 5A

CHEMICAL PRECIPITATION
Phosphorus Removal from Waste Water,
W76-08975 5D

Method and Apparatus for Chemically Purifying Sewage,
W76-08976 5D

Chemical Feed: It's A Way of Life at Windsor,
W76-09162 5D

Two-Step Phosphate Removal from Solution Using Aluminum Salts,
W76-09182 5D

New Method for Removing Sodium Sulfide from Sludge,
W76-09278 5D

Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

CHEMICAL PROPERTIES
Environmental Aspects of Chemical Use in Well Drilling Operations.
W76-08889 5G

CHEMICAL PROPERTY
Areal and Seasonal Variations in the Chemistry of Suspended Particulate Matter in a Deep Water Fjord,
W76-08829 2L

CHEMICAL REACTION
Kinetics and Mechanisms of the Oxidative Degradation of Nitrilotriacetic Acid (NTA) in Aqueous Solutions,
W76-08843 5B

CHEMICAL REACTIONS
Environmental Aspects of Chemical Use in Well Drilling Operations.
W76-08889 5G

CHEMICAL STRATIFICATION
A New Stratified Plankton Sampler for Shallow Waters, (In Spanish),
W76-09193 7B

CHEMICAL TREATMENT
Water Purification Process and Apparatus,
W76-09059 5D

CHEMICAL WASHES
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

CHEMICAL WASTES
The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

CHEMILUMINESCENT METHOD
Chemiluminescent Method of Determining Manganese in Natural Waters, (In Russian),
W76-09077 2K

CHILI WASTES
The Effects of a Synthetic Chili Waste on Biological Sewage Treatment Plant Operations,
W76-08845 5D

CHLOR-ALKALI PLANTS
Canadian Experience with the Reduction of Mercury at Chlor-Alkali Plants,
W76-09273 5G

CHLORELLA
A Thermodynamic Model for Steady State Metabolism of Phytoplankton, Part I. Theory,
W76-08944 5C

A Thermodynamic Model for Steady State Metabolism of Phytoplankton, Part II. Light and Carbon Limited Growth,
W76-08945 5C

CHLORIDES
Flow Injection Analysis. Part IV. Stream Sample Splitting and Its Application to the Continuous Spectrophotometric Determination of Chloride in Brackish Waters,
W76-09339 5A

CHLORINATED HYDROCARBON PESTICIDES
Standardization of Methods for the Determination of Traces of Some Volatile Chlorinated Aliphatic Hydrocarbons in Air and Water by Gas Chromatography,
W76-09287 5A

CHLORINATION
Chlorinated Resin Intended for Water Treatment,
W76-09060 5F

Chlorination and Iodination of Poliovirus and F2,
W76-09196 5A

LORINE
ffects of Temperature, Copper and Chlorine n Fish During Simulated Entrainment in ower-Plant Condenser Cooling Systems, /76-08878 5C

Method for Estimating the Toxicity of hlorinated Discharges, /76-08928 5C

LOROPHYTA
he in Vitro Sensitivity of Some Species of hlorophyceae to a Selected Range of Herbi-ides, /76-08824 5C

tudy of Algoflora of Contaminated Water odies, (In Ukranian), /76-09093 5C

RISTIANSEN METHOD
ntercontinental Comparison of Evaporation stimates, /76-08800 2D

ROMATOGRAPHY
actors Affecting the Extraction and Analysis f Polynuclear Aromatic Hydrocarbons in /ater, /76-09200 5A

RYSEMYS SP.
nsecticide Residues in Two Turtle Species Fol-owing Treatment with DDT, /76-08778 5C

ARIFICATION
iological Purification of Waste Waters, /76-08971 5D

ARIFIERS
anadian Clarifier is Low in Cost, /76-09019 5D

ARIPAK
anadian Clarifier is Low in Cost, /76-09019 5D

AY DEFLOCCULATION
ish Toxicity of Dispersed Clay Drilling Mud eflocculants, /76-08896 5C

AYS
ish Toxicity of Dispersed Clay Drilling Mud eflocculants, /76-08896 5C

he Availability of 137-CS to Fishes from In-ested Clays, /76-09118 5C

EANING
lobile Sewer Cleaning Machine, /76-08973 8C

ewer Cleaner Flushes Out Acids, /76-09032 8G

IMATIC DEPRESSION
ate Pleistocene and Modern Plant Communi-es of Shinumo Creek and Peach Springs /ash, Lower Grand Canyon, Arizona, /76-09074 2I

INOPTILOLITE
mmonia Removal by Use of Clinoptilolite, /76-09180 5D

OSED CONDUIT FLOW
losing the White Water System of Paper lachines -- Effective Protection of the En-ironment (Fechamento do sistema de agua branca das maquinas de papel -- uma potecao lucrativa do meio ambiente), W76-09342 3E

COAGULATION
Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth, W76-08842 5D

Sewage Treatment with Activated Fly-Ash and Regenerated Alum Sludge, W76-09183 5D

COAL MINES
Water-Resources Investigations of the U.S. Geological Survey in Selected Coal-Energy Areas of Utah, W76-09148 4B

Northern Great Plains Resource Program. Surface Resource Work Group--Regional Profile. W76-09228 4C

COAL OIL POINT (CA)
Hydrocarbons in Water and Sediment Samples from Coal Oil Point Area, Offshore California, W76-09384 5B

COASTAL CORDONS
First Observations on the Forest of Cameroon on Sandy Coastal Cordons, (In French) W76-09100 2I

COASTAL PLAINS
Quantitative Assessment of Changes in Urban Runoff, W76-09267 4C

COASTAL STRUCTURES
Features of Various Offshore Structures, W76-09311 8A

COASTAL ZONE
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy, W76-09035 6G

COASTS
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy, W76-09035 6G

Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi. W76-09238 2L

Phase I: Area Description, W76-09239 2L

Phase III: Sedimentology, W76-09241 2L

COATINGS
Coatings for Wastewater Treatment Plants, W76-09014 8G

COBALT
Multi-Reaction Proton Activation Analysis for Traces of Molybdenum, W76-09036 5A

Simultaneous Spectrophotometric Determination of Nickel and Cobalt in Mixtures with 3-Hydroxypicolinealdehyde Azine, W76-09042 5A

COCCOLITHS
Coccolith Sedimentation by Fecal Pellets: Laboratory Experiments and Field Observations, W76-08954 5C

COHESIVE SEDIMENT TRANSPORT
Finite Element Model for Cohesive Sediment Transport, W76-09264 2L

COHESIVE SOILS
Finite Element Model for Cohesive Sediment Transport, W76-09264 2L

COLIFORMS
Removal of Faecal Coliform from Waste Water by Proper Aerobic Biological Treatment, W76-09171 5D

Persistence of Fecal Coliform Indicator Bacteria on Alfalfa Irrigated with Municipal Sewage Lagoon Effluent, W76-09217 5C

COLLISIONS
Occurrence, Cause and Avoidance of the Spilling of Oil by Tankers, W76-09314 5B

COLOR
Three-Media Filtration Plant Treats a Problem Water, W76-09155 5F

Study to Define Changes in Pulp Mill Effluent-Contributed Color in Receiving Waters Detectable by Human Observers, W76-09276 5C

Colour Measurement of Pulp Mill Effluents, W76-09296 5A

Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon, W76-09298 5D

Effects of Color and Toxic Constituents of Bleached Kraft Mill Effluent on Algal Growth, W76-09300 5C

COMBINATION RIGS
Combination Rigs, W76-09345 8C

COMBINED SEWERS
Up-Flow Separator, W76-08983 5D

Decision Perspectives on Urban Storm Water Pollution, W76-09207 5G

COMBINED TREATMENT
Problems Caused by Industrial Residual Waters Treated in Conjunction with Urban Waters (Problemas planteados por las aguas residuales industriales en su tratamiento conjunto con las aguas urbanas), W76-09285 5D

COMMERCIAL SHELLFISH
Toxicity of Some Chemical Therapeutics to the Commercial Shrimp, Penaeus Californiensis, W76-08796 5C

Interrelation Between Weight and Linear Indices in Black Sea Oysters, (In Russian), W76-09087 2I

COMPACTION
Development of a Mathematical Model of Infiltration which Includes the Effects of Raindrop Impact, W76-08844 2G

LIBRARY U. OF A. ARIZONA-Water...

COMPREHENSIVE PLANNING
A Critical Study of Flood Protection Planning in the Susquehanna River Basin: 1936-1972,
W76-08846 6F

COMPUTER MODELS
A Simulation Model of Biophysiochemical Transformations of Nitrogen in tile-Drained Corn Belt Soil,
W76-08761 5B

A Reservoir Cove Ecosystem Model,
W76-08830 5C

A Two-Dimensional Hydrodynamic Model for Cooling-Tower Plumes,
W76-08851 5B

Urban Runoff Modelling,
W76-09033 4A

CONCRETE PIPES
Pennsylvania Sewer Placed in Crowded Ditch,
W76-08965 8F

Pipelaying 'Horse' Preassembles and helps Install Ocean Outfall,
W76-08970 8F

CONFERENCES
Environmental Effects of Cooling Systems at Nuclear Power Plants,
W76-08848 5C

Environmental Aspects of the Cooling Systems of Thermal Power Stations: Report on the Seminar Held at Zurich, May Conclusions and Recommendations, (Les Aspects D'Environment Des Systems De Refroidissement Des Centralles Thermiques),
W76-08850 6G

CONSTRUCTION
Water Control Solves Tough Sewer Problem,
W76-08967 8B

CONSTRUCTION COSTS
Pennsylvania Sewer Placed in Crowded Ditch,
W76-08965 8F

CONSTRUCTION MATERIALS
Fiberglass Fights SO3 Attack on Sewers,
W76-08964 8G

CONTACT STABILIZATION
Design Procedure for a Contact Stabilization Activated Sludge Process,
W76-09211 5D

CONTINENTAL SHELF
Responsibilities of Offshore Drilling Regulations,
W76-08918 5G

Possible Influence of Atmospheric Transport on the Total Mercury Content of Southeastern Atlantic Continental Shelf Surface Waters,
W76-09224 5B

Ocean Dumping--A Rational Approach to an International Problem,
W76-09304 5G

Mineral Resource Management of the Outer Continental Shelf.
W76-09306 6G

Ecological Effects of Offshore Construction,
W76-09307 6G

Surface Effects Skimmer Developments,
W76-09308 5G

Report on the Hydrologic and Sedimentologic Study of the Offshore Spoil Disposal Area, Savannah, Georgia,
W76-09309 5E

Wind and Current Effects on Large-Scale Oil Slicks,
W76-09310 5G

Features of Various Offshore Structures,
W76-09311 8A

Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

An Analysis of Oil Outflows Due to Tanker Accidents,
W76-09313 5B

Occurrence, Cause and Avoidance of the Spilling of Oil by Tankers,
W76-09314 5B

Petroleum Residues in the Sargasso Sea and on Bermuda Beaches,
W76-09315 5C

Simulation of Movement of Oil Slicks in the Strait of Georgia using Simple Atmosphere and Ocean Dynamics,
W76-09316 5C

Report of the Conference on Marine Resources of the Coastal Plains States, December 11-12, 1975, Savannah, Georgia.
W76-09329 5G

The OCS Forgotten Land: Territorial Sea, Nearshore, and Estuary,
W76-09330 5G

The Role of Engineering in Minimizing Offshore Impacts,
W76-09331 5G

Offshore Petroleum Drilling and Production,
W76-09332 5G

Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II,
W76-09333 5G

CONTINENTAL SHELF DRILLING
Responsibilities of Offshore Drilling Regulations,
W76-08918 5G

CONTROL SYSTEMS
Instrumentation and Control for Water Works (Suidosetsubi no keisoku to seigyo),
W76-09024 5F

Recent Trends of Process Control for Water Works and Drainage (Jogesuido purosesu seigyo no doko),
W76-09214 5G

COOLING TOWERS
A Two-Dimensional Hydrodynamic Model for Cooling-Tower Plumes,
W76-08851 5B

Combined Dry/Wet-Cooling Towers: Their Environmental Promise and Their Problems,
W76-08852 5B

Atmospheric Dispersion of Cooling-Tower Blowdown,
W76-08853 5B

COOLING WATER
Heat Discharges into the Sea at the Olkiluoto Site: Laboratory Model Test Results and Reasons for Selected Arrangements,
W76-08858 5E

Two Methods of Measuring the Heat Dissipation of Discharged Cooling Water: A Phenomenological Approach,
W76-08868 5E

COPEPODS
Distribution, Morphometry, and Seasonal Biology of the Planktonic Copepods, Neocalanus Robustior and N. Gracilis, in the Pacific Ocean,
W76-08951 5C

Copepod Slick in the Northwest Pacific Ocean,
W76-08959 5C

The Crustacean Plankton of an Acid Reservoir,
W76-09109 5C

COPPER
Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

Effects of Temperature, Copper and Chlorine on Fish During Simulated Entrainment in Power-Plant Condenser Cooling Systems,
W76-08878 5C

Effects of Copper on Natural Marine Phytoplankton Communities,
W76-08947 5C

Some Comments on Interferences by CU(II) Ions and AG(I) Ions on the Wet Reduction Flameless Atomic Absorption Determination of Mercury,
W76-09039 5A

Effects of Copper on the Coral Reef Echinoid Echinometra Mathaei,
W76-09113 5C

COPPER SULFATE
Toxicity of Some Chemical Therapeutics to the Commercial Shrimp, Penaeus Californiensis,
W76-08796 5C

CORAL-REEF ECHINOID
Effects of Copper on the Coral Reef Echinoid Echinometra Mathaei,
W76-09113 5C

CORES
A Light Weight Corer for Sampling Soft Subaqueous Deposits,
W76-09266 2

CORN BELT
A Simulation Model of Biophysiochemical Transformations of Nitrogen in tile-Drained Corn Belt Soil,
W76-08761 5B

CORN (FIELD)
Natural (15)N Abundance in Soil, Leaves, and Grain as Influenced by Long Term Additions of Fertilizer N at Several Rates,
W76-08765 3F

ORRELATION ANALYSIS
The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

Nutrient-Primary Production Relationships in Central Lake Erie: A Simple Correlation Approach,
W76-08836 5C

Rainfall Trends in the West African Sahel,
W76-09269 2B

ORROSION
Coatings for Wastewater Treatment Plants,
W76-09014 8G

Cathodic Protection Wells and Ground Water Pollution,
W76-09357 5G

ORROSION CONTROL
Fiberglass Fights SO3 Attack on Sewers,
W76-08964 8G

Coatings for Wastewater Treatment Plants,
W76-09014 8G

OST ANALYSIS
User Charges for Inland Waterways: A Review of Issues in Policy and Economic Impact,
W76-08847 4A

Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

Cost Estimation.
W76-09354 4B

OST COMPARISON
Private Wells Prove to be a Better Buy,
W76-09343 4B

OSTS
Costs of Biological Waste Water Purification (Die Kosten Der Biologischen Abwasserreinigung),
W76-09016 5D

Monograph of the Effectiveness and Cost of Water Treatment Processes for Removal of Specific Contaminants. Vol. 1. Technical Manual,
W76-09227 5F

Capabilities and Costs of Technology Associated with the Achievement of the Requirements and Goals of the FWPCA of 1972 for Pulp and Paper Industry.
W76-09229 5G

RABS
The Biology of the Leech Myzobdella Lugubris Infesting Blue Crabs and Catfish,
W76-08932 5C

Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

RAYFISH
Infection of Broad-Clawed Crayfish with Branchiobdella and Control Measures Against them, (In Russian),
W76-09086 2H

RITERIA
Can the Criteria and Methodology Used for Radioactive Discharges be Applied to Thermal Discharges. (Les Criteres et La Methodologie Retenus Pour les Rejets Radioactifs Sont-Ils Transposables Aux Rejets Thermiques.),
W76-08887 5G

Criteria for Selecting a Water Quality Model for 208 Planning,
W76-09212 5G

CROP PRODUCTION
Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

CROP RESPONSE
Salt Tolerance and Suitability of Various Grasses for Saline Roadsides,
W76-08764 3C

Drainage System Effects on Physical Properties of a Lakebed Clay Soil,
W76-09259 2G

CRUDE OIL
Responses of Arctic Marine Crustaceans to Crude Oil and Oil-Tainted Food,
W76-09123 5C

Photooxidation as a Factor in the Environmental Dispersal of Curde Oil,
W76-09389 5B

CRUISES
Cruise Summary, A. Southern California Bight Studies (SCBS).
W76-08960 5C

Cruise Summary, B. Gulf of California Photobiology Cruise,
W76-08961 5C

CRUSTACEANS
Effect of Food Concentration on Efficiency of its Assimilation by Planktonic Crustaceans with Different Feeding Mechanisms, (In Russian),
W76-09092 2I

Responses of Arctic Marine Crustaceans to Crude Oil and Oil-Tainted Food,
W76-09123 5C

CULTIVATED LANDS
Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

CULTIVATION
Soil and Water Conservation with Western Iowa Tillage Systems,
W76-08805 4D

Erosion for Corn Tillage Systems,
W76-09248 3F

CUNNER
Field Evaluation of Benzopyrene Hydroxylase Induction as a Monitor for Marine Petroleum Pollution,
W76-09116 5A

CYANOPHYTA
Valyl tRNA's of Anacystis Nidulans,
W76-08827 5C

Study of Algoflora of Contaminated Water Bodies, (In Ukranian),
W76-09093 5C

CYCLING NUTRIENTS
Dynamics of Phosphorus Cycling in the Euphotic Waters of the Central North Pacific Ocean,
W76-08939 5C

Cycling of Organic Carbon in the Ocean: Use of Naturally-Occurring Radiocarbon as a Long and Short Term Tracer,
W76-08956 5C

Nutrient Cycling Between the Water Column and a Marine Sediment. I. Organic Carbon,
W76-08957 5C

Desert Ecosystems: Higher Trophic Levels,
W76-09064 2A

Digestive Activities of Carp as a Major Contributor to the Nutrient Loading of Lakes,
W76-09103 5C

CYCLOPS
The Crustacean Plankton of an Acid Reservoir,
W76-09109 5C

CYTOLOGICAL STUDIES
Studies on Phosphorylation Coupled with Denitrification and Aerobic Respiration in Pseudomonas Denitrificans,
W76-08823 5C

Valyl tRNA's of Anacystis Nidulans,
W76-08827 5C

Effect of Hardening on the State of Water in Seedlings of Winter Cultures, (In Russian),
W76-09095 2I

DAPHNIA
The Crustacean Plankton of an Acid Reservoir,
W76-09109 5C

DARDENNE CREEK (MO)
Flood Plain Information: Dardenne and Belleau Creeks, St. Charles County, Missouri.
W76-08818 4A

DATA COLLECTION
Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming,
W76-09349 5A

DATA COLLECTIONS
Expedient Technique of Permanent Observations -- An Indispensable Tool on Studying the Limnology of Rivers,
W76-09106 7B

Low-Flow Characteristics and Mean Annual Discharge of North Branch Manitowoc River at Potter, Wisconsin,
W76-09147 7C

Design of Nationwide Water-Quality-Monitoring Networks,
W76-09209 5A

The Po River at the Island of Serafini, (In Italian),
W76-09305 2E

DATA TRANSFER
Statistics of Data Transfer,
W76-09133 4A

DDD
Insecticide Residues in Two Turtle Species Following Treatment with DDT,
W76-08778 5C

DDE
Insecticide Residues in Two Turtle Species Following Treatment with DDT,
W76-08778 5C

DDT
Insecticide Residues in Two Turtle Species Following Treatment with DDT,
W76-08778 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

DECISION MAKING
Decision Perspectives on Urban Storm Water Pollution,
W76-09207 5G

DECOLORIZATION
Decolorization of Night Soil Treatment Plant Effluent by Ozone (Ozon ni yoru shinyo shorisui no dasshoku),
W76-09026 5D

DEEP PERCOLATION
Simulation of Deep Seepage to a Water Table,
W76-09245 2F

DEEP WELLS
Techniques of Deep Well Drilling,
W76-08890 8B

DEEPWATER OIL TERMINALS
Environmental Site Assessment for a Massachusetts Bay Deepwater Oil Terminal,
W76-09380 5G

DENDROCOELUM-AFINE
Protection of Romanian Underground Water Fauna, (In Romanian),
W76-09085 2I

DENDROCOELUM-ATRIOSTRICTUM
Protection of Romanian Underground Water Fauna, (In Romanian),
W76-09085 2I

DENDROCOELUM-BANATICUM
Protection of Romanian Underground Water Fauna, (In Romanian),
W76-09085 2I

DENITRIFICATION
Studies on Phosphorylation Coupled with Denitrification and Aerobic Respiration in Pseudomonas Denitrificans,
W76-08823 5C

Waste Water Purification,
W76-08972 5D

Waste Treatment Process,
W76-08978 5D

Kinetics and Control Tests of Nitrification-Denitrication Process, Part I: Kinetics,
W76-09365 5D

Kinetics and Control Tests of Nitrification-Denitrification Process, Part II: Respiration and Control Tests,
W76-09366 5D

DESALINATION
Direct Contact Multi-Stage Flash Desalination,
W76-09052 3A

The Role of New Technologies for Improved Water Management and Related Effects on Water Law Systems,
W76-09065 3E

Reverse Osmosis Separation of Polar Organic Compounds in Aqueous Solution,
W76-09165 5D

Reverse Osmosis Today,
W76-09169 5D

DESALINATION APPARATUS
Direct Contact Multi-Stage Flash Desalination,
W76-09052 3A

DESALINATION PROCESSES
Direct Contact Multi-Stage Flash Desalination,
W76-09052 3A

DESERT PLANTS
The Nature and Causes of Desertization,
W76-09069 4C

DESERTIFICATION
The Nature and Causes of Desertization,
W76-09069 4C

DESERTS
Desert Ecosystems: Higher Trophic Levels,
W76-09064 2A

The Nature and Causes of Desertization,
W76-09069 4C

DESIGN
Pollution Control Plant is Designed to be an Attractive Neighbor, Too.
W76-09011 5D

Canadian Clarifier is Low in Cost,
W76-09019 5D

Diffuser Design,
W76-09291 8A

DESIGN CRITERIA
Methods for Filtering Nitrified Effluents,
W76-09015 5D

Advanced Waste Treatment Plant Features Nitrification,
W76-09020 5D

Hydraulic Calculation of Sludge Pipelines in Waste Water Treatment Plants (De hydraulische berekening van slibwaterleidingen op rioolwaterzuiveringstallaties),
W76-09208 8C

Design of Nationwide Water-Quality-Monitoring Networks,
W76-09209 5A

Design Procedure for a Contact Stabilization Activated Sludge Process,
W76-09211 5D

DEWATERING
Process for Treating Sewage Sludge and Fertilizer Products Thereof,
W76-08984 5D

Removal of Water from Sludges with Filter Presses (Schlammentwaesserung Mit Pressfiltern),
W76-08998 5D

Application of Centrifuges. Dewatering of Sludges from Waterworks (Applicazione Di Centrifughe. Disidratazione Di Fanghi Provenienti Da Impianti Di Potabilizzazione),
W76-09008 5F

Sludge Handling and Disposal: A Special Report,
W76-09012 5D

Modern Filter Press Technology for Sewage Sludge Dewatering,
W76-09021 5D

The Effect of Flocculants on Postcoagulation Sludge Dewatering (Wplyw flokulantow na odwadnialnosc osadow pokoagulacyjnych),
W76-09174 5D

Continuous Filter for Dewatering Sludges (Filtre continu de deshydratation des boues),
W76-09279 5D

DIATOMS
The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

Diatom Community Response to Variations in Effluent Concentration,
W76-08835 5C

Phosphate Utilization by an Oceanic Diatom in Phosphorus-Limited Chemostat Culture and in the Oligotrophic Waters of the Central North Pacific,
W76-08938 5C

Investigations on the Phytoplankton and Some Environmental Parameters of the Shattal-Arab (Iraq), (In German)
W76-09084 2L

Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

Water Pollution Monitoring Using Matched Spatial Filters,
W76-09194 5A

Microbiological and Algological Survey of A Primary Stage of Eutrophication in a Stream, (In French),
W76-09399 5C

DICHLOBENIL
Effects of Selected Herbicides on Bacterial Populations in Nontreated and Treated Water,
W76-09369 5C

DIFFUSERS
Diffuser Design,
W76-09291 8A

DIFFUSION
Finite Element Model for Cohesive Sediment Transport,
W76-09264 2L

DINOFLAGELLATES
Physiological Ecology of Gonyaulax Polyedra, a Red Water Dinoflagellate Off Southern California,
W76-08936 5C

Two Blooms of Gymnodinium Splendens (Lebour). A Large Naked Dinoflagellate,
W76-08937 5C

DIPTEROCARPUS-TUBERCULATUS
A Lake Population: The Intha of Lake Inle. (Southern Shan States, Burma), (In French),
W76-09361 2H

DIQUAT
Effects of Selected Herbicides on Bacterial Populations in Nontreated and Treated Water,
W76-09369 5C

DISINFECTION
Ozonization of Water in Moscow (Ozonisation De L'Eau a Moscou),
W76-08997 5F

Disinfection of Urban Sewage Sludge (La Desinfection Des Bous Residuaires Urbaines),
W76-09007 5D

Wastewater Plant will Use no Chemicals for Sludge Conditioning,
W76-09161 5D

DISPERSION
A Model for Salt Drift Deposition from Spray Ponds,
W76-08866 5B

Mass Transport and Dispersion Off a Tidal Inlet,
W76-09381 5G

Photooxidation as a Factor in the Environmental Dispersal of Curde Oil,
W76-09389 5B

DISSOLVED OXYGEN
Selective Fish Mortality Resulting from Low Winter Oxygen,
W76-08788 5C

Measurement of the Oxygenation Capacity in Waste Water Treatment Plants using Completely Mixed Activated Sludge (Mesure De La Capacite D'Oxygenation Dans Les Stations De Traitement A Boues Activees En Melange Integral),
W76-09006 5D

Changes in the Composition of the Plankton of the Rivers Rhine and Meuse in the Netherlands During the Last Fifty Five Years,
W76-09105 5C

The Use of Oxygen in the Treatment of Waste Water,
W76-09167 5D

Comparison of Warburg and Marais Methods of Determining Oxygen Uptake Rate Constants,
W76-09189 5A

Monitoring Dissolved-Oxygen Content to Assure Clean Wastewater,
W76-09202 5A

Temperature, Oxygen, and Nutrient Distribution Patterns in Lake Erie, 1970,
W76-09262 5B

Oxygen Depletion in the Central and Eastern Basins of Lake Erie, 1970,
W76-09263 5C

DISSOLVED OXYGEN ANALYZERS
Monitoring Dissolved-Oxygen Content to Assure Clean Wastewater,
W76-09202 5A

DISSOLVED SOLIDS
Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming,
W76-09349 5A

DISTRIBUTION
The Effect of Thermal Pollution on the Distribution of Naegleri Fowleri,
W76-08930 5C

Distribution, Circulation and Evolution of Nutrients, Particularly Inorganic Phosphorus in Lake Etang DeBerre: Influence of River Durance Waters, (In French),
W76-09393 5B

DISTRIBUTION PATTERNS
Distribution, Morphometry, and Seasonal Biology of the Planktonic Copepods, Neocalanus Robustior and N. Gracilis, in the Pacific Ocean,
W76-08951 5C

Temperature, Oxygen, and Nutrient Distribution Patterns in Lake Erie, 1970,
W76-09262 5B

Phytoplankton Distribution in the Vicinity of the Peru Current Near 8 Degrees S. Latitude, (In Russian),
W76-09283 5B

DIURON
Effects of Selected Herbicides on Bacterial Populations in Nontreated and Treated Water,
W76-09369 5C

DOMESTIC WASTES
Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

DOMESTIC WELLS
Private Wells Prove to be a Better Buy,
W76-09343 4B

DOMINANT ORGANISMS
The Crustacean Plankton of an Acid Reservoir,
W76-09109 5C

DRAGONFLIES
Thermal Ecology of Dragonflies in Habitats Receiving Reactor Effluent,
W76-08881 5C

DRAINAGE
A Simulation Model of Biophysiochemical Transformations of Nitrogen in tile-Drained Corn Belt Soil,
W76-08761 5B

Quantitative Assessment of Changes in Urban Runoff,
W76-09267 4C

DRAINAGE EFFECTS
Drainage System Effects on Physical Properties of a Lakebed Clay Soil,
W76-09259 2G

DRAINAGE PRACTICES
Structural Performance of Buried Plastic Drain Tubing,
W76-08771 8G

DRAINAGE TUBING
Structural Performance of Buried Plastic Drain Tubing,
W76-08771 8G

DRAINS
Structural Performance of Buried Plastic Drain Tubing,
W76-08771 8G

DREDGING
Beach-Offshore Dredging: Some Environmental Consequences,
W76-09335 5G

DRILLERS LOGS
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74,
W76-09144 7C

DRILLING COST ESTIMATION
Cost Estimation.
W76-09354 4B

DRILLING EQUIPMENT
Techniques of Deep Well Drilling,
W76-08890 8B

The Handling and Treating of Water-Based Drilling Muds,
W76-08912 5D

Combination Rigs,
W76-09345 8C

Wire Rope,
W76-09359 8G

DRILLING FLUID ADDITIVES
Effect of Drilling Fluid Components Mixtures on Plants and Soils,
W76-08897 5C

Ground Water Problems Associated with Well-Drilling Additives,
W76-08902 5B

Environmental Implications of Sediment Bulk Analysis Techniques for Trace Metals in Offshore Well-Drilling Operations,
W76-08908 5A

The Toxicity of Drilling Fluids, Their Testing and Disposal,
W76-08911 5D

DRILLING FLUID DISPOSAL
Treatment and Disposal of Waste Fluids from Onshore Drilling Sites,
W76-08910 5D

DRILLING FLUIDS
Techniques of Deep Well Drilling,
W76-08890 8B

Drilling Fluid Principles and Operations,
W76-08893 8G

Toxicity Study - Drilling Fluid Chemicals on Aquatic Life,
W76-08895 5C

Fish Toxicity of Dispersed Clay Drilling Mud Deflocculants,
W76-08896 5C

Effect of Drilling Fluid Components Mixtures on Plants and Soils,
W76-08897 5C

Acute Toxicity of Well-Drilling to Rainbow Trout,
W76-08899 5A

Thermal Degradation of Drilling Mud Additives,
W76-08901 8G

Ground Water Problems Associated with Well-Drilling Additives,
W76-08902 5B

Chemical Applications in Oil and Gas Well-Drilling and Completion Operations,
W76-08903 8G

Mobility of Well-Drilling Additives in the Ground Water System,
W76-08904 5B

Toxicity and Environmental Properties of Chemicals used in Well-Drilling Operations,
W76-08906 5C

Potential Effects of Oil Drilling and Dumping Activities on Marine Biota,
W76-08907 5C

Effects of Drilling Operations on the Marine Environment,
W76-08909 5G

The Toxicity of Drilling Fluids, Their Testing and Disposal,
W76-08911 5D

The Handling and Treating of Water-Based Drilling Muds,
W76-08912 5D

LIBRARY U. OF A. ORGANIC-GEOCHEM. COLL.

Handling and Treatment of Oil-Base Drilling Muds,
W76-08913 8G

Waste Water Base Drilling Fluid Disposal,
W76-08914 5D

Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic,
W76-09334 5G

DRILLING METHODS
Techniques of Shallow Well Drilling,
W76-08891 8B

DRILLING PIPE
Techniques of Deep Well Drilling,
W76-08890 8B

DROP INLETS
Stepped Baffled Trash Rack for Drop Inlets,
W76-09250 8B

DROPS (STRUCTURES)
Stepped Baffled Trash Rack for Drop Inlets,
W76-09250 8B

DROUGHT RESISTANCE
Effect of the Water Regime on the Heat-Resistance of Leaf Cells of Heat-Hardened Tradescantia Fluminensis Vell. Plants, (In Russian),
W76-09102 2I

DROUGHTS
The Sahel: Time for a New Approach,
W76-09070 4C

Rainfall Trends in the West African Sahel,
W76-09269 2B

DRUG RESIDUES
An Investigation of Antibiotic and Drug Residues in Fish,
W76-09124 5C

DRYING
Method and Apparatus for Treating a Continuous Flow of Fluid Waste Products and Other Materials,
W76-08993 5D

DUMPSITES
New York Alternative Dumpsite Assessment - Reconnaissance Study of Surficial Sediments,
W76-09383 5G

DURSBAN
The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

DYES
Interaction Between Surfactant and Dye IV. Application of the Acridine Orange Method to the Survey of Pollution of Alkylbenzene Sulfonate in Rivers and the Survey of Water Pollution in Kinokawa,
W76-09364 5A

EARTHQUAKES
Evaluation of Seismicity and Earthquake Shaking at Offshore Sites,
W76-09379 5G

EAST HARBOR (LAKE ERIE)
Changes in the Algal Flora of East Harbor, Ottawa County, Ohio, Since 1900,
W76-08834 5C

ECOLOGICAL DISTRIBUTION
Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

ECOLOGY
Ecology of Artificially Heated Streams, Swamps and Reservoirs on the Savannah River Plant, the Thermal Studies Program of the Savannah River Ecology Laboratory,
W76-08870 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-08948 5C

Distribution, Morphometry, and Seasonal Biology of the Planktonic Copepods, Neocalanus Robustior and N. Gracilis, in the Pacific Ocean,
W76-08951 5C

The Offshore Ecology Investigation,
W76-09382 5G

ECONOMIC IMPACT
User Charges for Inland Waterways: A Review of Issues in Policy and Economic Impact,
W76-08847 4A

The Sahel: Time for a New Approach,
W76-09070 4C

ECONOMICS
Economic Considerations in the Selection of a Biological Treatment System,
W76-09290 5D

ECOSYSTEM
The Nature and Causes of Desertization,
W76-09069 4C

ECOSYSTEMS
A Reservoir Cove Ecosystem Model,
W76-08830 5C

Thermal Studies on Tropical Marine Ecosystems in Puerto Rico,
W76-08872 5C

Notes on the Importance of Dissolved and Particulate Organic Matter in Marine Food Chains, (In Spanish),
W76-08916 5C

Desert Ecosystems: Higher Trophic Levels,
W76-09064 2A

The Offshore Ecology Investigation,
W76-09382 5G

ELECTRIC POWER COSTS
Power Factors and Electrical Demands of Center-Pivot Irrigation Machines,
W76-08770 3F

ELECTRIC POWER DEMAND
Power Factors and Electrical Demands of Center-Pivot Irrigation Machines,
W76-08770 3F

ELECTRIC POWER PRODUCTION
Water Requirements for Energy,
W76-09231 3B

ELECTRICAL WELL LOGGING
How to Get Good Samples by Rotary Drilling,
W76-09363 8G

ELECTROLYSIS
Ammonia Nitrogen Removal from Waste Water Effluents by Zeolite Ion Exchange and Electrolysis Combination (Zeoraito ni yoru ion-kokan-denkai no kumiawase ni yoru haisui karano ammoniasei chisso jokyo),
W76-09023 5D

Process for Electrolysis of Brine,
W76-09053 5D

ELECTROLYTIC OXIDATION
Ammonia Nitrogen Removal from Waste Water Effluents by Zeolite Ion Exchange and Electrolysis Combination (Zeoraito ni yoru ion-kokan-denkai no kumiawase ni yoru haisui karano ammoniasei chisso jokyo),
W76-09023 5D

ELECTRON MICROSCOPY
The Application of the Scanning Electron Microscope to Freshwater Phytoplankton Taxonomy and Morphology,
W76-09225 5A

EMBANKMENTS
Effect of the Mozhaysk Reservoir on Soil of the Bank Area of the Surrounding Territory, (In Russian),
W76-09081 2G

EMBRYONIC GROWTH STAGE
Effects of Copper on the Coral Reef Echinoid Echinometra Mathaei,
W76-09113 5C

EMULSIONS
The Handling and Treating of Water-Based Drilling Muds,
W76-08912 5D

ENDRIN
Endrin Toxicity and Distribution in Freshwater: A Review,
W76-09122 5C

ENERGY
There is Something New Under the Sun,
W76-09152 5D

Hydrological Problems Associated with Developing Geothermal Energy Systems,
W76-09260 4B

Economics and Energy: Reducing Mill Energy Consumption and Effluent Volume,
W76-09299 5G

ENERGY BALANCE
Nutrient Regeneration by Oceanic Zooplankton: A Comparison of Methods,
W76-08950 5C

ENERGY BUDGET
A Preliminary Water and Energy Budget Analysis of Montezuma Well, Arizona,
W76-09072 4B

Thermal Structure of Lake Mascardi (Province of Rio Negro, Argentina, (In Spanish),
W76-09358 2H

ENERGY CONSERVATION
Economics and Energy: Reducing Mill Energy Consumption and Effluent Volume,
W76-09299 5G

ENVIRONMENT
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

ENVIRONMENT EFFECTS
A Method for Estimating the Toxicity of Chlorinated Discharges,
W76-08928 5C

ENVIRONMENTAL CONTROL
The Sahel: Time for a New Approach,
W76-09070 4C

Growth, Water Consumption, and Salt Uptake of Tomato Plants in High Humidity- High Carbon Dioxide Greenhouse Environments,
W76-09075 3C

ENVIRONMENTAL DESIGN
Environmental Studies for Major Offshore Developments,
W76-09336 5G

ENVIRONMENTAL EFFECT
Environmental Aspects of Chemical Use in Well Drilling Operations.
W76-08889 5G

Simulation of Movement of Oil Slicks in the Strait of Georgia using Simple Atmosphere and Ocean Dynamics,
W76-09316 5C

ENVIRONMENTAL EFFECTS
Implications of Zoning as An Urban Water Management Measure,
W76-08755 6F

The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

Rationale for a Water Pollution Code Part 1: The Waste System and the Natural System,
W76-08839 5G

Environmental Effects of Cooling Systems at Nuclear Power Plants,
W76-08848 5C

Environmental Aspects of the Cooling Systems of Thermal Power Stations: Report on the Seminar Held at Zurich, May Conclusions and Recommendations, (Les Aspects D'Environment Des Systems De Refroidissement Des Centralles Thermiques),
W76-08850 6G

A Two-Dimensional Hydrodynamic Model for Cooling-Tower Plumes,
W76-08851 5B

Combined Dry/Wet-Cooling Towers: Their Environmental Promise and Their Problems,
W76-08852 5B

Heat Discharges into the Sea at the Olkiluoto Site: Laboratory Model Test Results and Reasons for Selected Arrangements,
W76-08858 5B

Heating of Estuarine and Coastal Waters by Nuclear Power Stations in France, (Echauffement Des Eaux Par Des Centrales Nucleaires En Estuaire Et Bord De Mer En France),
W76-08859 5B

The Chalk Point Cooling Tower Project,
W76-08861 5B

Seasonal Feature of Thermal Abatement of Shoreline Discharges at Nuclear Sites,
W76-08862 5G

United Kingdom Experience of the Physical Behaviour of Heated Effluents in the Atmosphere and in Various Types of Aquatic Systems,
W76-08863 5B

Waste-Heat Disposal from Steam Electric Plants with Reference to the Stochastic Nature of Some Environmental Conditions and to Thermal Pollution Control Regulations,
W76-08865 5G

Thermal Discharge Studies on the Great Lakes-the Canadian Experience,
W76-08869 5G

Ecology of Artificially Heated Streams, Swamps and Reservoirs on the Savannah River Plant, the Thermal Studies Program of the Savannah River Ecology Laboratory,
W76-08870 5C

Effects of a Thermal Discharge into a River on the Movement of Fish Populations, (Incidences D'un Rejet Thermique En Milieu Fluvial Sur Les Mouvements Des Populations Ichtyologiques),
W76-08871 5C

Thermal Studies on Tropical Marine Ecosystems in Puerto Rico,
W76-08872 5C

Environmental Effects of the Heated Discharges From Bradwell Nuclear Power Station, and of the Cooling Systems of Other Stations,
W76-08873 5C

Influence of Heat from the Gentilly Nuclear Power Station on Water Temperature and Gastropoda, (Influence De L'Apport Thermique Originaire de la Centrale Nucleaire Gentilly Sur La Temperature De L'eau Et Sur Les Gasteropodes),
W76-08874 5C

Studies Carried out in France on the Ecological Consequences of Open-Circuit Cooling in Thermal Power Stations, (Etudes Realisees en France sur Les Consequences Ecologiques de la Refrigeration des Centrales Thermiques en Circuit Ouvert),
W76-08875 5C

Behavioural Responses of Lake Michigan Fishes to a Nuclear Power Plant Discharge,
W76-08876 5C

Thermal Effects on Marine Biota in Experimental Systems,
W76-08877 5C

Effects of Temperature, Copper and Chlorine on Fish During Simulated Entrainment in Power-Plant Condenser Cooling Systems,
W76-08878 5C

Effects of Heat Enrichment on Species Succession and Primary Production in Fresh-Water Plankton,
W76-08879 5C

Aquatic Physiology of Thermal and Chemical Discharges,
W76-08880 5C

Thermal Ecology of Dragonflies in Habitats Receiving Reactor Effluent,
W76-08881 5C

Temperature Selection By Fish--A Factor in Power-Plant Impact Assessments,
W76-08882 5C

Predicting the Ecological Consequences of Thermal Pollution from Observations on Geothermal Habitats,
W76-08883 5C

A Comparison of Short-Term Effects of Thermal Addition on Photosynthesis and Plant-Water Stress in Three Ecosystems,
W76-08884 5C

Regulations and Environmental Investigations Associated with Nuclear Station Thermal Discharges,
W76-08886 5G

Can the Criteria and Methodology Used for Radioactive Discharges be Applied to Thermal Discharges. (Les Criteres et La Methodologie Retenus Pour les Rejets Radioactifs Sont-Ils Transposables Aux Rejets Thermiques.),
W76-08887 5G

Comparative Effects of Two Modes of Cooling Water Discharge on Mississippi River Biota and Environmental Ecosystems,
W76-08888 5C

Potential Effects of Oil Drilling and Dumping Activities on Marine Biota,
W76-08907 5C

The Effect of Thermal Pollution on the Distribution of Naegleri Fowleri,
W76-08930 5C

Feeding Behavior and Temperature and Light Tolerance of Mysis Relicta in the Laboratory,
W76-08931 5C

Environmental and Intrinsic Control of Filtering and Feeding Rates in Arctic Daphnia,
W76-08933 5C

Temperature Influence on Chemical Toxicity to Aquatic Organisms,
W76-08934 5C

Chlorine Reactions with Seawater Constituents and the Inhibition on Photosynthesis of Natural Marine Phytoplankton,
W76-08946 5C

Effects of Copper on Natural Marine Phytoplankton Communities,
W76-08947 5C

The Sahel: Time for a New Approach,
W76-09070 4C

Late Pleistocene and Modern Plant Communities of Shinumo Creek and Peach Springs Wash, Lower Grand Canyon, Arizona,
W76-09074 2I

Environmental Changes in a Portion of Lake Ontario Following Pollution Abatement,
W76-09119 5C

Sediment Transport, Turbidity, Channel Configuration, and Possible Effects of Impoundment of the Mad River, Humboldt County, California,
W76-09136 2J

Water-Resources Investigations of the U.S. Geological Survey in Selected Coal-Energy Areas of Utah,
W76-09148 4B

Ocean Dumping--A Rational Approach to an International Problem,
W76-09304 5G

Mineral Resource Management of the Outer Continental Shelf.
W76-09306 6G

Ecological Effects of Offshore Construction,
W76-09307 6G

Surface Effects Skimmer Developments,
W76-09308 5G

LIBRARY U. OF A. ENVIRONMENTAL SCIENCES

ENVIRONMENTAL EFFECTS

Report on the Hydrologic and Sedimentologic Study of the Offshore Spoil Disposal Area, Savannah, Georgia,
W76-09309 5E

Wind and Current Effects on Large-Scale Oil Slicks,
W76-09310 5G

Features of Various Offshore Structures,
W76-09311 8A

Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

An Analysis of Oil Outflows Due to Tanker Accidents,
W76-09313 5B

Occurrence, Cause and Avoidance of the Spilling of Oil by Tankers,
W76-09314 5B

Petroleum Residues in the Sargasso Sea and on Bermuda Beaches,
W76-09315 5C

Simulation of Movement of Oil Slicks in the Strait of Georgia using Simple Atmosphere and Ocean Dynamics,
W76-09316 5C

Toxicity and Avoidance Tests with Prudhoe Bay Oil and Pink Salmon Fry,
W76-09317 5C

Microbial Ecology of Petroleum Utilization in Chesapeake Bay,
W76-09319 5C

Effects of Seawater Extracts of Crude Oil on Carbon Budgets in Two Species of Mussels,
W76-09320 5C

The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

Biological Effects of Refinery Effluents,
W76-09322 5C

Respiratory Response of Juvenile Chinook Salmon and Striped Bass Exposed to Benzene, A Water-Soluble Component of Crude Oil,
W76-09323 5C

Interagency Investigations of a Persistent Oil Spill on the Washington Coast. Animal Population Studies, Hydrocarbon Uptake by Marine Organisms, and Algae Response Following the Grounding of the Troopship General M.C. Meigs,
W76-09324 5C

Effects of Water Soluble Extracts of Oil on Phytoplankton,
W76-09325 5C

Effect of a Bunker Fuel on the Beach Bacterial Flora,
W76-09326 5C

Microbial Petroleum Degradation: The Role of Cladosporium Resinae,
W76-09327 5C

The Fate of a Bunker Fuel in Beach Sand,
W76-09328 5C

Report of the Conference on Marine Resources of the Coastal Plains States, December 11-12, 1975, Savannah, Georgia.
W76-09329 5G

The OCS Forgotten Land: Territorial Sea, Nearshore, and Estuary,
W76-09330 5G

The Role of Engineering in Minimizing Offshore Impacts,
W76-09331 5G

Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II,
W76-09333 5G

Beach-Offshore Dredging: Some Environmental Consequences,
W76-09335 5G

Environmental Studies for Major Offshore Developments,
W76-09336 5G

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II.
W76-09371 5G

Development of a Water Quality Instrumentation Package for Long-Term Operation from Buoys and Other Unattended Marine Platforms,
W76-09372 5G

On the Risk Assessment of Offshore Structures,
W76-09373 5G

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III.
W76-09374 5G

Evaluation of Multi-Purpose Industrial-Port Islands: Sea Island Structure Engineering Research Study,
W76-09375 5G

Offshore Multi-Use Port Islands and Their Environment,
W76-09376 5G

Industry Candidates and General Locations for Artificial Industrial-Port Islands,
W76-09377 5G

Adapting Industrial Processes for Multi-Purpose Industrial Port Islands,
W76-09378 5G

Evaluation of Seismicity and Earthquake Shaking at Offshore Sites,
W76-09379 5G

Environmental Site Assessment for a Massachusetts Bay Deepwater Oil Terminal,
W76-09380 5G

Mass Transport and Dispersion Off a Tidal Inlet,
W76-09381 5G

The Offshore Ecology Investigation,
W76-09382 5G

New York Alternative Dumpsite Assessment - Reconnaissance Study of Surficial Sediments,
W76-09383 5G

Hydrocarbons in Water and Sediment Samples from Coal Oil Point Area, Offshore California,
W76-09384 5B

Influx of Petroleum Hydrocarbons into the Ocean,
W76-09385 5G

Effect of Offshore Structures on Shoreline Evolution, Atlantic Generating Station,
W76-09388 5G

ENVIRONMENTAL ENGINEERING

Atmospheric Dispersion of Cooling-Tower Blowdown,
W76-08853 5B

Fog Formation and Fog Elimination,
W76-08854 5G

ENVIRONMENTAL IMPACT

Interagency Investigations of a Persistent Oil Spill on the Washington Coast. Animal Population Studies, Hydrocarbon Uptake by Marine Organisms, and Algae Response Following the Grounding of the Troopship General M.C. Meigs,
W76-09324 5C

Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II,
W76-09333 5G

Environmental Studies for Major Offshore Developments,
W76-09336 5G

ENVIRONMENTAL IMPACT ASSESSMENT

Aquatic Physiology of Thermal and Chemical Discharges,
W76-08880 5C

ENVIRONMENTL EFFECTS

Offshore Petroleum Drilling and Production,
W76-09332 5G

ENVIRONMETAL CONTROL

Fog Formation and Fog Elimination,
W76-08854 5G

ENZYMES

Assay of Nitrate Reductase from Plasmolyzed Marine Phytoplankton,
W76-08943 5C

Field Evaluation of Benzopyrene Hydroxylase Induction as a Monitor for Marine Petroleum Pollution,
W76-09116 5A

EPIBENTHIC ALGAE

The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

EPIDEMIOLOGY

Hepatitis Attributed to Polluted Stream,
W76-09220 5C

EQUATIONS

Transform Approach to Solution of Groundwater Flow Equations,
W76-08922 2F

EROSION

Flood Plain Information: Dry Creek and Tributaries, Roseville, California.
W76-08814 4A

Vegetation and Landslides, (In French),
W76-09101 4C

EROSION CONTROL
Soil and Water Conservation with Western Iowa Tillage Systems,
W76-08805 4D

Modern State of the Vegetation in the Donbas Small River Basins and its Antierosive and Water-Protective Role, (In Ukranian)
W76-09096 4C

Erosion for Corn Tillage Systems,
W76-09248 3F

ERTS
An Evaluation of ERTS Data for Oceanographic uses Through Great Lake Studies,
W76-09244 2H

ESTIMATED COSTS
Cost Estimation.
W76-09354 4B

ESTUARIES
Mercury Concentrations in Spring and Fall Zooplankton of the Estuary of the Arosa River, (In Spanish),
W76-08768 5C

Investigations on the Phytoplankton and Some Environmental Parameters of the Shattal-Arab (Iraq), (In German)
W76-09084 2L

Macroscopic Benthic Fauna of Three Tidal Creeks Adjoining the Rhode River, Maryland,
W76-09143 5B

Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi.
W76-09238 2L

Phase I: Area Description,
W76-09239 2L

Phase II: Hydrology,
W76-09240 2L

Phase III: Sedimentology,
W76-09241 2L

Phase IV: Biology,
W76-09242 2L

Finite Element Model for Cohesive Sediment Transport,
W76-09264 2L

Wilson Inlet: A Seasonally Closed Western Australian South Coast Estuary,
W76-09390 2L

ESTUARINE ENVIRONMENT
Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

EUTROPHICATION
Experiments on the Effects of Inorganic Enrichment of Rivers on Periphyton Primary Production,
W76-08787 5C

Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

Influence of Mineral Fertilization of Lakes on Fish Growth,
W76-08799 5C

Two Blooms of Gymnodinium Splendens (Lebour). A Large Naked Dinoflagellate,
W76-08937 5C

Phosphorous Flux Through Fishes,
W76-09104 5C

Changes in the Composition of the Plankton of the Rivers Rhine and Meuse in the Netherlands During the Last Fifty Five Years,
W76-09105 5C

Results of Phytoplankton Sampling at National Stream Quality Accounting Network Stations in Montana--1975 Water Year,
W76-09146 5A

Microbiological and Algological Survey of A Primary Stage of Eutrophication in a Stream, (In French),
W76-09399 5C

EVAPORATION
Intercontinental Comparison of Evaporation Estimates,
W76-08800 2D

Comparative Evaluation of Climatic Factors and Conditions at Fudhaliya Agro-Meteorological Station and Baghdad Airport Meteorological Station,
W76-09067 2B

Surface Residue, Water Application, and Soil Texture Effects on Water Accumulation,
W76-09258 2G

FALLOUT
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

FARM EQUIPMENT
Is Your Pump a Candidate for Inefficiency.,
W76-09352 3F

FARM MANAGEMENT
Soil and Water Conservation with Western Iowa Tillage Systems,
W76-08805 4D

Erosion for Corn Tillage Systems,
W76-09248 3F

Surface Residue, Water Application, and Soil Texture Effects on Water Accumulation,
W76-09258 2G

FARM WASTES
Ciliate Associations (Ciliata) in the Pradnik Stream, Which is Polluted by Residual Waters of a Dairy, (In French),
W76-08777 5C

FATHEAD MINNOWS
Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

FEASIBILITY STUDIES
Hydrologic Concepts of Artificially Recharging the Floridan Aquifer in Eastern Orange County, Florida--A Feasibility Study,
W76-09150 4B

FECAL PELLETS
Coccolith Sedimentation by Fecal Pellets: Laboratory Experiments and Field Observations,
W76-08954 5C

FECUNDITY
Effect of Constant and Varying Temperature on Egg Production of Lymnaea Obrussa Say (Mollusca: Gastropoda),
W76-09120 5C

FEDERAL GOVERNMENT
Water Resources Policy Issues - 1975.
W76-09230 6B

EPA Standards for Drinking Water become Effective in June, 1977.
W76-09356 5F

FEEDING RATES
Environmental and Intrinsic Control of Filtering and Feeding Rates in Arctic Daphnia,
W76-08933 5C

FEEDLOTS
Intact Manure Pack Halts Seepage,
W76-09344 5G

FERTILIZATION
Natural (15)N Abundance in Soil, Leaves, and Grain as Influenced by Long Term Additions of Fertilizer N at Several Rates,
W76-08765 3F

The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

Influence of Mineral Fertilization of Lakes on Fish Growth,
W76-08799 5C

Persistence of Fecal Coliform Indicator Bacteria on Alfalfa Irrigated with Municipal Sewage Lagoon Effluent,
W76-09217 5C

FERTILIZERS
Natural (15)N Abundance in Soil, Leaves, and Grain as Influenced by Long Term Additions of Fertilizer N at Several Rates,
W76-08765 3F

Effect of Soil-Moisture Regimes and N and P Fertilization on Berseem Grown for Fodder,
W76-08987 3F

FILTER PRESSES
Removal of Water from Sludges with Filter Presses (Schlammentwaesserung Mit Pressfiltern),
W76-08998 5D

Modern Filter Press Technology for Sewage Sludge Dewatering,
W76-09021 5D

FILTERS
An Experimental Investigation of Tertiary Treatment with a Submerged Filter (Sesshoku bakkiho ni yoru gesui sanjishori no jikkenteki kenkyu),
W76-08999 5D

Methods for Filtering Nitrified Effluents,
W76-09015 5D

Modern Filter Press Technology for Sewage Sludge Dewatering,
W76-09021 5D

Studies of High-Rate Biological Treatment of Ipswich Sewage on Pilot Filters using Plastics Media,
W76-09029 5D

Water Pollution Monitoring Using Matched Spatial Filters,
W76-09194 5A

Microflocculation--Comparative Experiments Between Single and Double Layer Filters with Iron and Aluminum Sulfate (Microflockung--Vergleichsversuche Zwischen ein-und

LIBRARY U. OF A. ARKANSAS-Fayetteville

Zweischicteiltern mit eisen-und Aluminum-sulfat),
W76-09206 5F

Continuous Filter for Dewatering Sludges (Filtre continu de deshydratation des boues),
W76-09279 5D

Filter Media Comparison at Prince George Pulp and Paper (Limited),
W76-09286 5D

FILTRATION
An Experimental Investigation of Tertiary Treatment with a Submerged Filter (Sesshoku bakkiho ni yoru gesui sanjishori no jikkenteki kenkyu),
W76-08999 5D

Studies of High-Rate Biological Treatment of Ipswich Sewage on Pilot Filters using Plastics Media,
W76-09029 5D

The Effect of Flocculants on Postcoagulation Sludge Dewatering (Wplyw flokulantow na odwadnialnosc osadow pokoagulacyjnych),
W76-09174 5D

Conditioning Improves Sludge Filterability,
W76-09181 5D

FINITE ELEMENT ANALYSIS
A Finite Element Model of Contaminant Movement in Groundwater,
W76-09253 5B

Finite Element Model for Cohesive Sediment Transport,
W76-09264 2L

FISH
Protection of Romanian Underground Water Fauna, (In Romanian),
W76-09085 2I

FISH DIETS
On the Histological Structure and Function of Digestive Organs of the Fed and Starved Larvae of the Yellowtail, Seriola Quinqueradiata, (In Japanese),
W76-09088 2I

Physiological Evaluation of the Nutritional Value of Artificial Fish Feeds, (In Russian),
W76-09090 2I

Effect of Food Concentration on Efficiency of its Assimilation by Planktonic Crustaceans with Different Feeding Mechanisms, (In Russian),
W76-09092 2I

FISH DISEASES
Ecology of an Annual Saprolegnia Sp. (Phycomycete) Outbreak in Wild Brown Trout,
W76-08786 5C

Infection of Broad-Clawed Crayfish with Branchiobdella and Control Measures Against them, (In Russian),
W76-09086 2H

FISH EGGS
Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

FISH FARMING
Acclimation of Rainbow Trout to Sea Water,
W76-09125 2L

FISH FOOD ORGANISMS
On the Histological Structure and Function of Digestive Organs of the Fed and Starved Larvae of the Yellowtail, Seriola Quinqueradiata, (In Japanese),
W76-09088 2I

Physiological Evaluation of the Nutritional Value of Artificial Fish Feeds, (In Russian),
W76-09090 2I

Effect of Food Concentration on Efficiency of its Assimilation by Planktonic Crustaceans with Different Feeding Mechanisms, (In Russian),
W76-09092 2I

FISH HATCHERIES
Formation of Fish Fauna of the Berdyansk Reservoir in the First Twelve Years of its Existence, (In Russian),
W76-09392 2H

FISH KILL
Selective Fish Mortality Resulting from Low Winter Oxygen,
W76-08788 5C

FISH MANAGEMENT
A Reservoir Cove Ecosystem Model,
W76-08830 5C

FISH PARASITES
Infection of Broad-Clawed Crayfish with Branchiobdella and Control Measures Against them, (In Russian),
W76-09086 2H

FISH PHYSIOLOGY
River Pollution by Anticholinesterase Agents,
W76-08782 5C

Physiological Effects of Sublethal Levels of Acid Water on Fish,
W76-08927 5C

Physiological Evaluation of the Nutritional Value of Artificial Fish Feeds, (In Russian),
W76-09090 2I

Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

FISH POPULATIONS
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

Self-Regulation of the Population and Biomass of Schools of Yearling Carp, (In Russian),
W76-08832 2I

FISH REPRODUCTION
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

FISH TOXICITY
Fish Toxicity of Dispersed Clay Drilling Mud Deflocculants,
W76-08896 5C

FISHKILL
On Spent Semichemical Pulping Liquors. (4) Xylan in Neutral Sulfite Semichemical Spent Liquor (In Japanese),
W76-09338 5C

FJORDS
Areal and Seasonal Variations in the Chemistry of Suspended Particulate Matter in a Deep Water Fjord,
W76-08829 2L

Trapping of Heat in Sill Fjords,
W76-08856 5C

FLAGELLATES
Laboratory Experiments to Determine the Limits of Tolerance of Flagellates to Some Abiotic Factors,
W76-09110 5C

FLAMELESS ATOMIC ABSORPTION
Some Comments on Interferences by CU(II) Ions and AG(I) Ions on the Wet Reduction-Flameless Atomic Absorption Determination of Mercury,
W76-09039 5A

FLIES
Problem of Blood-Sucking Flies in the Zones Affected by Big Water Reservoirs in the Ukrainian SSR, (In Russian),
W76-08991 5G

FLOATING POWERPLANTS
Geotechnical Aspects of Rock Borrow for Large Breakwaters,
W76-09386 5G

Evaluation of Offshore Breakwater Stability Under Wave Action,
W76-09387 5G

Effect of Offshore Structures on Shoreline Evolution, Atlantic Generating Station,
W76-09388 5G

FLOCCULATION
Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth,
W76-08842 5D

Sewage Treatment System,
W76-08992 5D

The Effect of Flocculants on Postcoagulation Sludge Dewatering (Wplyw flokulantow na odwadnialnosc osadow pokoagulacyjnych),
W76-09174 5D

The Nature of Activated Sludge Flocs,
W76-09188 5D

Microflocculation--Comparative Experiments Between Single and Double Layer Filters with Iron and Aluminum Sulfate (Microflockung--Vergleichsversuche Zwischen ein-und Zweischicteiltern mit eisen-und Aluminum-sulfat),
W76-09206 5F

Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

FLOOD CONTROL
Flood Plain Information: Sappa Creek, Oberlin, Kansas.
W76-08821 4A

Water Control Solves Tough Sewer Problem,
W76-08967 8B

FLOOD DAMAGE
Flood Plain Information: Maricopa County Arizona, Volume V, New River Report.
W76-08809 4A

Special Flood Hazard Information: Mill Creek-Gekeler Slough, La Grande, Oregon.
W76-08811 4A

Flood Plain Information: Sappa Creek, Oberlin, Kansas.
W76-08821 4A

LOOD DATA
Flood Plain Information: Cow Creek, Palo Cedro, California.
W76-08817 4A

LOOD FORECASTING
Flood Plain Information: Maricopa County, Arizona, Volume I, Indian Bend Wash Report.
W76-08806 4A

Flood Plain Information: Maricopa County, Arizona, Volume II, Cave Creek Report,
W76-08807 4A

Flood Plain Information: Maricopa County Arizona, Volume V, New River Report.
W76-08809 4A

Flood Plain Information: Dry Creek and Tributaries, Roseville, California.
W76-08814 4A

Flood Plain Information: Guadalupe River, Santa Clara County, California.
W76-08815 4A

Flood Plain Information: St. Charles County, Missouri, Part 2, Peruque Creek.
W76-08819 4A

Flood Plain Information: Middle River Rouge, Northville, Michigan.
W76-08820 4A

Flood Plain Information: Arkansas River, Derby-Mulvane, Kansas.
W76-08822 4A

LOOD FREQUENCY
Flood Plain Information: Maricopa County, Arizona, Volume I, Indian Bend Wash Report.
W76-08806 4A

Flood Plain Information: Maricopa County Arizona, Volume V, New River Report.
W76-08809 4A

Flood Plain Information: Kings River, Sanger, California.
W76-08813 4A

Flood Plain Information: Umatilla River Tributaries, Mckay, Tutuilla and Wildhorse Creeks, Pendleton, Oregon and Vicinity.
W76-08816 4A

LOOD PEAK
Flood Plain Information: Northeast Stream Group, Stockton, California.
W76-08810 4A

LOOD PLAINS
Flood Plain Information: Maricopa County, Arizona, Volume I, Indian Bend Wash Report.
W76-08806 4A

Flood Plain Information: Maricopa County, Arizona, Volume II, Cave Creek Report,
W76-08807 4A

Flood Plain Information: Maricopa County, Arizona, Volume IV, Wickenburg Report.
W76-08808 4A

Flood Plain Information: Maricopa County Arizona, Volume V, New River Report.
W76-08809 4A

Flood Plain Information: Northeast Stream Group, Stockton, California.
W76-08810 4A

Special Flood Hazard Information: Mill Creek-Gekeler Slough, La Grande, Oregon.
W76-08811 4A

Flood Plain Information: Rush Creek-Petaluma River to U. S. Highway 101, Marin County, California.
W76-08812 4A

Flood Plain Information: Kings River, Sanger, California.
W76-08813 4A

Flood Plain Information: Dry Creek and Tributaries, Roseville, California.
W76-08814 4A

Flood Plain Information: Guadalupe River, Santa Clara County, California.
W76-08815 4A

Flood Plain Information: Cow Creek, Palo Cedro, California.
W76-08817 4A

Flood Plain Information: Dardenne and Belleau Creeks, St. Charles County, Missouri.
W76-08818 4A

Flood Plain Information: St. Charles County, Missouri, Part 2, Peruque Creek.
W76-08819 4A

Flood Plain Information: Middle River Rouge, Northville, Michigan.
W76-08820 4A

Flood Plain Information: Sappa Creek, Oberlin, Kansas.
W76-08821 4A

FLOOD PROFILES
Flood Plain Information: Maricopa County, Arizona, Volume II, Cave Creek Report,
W76-08807 4A

Flood Plain Information: Maricopa County, Arizona, Volume IV, Wickenburg Report.
W76-08808 4A

Flood Plain Information: Northeast Stream Group, Stockton, California.
W76-08810 4A

Flood Plain Information: Rush Creek-Petaluma River to U. S. Highway 101, Marin County, California.
W76-08812 4A

Flood Plain Information: Kings River, Sanger, California.
W76-08813 4A

Flood Plain Information: Dry Creek and Tributaries, Roseville, California.
W76-08814 4A

Flood Plain Information: Guadalupe River, Santa Clara County, California.
W76-08815 4A

Flood Plain Information: Umatilla River Tributaries, Mckay, Tutuilla and Wildhorse Creeks, Pendleton, Oregon and Vicinity.
W76-08816 4A

Flood Plain Information: Cow Creek, Palo Cedro, California.
W76-08817 4A

Flood Plain Information: Dardenne and Belleau Creeks, St. Charles County, Missouri.
W76-08818 4A

Flood Plain Information: St. Charles County, Missouri, Part 2, Peruque Creek.
W76-08819 4A

Flood Plain Information: Middle River Rouge, Northville, Michigan.
W76-08820 4A

Flood Plain Information: Sappa Creek, Oberlin, Kansas.
W76-08821 4A

Flood Plain Information: Arkansas River, Derby-Mulvane, Kansas.
W76-08822 4A

FLOOD PROTECTION
A Critical Study of Flood Protection Planning in the Susquehanna River Basin: 1936-1972,
W76-08846 6F

FLOOD STAGE
Flood Plain Information: Dry Creek and Tributaries, Roseville, California.
W76-08814 4A

FLOOD STAGES
Flood Plain Information: Maricopa County Arizona, Volume V, New River Report.
W76-08809 4A

Flood Plain Information: Umatilla River Tributaries, Mckay, Tutuilla and Wildhorse Creeks, Pendleton, Oregon and Vicinity.
W76-08816 4A

Flood Plain Information: Arkansas River, Derby-Mulvane, Kansas.
W76-08822 4A

FLOODING
Flood Plain Information: Rush Creek-Petaluma River to U. S. Highway 101, Marin County, California.
W76-08812 4A

Effects of Initial Flooding on Forest Vegetation at Two Oklahoma Lakes,
W76-08831 4A

FLOODS
Special Flood Hazard Information: Mill Creek-Gekeler Slough, La Grande, Oregon.
W76-08811 4A

Flood Plain Information: Rush Creek-Petaluma River to U. S. Highway 101, Marin County, California.
W76-08812 4A

Flood Plain Information: Dardenne and Belleau Creeks, St. Charles County, Missouri.
W76-08818 4A

Flood Plain Information: St. Charles County, Missouri, Part 2, Peruque Creek.
W76-08819 4A

FLOODWAYS
Flood Plain Information: Maricopa County, Arizona, Volume I, Indian Bend Wash Report.
W76-08806 4A

Flood Plain Information: Maricopa County, Arizona, Volume II, Cave Creek Report,
W76-08807 4A

LIBRARY U. OF A. ARIZONA-STATE ...

Flood Plain Information: Maricopa County, Arizona, Volume IV, Wickenburg Report.
W76-08808 4A

Flood Plain Information: Kings River, Sanger, California.
W76-08813 4A

Flood Plain Information: Guadalupe River, Santa Clara County, California.
W76-08815 4A

FLORIDA
Hydrologic Environmental Effects of Sprayed Sewage Effluent, Tallahassee, Florida,
W76-09134 5B

Summary of Hydrologic Data Collected During 1974 in Dade County Florida,
W76-09135 7C

Water Resources of Walton County, Florida,
W76-09149 4A

Hydrologic Concepts of Artificially Recharging the Floridan Aquifer in Eastern Orange County, Florida--A Feasibility Study,
W76-09150 4B

FLORIDAN AQUIFER (FLA)
Hydrologic Concepts of Artificially Recharging the Floridan Aquifer in Eastern Orange County, Florida--A Feasibility Study,
W76-09150 4B

FLOW
Wind-Driven Flow of Water Influenced by a Canopy,
W76-08801 2H

Giant Mole to Dig Sanitary District Tunnels,
W76-08963 5D

FLOW DURATION
Flood Plain Information: Cow Creek, Palo Cedro, California.
W76-08817 4A

FLOW RATES
A Technique for Estimating the Time of Travel of Water in Indiana Streams,
W76-09138 4A

Discharge Data at Water-Quality Monitoring Stations in Arkansas,
W76-09145 7C

FLOW RESISTANCE
A Theory of Flow Resistance for Vegetated Channels,
W76-09252 4A

FLOW VELOCITIES
Flow Velocity as a Rate Determining Factor for Self-Purification in Rivers (Uber Den Einfluss der Stromungsgeschwindigkeit auf die Selbstreinigung in Fliessgewaessern),
W76-09204 5F

FLUCTUATIONS
Biomass Parameters and Primary Production at a Nearshore and a Midlake Station of Lake Ontario During IFYGL,
W76-08825 5C

FLY ASH
Sewage Treatment with Activated Fly-Ash and Regenerated Alum Sludge,
W76-09183 5D

FOAM FRACTIONATION
Chemical Characteristics, Acute Toxicity and Detoxification of Foam in Two Aerated Lagoons,
W76-09295 5C

FOAM SEPARATION
Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W76-09292 5D

FODDER
Effect of Soil-Moisture Regimes and N and P Fertilization on Berseem Grown for Fodder,
W76-08987 3F

FOG
Fog Formation and Fog Elimination,
W76-08854 5G

FOOD CHAINS
Mercury Content of Biota in Coastal Waters in Hawaii,
W76-08776 5C

Influence of Mineral Fertilization of Lakes on Fish Growth,
W76-08799 5C

Notes on the Importance of Dissolved and Particulate Organic Matter in Marine Food Chains, (In Spanish),
W76-08916 5C

Research on the Marine Food Chain.
W76-08935 5C

Two Blooms of Gymnodinium Splendens (Lebour). A Large Naked Dinoflagellate,
W76-08937 5C

Primary Production and the Factors Controlling Phytoplankton Growth in the Antarctic Seas,
W76-08942 5C

Assay of Nitrate Reductase from Plasmolyzed Marine Phytoplankton,
W76-08943 5C

FOOD HABITS
Influence of Mineral Fertilization of Lakes on Fish Growth,
W76-08799 5C

FOOD WEBS
Insecticide Residues in Two Turtle Species Following Treatment with DDT,
W76-08778 5C

Research on the Marine Food Chain.
W76-08935 5C

FORAGE
Meadow Vegetation and Forage Resources of the Ural River Floodplain, (In Russian)
W76-09098 4A

FORECASTING
Field Evaluation of a Predictive Model for Thermal Stratification in Lakes and Reservoirs,
W76-08920 2H

A Technique for Estimating the Time of Travel of Water in Indiana Streams,
W76-09138 4A

FOREST MANAGEMENT
Zonation of Snow Conditions in Forest-Tundra, Hudson Bay, New Quebec, (In French),
W76-08759 2C

FOREST SOILS
Sewage Effluent Infiltrates Frozen Forest Soil,
W76-09288 5B

FOREST WATERSHEDS
Fish Habitat in Forest Lands,
W76-09233 8I

FOSSIL FUELS
Offshore Petroleum Drilling and Production,
W76-09332 5G

Environmental Studies for Major Offshore Developments,
W76-09336 5G

The Offshore Ecology Investigation,
W76-09382 5G

FOULING
Development of a Water Quality Instrumentation Package for Long-Term Operation from Buoys and Other Unattended Marine Platforms,
W76-09372 5G

FRANCE
Hyperhaline Environments of the Complex of Bages-Sigean, the Lagoon of the Doul, (In French),
W76-08784 2L

Studies Carried out in France on the Ecological Consequences of Open-Circuit Cooling in Thermal Power Stations, (Etudes Realisees en France sur Les Consequences Ecologiques de la Refrigeration des Centrales Thermiques en Circuit Ouvert),
W76-08875 5C

A Study of the Infralittoral Population of the Coast of Roussillon: III. Spatial and Seasonal Variations, (In French),
W76-08898 2L

Papeteries De L'AA -- Suspended Solids Reduced by 98%, Organic Materials by 74% (Papeteries de l'Aa -- mes reduites de 98%, et MO de 74%),
W76-09341 5D

FRANCE (GARONNE-ARIEGE RIVERS)
Vegetation and Landslides, (In French),
W76-09101 4C

FRANCE (LAKE PORT-BIELH)
The Sediments of High Mountain Lake: Structure: Nature and Populations, (In French),
W76-09347 2L

FREEZING PRESSURES
Solutions for Some Problems Resulting from Refreezing of Permafrost Around a Wellbore,
W76-08892 8C

FRESHWATER
Chemical Analyses of Campbell Island Fresh Water,
W76-09395 2K

FRESHWATER FISH
Selective Fish Mortality Resulting from Low Winter Oxygen,
W76-08788 5C

FROST
Effect of Hardening on the State of Water in Seedlings of Winter Cultures, (In Russian),
W76-09095 2

FROZEN SOILS
Sewage Effluent Infiltrates Frozen Forest Soil,
W76-09288 5B

FUDHALIYA AGRO-METEOROLOGICAL STATION (IRAQ)
Comparative Evaluation of Yearly Climatic Factors with the Five Years Averages for Fudhaliya Agro-Meteorological Station,
W76-09066 2B

Comparative Evaluation of Climatic Factors and Conditions at Fudhaliya Agro-Meteorological Station and Baghdad Airport Meteorological Station,
W76-09067 2B

FUELS
Historic Heat curve of Recovery Operations,
W76-09303 5E

GAGING STATIONS
Discharge Data at Water-Quality Monitoring Stations in Arkansas,
W76-09145 7C

GAMMA RAYS
Development of a Mathematical Model of Infiltration which Includes the Effects of Raindrop Impact,
W76-08844 2G

Apparatus for Treatment of Water, Particularly Waste Water,
W76-08985 5D

Sludge Sterilization by Gamma Rays (La Sterilizzazione Dei Fanghi Con Raggi Gamma),
W76-09004 5D

GAMMARUS
Environmental Changes in a Portion of Lake Ontario Following Pollution Abatement,
W76-09119 5C

GAS CHROMATOGRAPHY
Standardization of Methods for the Determination of Traces of Some Volatile Chlorinated Aliphatic Hydrocarbons in Air and Water by Gas Chromatography,
W76-09287 5A

GASTROPODS
Influence of Heat from the Gentilly Nuclear Power Station on Water Temperature and Gastropoda, (Influence De L'Apport Thermique Originaire de la Centrale Nucleaire Gentilly Sur La Temperature De L'eau Et Sur Les Gasteropodes),
W76-08874 5C

Effect of Constant and Varying Temperature on Egg Production of Lymnaea Obrussa Say (Mollusca: Gastropoda),
W76-09120 5C

GEOCHEMISTRY
Contents of Eleven Trace Elements in Ureilite Achondrites,
W76-09041 5A

GEOHYDROLOGIC UNITS
Hydrogeological Conditions of Al-Hamad Area, Iraq,
W76-09068 2F

GEOLOGIC FORMATIONS
Fundamental Geologic Principles,
W76-09362 7C

GEOMORPHOLOGY
Trapping of Heat in Sill Fjords,
W76-08856 5C

GEORGIA
Report on the Hydrologic and Sedimentologic Study of the Offshore Spoil Disposal Area, Savannah, Georgia,
W76-09309 5E

GEOTHERMAL ENERGY
Hydrological Problems Associated with Developing Geothermal Energy Systems,
W76-09260 4B

GEOTHERMAL STUDIES
Predicting the Ecological Consequences of Thermal Pollution from Observations on Geothermal Habitats,
W76-08883 5C

Hydrological Problems Associated with Developing Geothermal Energy Systems,
W76-09260 4B

GLACIAL DRIFT
The Availability of Ground Water for Irrigation in the Rice Lake-Eau Claire Area, Wisconsin,
W76-09348 4B

GLYCEROPHOSPHATIDE
Glycerophosphatide Content and Composition of Trout (Salvelinus Fontinalis M.) Brain,
W76-08929 5C

GOLDFISH
A Continuous Flow Bioassay Method to Evaluate the Effects of Outboard Motor Exhausts and Selected Aromatic Toxicants on Fish,
W76-08780 5C

GONIUM MULTICOCCUM
Observations of Colonial Multiplication in a Rapidly Growing Alga, Gonium Multicoccum Pocock (Volvocaceae),
W76-08826 5C

GRASSES
Salt Tolerance and Suitability of Various Grasses for Saline Roadsides,
W76-08764 3C

A Salt Marsh Microcosm: An Experimental Unit for Marine Pollution Studies,
W76-09318 5C

GRAVITY SEPARATION
Gravity Separation of Coarse Solids in Wastewater,
W76-09028 5D

GREAT LAKES
Thermal Discharge Studies on the Great Lakes-the Canadian Experience,
W76-08869 5G

An Evaluation of ERTS Data for Oceanographic uses Through Great Lake Studies,
W76-09244 2H

Temperature, Oxygen, and Nutrient Distribution Patterns in Lake Erie, 1970,
W76-09262 5B

Oxygen Depletion in the Central and Eastern Basins of Lake Erie, 1970,
W76-09263 5C

GREAT PLAINS
Northern Great Plains Resource Program. Surface Resource Work Group--Regional Profile.
W76-09228 4C

Surface Residue, Water Application, and Soil Texture Effects on Water Accumulation,
W76-09258 2G

GREENBELT IRRIGATION
Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

GREENHOUSES
Growth, Water Consumption, and Salt Uptake of Tomato Plants in High Humidity- High Carbon Dioxide Greenhouse Environments,
W76-09075 3C

GROUND WATER CONTAMINATION
Ground Water Problems Associated with Well-Drilling Additives,
W76-08902 5B

GROUNDWATER
Ground Water Problems Associated with Well-Drilling Additives,
W76-08902 5B

Hydrologic Environmental Effects of Sprayed Sewage Effluent, Tallahassee, Florida,
W76-09134 5B

Summary of Hydrologic Data Collected During 1974 in Dade County Florida,
W76-09135 7C

Quality Assurance for Groundwater,
W76-09213 5G

Utilization of Wastewater Sludge for Agricultural Soil Enrichment,
W76-09219 5D

Hydrological Problems Associated with Developing Geothermal Energy Systems,
W76-09260 4B

Subsurface Brine Disposal - Be Reasonable,
W76-09261 5B

The Availability of Ground Water for Irrigation in the Rice Lake-Eau Claire Area, Wisconsin,
W76-09348 4B

Application of Ground-Water Flow Theory to a Subsurface Oil Spill,
W76-09350 2L

Making the World Safe for Ground Water,
W76-09360 5B

GROUNDWATER BASINS
The Effects of Ground-Water Development on the Water Supply in the Post Headquarters Area, White Sands Missile Range, New Mexico,
W76-09137 5B

GROUNDWATER CONTAMINANT BEHAVIOR
Mobility of Well-Drilling Additives in the Ground Water System,
W76-08904 5B

GROUNDWATER LEVELS
Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming,
W76-09349 5A

GROUNDWATER MANAGEMENT
The Role of Ground Water.
W76-09353 2F

GROUNDWATER MINING
The Effects of Ground-Water Development on the Water Supply in the Post Headquarters Area, White Sands Missile Range, New Mexico,
W76-09137 5B

LIBRARY U. OF A. UNIVERSITY, ...

GROUNDWATER MOVEMENT
Transform Approach to Solution of Groundwater Flow Equations,
W76-08922 2F

Ground-Water Levels and Chemical Quality of Ground Water in Lincoln, Montana,
W76-09132 7C

A Finite Element Model of Contaminant Movement in Groundwater,
W76-09253 5B

GROUNDWATER POLLUTION RESEARCH
Making the World Safe for Ground Water,
W76-09360 5B

GROUNDWATER RECHARGE
Hydrologic Concepts of Artificially Recharging the Floridan Aquifer in Eastern Orange County, Florida--A Feasibility Study,
W76-09150 4B

GROUNDWATER RESOURCES
Summary Appraisals of the Nation's Ground-Water Resources--California Region,
W76-09139 4B

Ground-Water Data for Sunflower County, Mississippi,
W76-09140 7C

Ground-Water Data for Carroll County, Mississippi,
W76-09141 7C

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74,
W76-09144 7C

Water Resources of Walton County, Florida,
W76-09149 4A

GROWTH RATES
The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

Growth and Survival of Young-of-the-Year Emerald Shiners (Notropis Atherinoides) at Different Temperatures,
W76-08779 5C

Influence of Mineral Fertilization of Lakes on Fish Growth,
W76-08799 5C

Observations of Colonial Multiplication in a Rapidly Growing Alga, Gonium Multicoccum Pocock (Volvocaceae),
W76-08826 5C

Primary Production and the Factors Controlling Phytoplankton Growth in the Antarctic Seas,
W76-08942 5C

GROWTH STAGES
Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

GUADALUPE RIVER (CALIF)
Flood Plain Information: Guadalupe River, Santa Clara County, California.
W76-08815 4A

GULF OF ALASKA
Evaluation of Seismicity and Earthquake Shaking at Offshore Sites,
W76-09379 5G

GULF OF CALIFORNIA
Silicic Acid Uptake and Incorporation by Natural Marine Phytoplankton Populations,
W76-08941 5C

Cruise Summary, B. Gulf of California Photobiology Cruise,
W76-08961 5C

Resilience of a Rocky Intertidal Fish Community in a Physically Unstable Environment,
W76-09126 5C

GULF OF FINLAND
Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

GULF OF MEXICO
Comparison of Two Methods for Determination of Primary Productivity on Coastal Waters of the Gulf of Mexico, (In Spanish),
W76-09391 5A

GYTTJA
The Formation and Detection of Metal Dispersion Halos in Organic Lake Sediments,
W76-09129 2J

HALIDES
Hyperhaline Environments of the Complex of Bages-Sigean, the Lagoon of the Doul, (In French),
W76-08784 2L

HANTUSH'S THEORY
Application of Ground-Water Flow Theory to a Subsurface Oil Spill,
W76-09350 2L

HARDANGERFJORDEN (NORWAY)
Areal and Seasonal Variations in the Chemistry of Suspended Particulate Matter in a Deep Water Fjord,
W76-08829 2L

HAWAII
Mercury Content of Biota in Coastal Waters in Hawaii,
W76-08776 5C

HEAT BALANCE
The Total Heat-Exchange Coefficient of Surface Waters,
W76-08867 5B

Two Methods of Measuring the Heat Dissipation of Discharged Cooling Water: A Phenomenological Approach,
W76-08868 5B

A Preliminary Water and Energy Budget Analysis of Montezuma Well, Arizona,
W76-09072 4B

HEAT-EXCHANGE COEFFICIENT
Two Methods of Measuring the Heat Dissipation of Discharged Cooling Water: A Phenomenological Approach,
W76-08868 5B

HEAT RECOVERY
Historic Heat curve of Recovery Operations,
W76-09303 5E

HEAT RESISTANCE
Laboratory Experiments to Determine the Limits of Tolerance of Flagellates to Some Abiotic Factors,
W76-09110 5C

HEAT TRANSFER
Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

Thermal Structure of Lake Mascardi (Province of Rio Negro, Argentina, (In Spanish),
W76-09358 2H

HEATED WATER
Growth and Survival of Young-of-the-Year Emerald Shiners (Notropis Atherinoides) at Different Temperatures,
W76-08779 5C

Laboratory and Field Tests of Temperature Tolerance on Gambusia A. Affinis, the Western Mosquitofish,
W76-08798 5C

Management of Waste Heat at Nuclear Power Stations, Its Possible Impact on the Environment, and Possibilities of its Economic Use,
W76-08849 5G

Trapping of Heat in Sill Fjords,
W76-08856 5C

HEAVY METAL
Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

HEAVY METALS
The Effects of Waste Water Diversion on Heavy Metal Levels in the Sediments of a Large Urban Lake,
W76-08754 5B

Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

Multi-Reaction Proton Activation Analysis for Traces of Molybdenum,
W76-09036 5A

The Effect of Lead on Mouse Brain Development,
W76-09038 5C

Some Comments on Interferences by CU(II) Ions and AG(I) Ions on the Wet Reduction-Flameless Atomic Absorption Determination of Mercury,
W76-09039 5A

Contents of Eleven Trace Elements in Ureilite Achondrites,
W76-09041 5A

Simultaneous Spectrophotometric Determination of Nickel and Cobalt in Mixtures with 3-Hydroxypicolinealdehyde Azine,
W76-09042 5A

Chemical Interference Effects in the Atomic Absorption Spectrometric Determination of Lead with Premixed Inert Gas (Entrained Air)-Hydrogen Flames.
W76-09043 5A

Measurement of Metal Toxicity by Biochemical Oxygen Demand,
W76-09127 5A

The Formation and Detection of Metal Dispersion Halos in Organic Lake Sediments,
W76-09129 2J

Utilization of Wastewater Sludge for Agricultural Soil Enrichment,
W76-09219 5D

Study on the Balance of Heavy Metals in Activated Sludge Treatment Process (Gesui shori shisetsu ni okeru jukinzokurui no shushi ni kansuru kenkyu),
W76-09222 5A

Heavy Metals in the Aquatic Environment.
W76-09272 5B

Agronomic and Cattle Studies with Municipal Liquid Digested Sludge,
W76-09367 5E

ELSINKI (FINLAND)
Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

EPATITIS
Hepatitis Attributed to Polluted Stream,
W76-09220 5C

ERBICIDES
The in Vitro Sensitivity of Some Species of Chlorophyceae to a Selected Range of Herbicides,
W76-08824 5C

Effects of Selected Herbicides on Bacterial Populations in Nontreated and Treated Water,
W76-09369 5C

IGH-RATE BIOLOGICAL FILTERS
Studies of High-Rate Biological Treatment of Ipswich Sewage on Pilot Filters using Plastics Media,
W76-09029 5D

ISTORIC FLOODS
Flood Plain Information: Kings River, Sanger, California.
W76-08813 4A

Flood Plain Information: Umatilla River Tributaries, Mckay, Tutuilla and Wildhorse Creeks, Pendleton, Oregon and Vicinity.
W76-08816 4A

Flood Plain Information: Arkansas River, Derby-Mulvane, Kansas.
W76-08822 4A

OLLOW-BORE AUGER
Water for the Ivory Coast.
W76-09355 8C

ONG KONG
Photographic Analysis of Water Quality Changes,
W76-09199 5A

UDSON BAY
Zonation of Snow Conditions in Forest-Tundra, Hudson Bay, New Quebec, (In French),
W76-08759 2C

UMAN DISEASES
Hepatitis Attributed to Polluted Stream,
W76-09220 5C

UMIDITY
Growth, Water Consumption, and Salt Uptake of Tomato Plants in High Humidity- High Carbon Dioxide Greenhouse Environments,
W76-09075 3C

Vegetational Strata in Perhumid and Perarid Regions of the Tropical Andes, (In German)
W76-09083 2I

HYDRATES
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

HYDRAULIC CONDUCTIVITY
Determination of the Hydraulic Conductivity - Drainable Porosity Ratio from Water Table Measurements,
W76-09249 2F

Determining the Hydraulic Conductivity of Soil Cores by Centrifugation,
W76-09256 2G

Variability of Hydraulic Conductivity in Two Subsurface Horizons of Two Silt Loam Soils,
W76-09257 2G

Determining Both Water Characteristics and Hydraulic Conductivity of a Soil Core at High Water Contents from a Transient Flow Experiment,
W76-09271 2G

Cathodic Protection Wells and Ground Water Pollution,
W76-09357 5G

HYDRAULIC ENGINEERING
Diffuser Design,
W76-09291 8A

HYDRAULIC JUMP
Pressure Fluctuations in Submerged Jump,
W76-09265 8B

HYDRAULIC PROPERTIES
Hydraulic Properties of a Porous Medium: Measurement and Empirical Representation,
W76-09255 2G

HYDROCOMP MODEL
Urban Runoff Modelling,
W76-09033 4A

HYDROGEN ION CONCENTRATION
The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

Reclamation of Acidified Lakes - Middle and Lohi, Sudbury, Ontario,
W76-09108 5G

Laboratory Experiments to Determine the Limits of Tolerance of Flagellates to Some Abiotic Factors,
W76-09110 5C

HYDROGEN SULFIDE
Destructive Air Deodorisation at a Dublin Sewage Works,
W76-09158 5D

HYDROGEOLOGY
Hydrogeological Conditions of Al-Hamad Area, Iraq,
W76-09068 2F

Subsurface Brine Disposal - Be Reasonable,
W76-09261 5B

HYDROLOGIC ASPECTS
Hydrological Problems Associated with Developing Geothermal Energy Systems,
W76-09260 4B

HYDROLOGIC BOUNDARIES
Hydrologic Unit Map--1974, State of Minnesota.
W76-09131 7C

HYDROLOGIC BUDGET
A Preliminary Water and Energy Budget Analysis of Montezuma Well, Arizona,
W76-09072 4B

HYDROLOGIC CYCLE
Intercontinental Comparison of Evaporation Estimates,
W76-08800 2D

The Role of Ground Water.
W76-09353 2F

HYDROLOGIC DATA
Summary of Hydrologic Data Collected During 1974 in Dade County Florida,
W76-09135 7C

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74,
W76-09144 7C

HYDROLOGIC EQUATION
The Role of Ground Water.
W76-09353 2F

HYDROLOGIC UNIT MAPS (MINN)
Hydrologic Unit Map--1974, State of Minnesota.
W76-09131 7C

HYDROLOGY
Hyperhaline Environments of the Complex of Bages-Sigean, the Lagoon of the Doul, (In French),
W76-08784 2L

Hydrologic Unit Map--1974, State of Minnesota.
W76-09131 7C

Phase II: Hydrology,
W76-09240 2L

HYSTERESIS
Hydraulic Properties of a Porous Medium: Measurement and Empirical Representation,
W76-09255 2G

ICED LAKES
Selective Fish Mortality Resulting from Low Winter Oxygen,
W76-08788 5C

IDAHO
Impact of Changes in Irrigation water Management in Eastern Idaho,
W76-08925 3F

IMPERATA
A Lake Population: The Intha of Lake Inle. (Southern Shan States, Burma), (In French),
W76-09361 2H

INCINERATION
Fluidized Furnace Construction for Burning Partly Dehydrated Sludge,
W76-08988 5E

Method and Apparatus for Treating a Continuous Flow of Fluid Waste Products and Other Materials,
W76-08993 5D

Historic Heat curve of Recovery Operations,
W76-09303 5E

INDIAN OCEAN
Vitamins in the South Polar Seas, I. Distribution and Significance of Dissolved and Particu-

LIBRARY U. OF I. URBANA-CHAMPAIGN

INDIAN OCEAN

late Vitamin B 12, Thiamine, and Biotin in the Southern Indian Ocean,
W76-08952 5C

INDIANA
A Technique for Estimating the Time of Travel of Water in Indiana Streams,
W76-09138 4A

INDICATORS
Indicators of Air and Water Quality are Tackled by CEQ for Consistency,
W76-08838 5A

Titration of Antimony (III) with Cerium (IV) Sulphate and Diphenylamine and its Derivatives as Reversible Indicators,
W76-09040 5A

INDUSTRIAL WASTES
River Pollution by Anticholinesterase Agents,
W76-08782 5C

The Significance of Isomery in Hygienic Standardization of Industrial Contaminations of Water Bodies, (In Russian),
W76-08864 5A

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09054 5D

Study of Algoflora of Contaminated Water Bodies, (In Ukranian),
W76-09093 5C

Problems Caused by Industrial Residual Waters Treated in Conjunction with Urban Waters (Problemas planteados por las aguas residuales industriales en su tratamiento conjunto con las aguas urbanas),
W76-09285 5D

Separation Processes Used for Pollution Control in the Pulp and Paper Industry,
W76-09340 5D

INDUSTRIAL WATER
Industrial Development Through Water-Resources Planning,
W76-09034 3E

INFILTRATION
Development of a Mathematical Model of Infiltration which Includes the Effects of Raindrop Impact,
W76-08844 2G

Vertical Flow of Air and Water with a Flux Boundary Condition,
W76-09251 2G

Determining the Hydraulic Conductivity of Soil Cores by Centrifugation,
W76-09256 2G

INHIBITORS
The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

INLAND WATERWAYS
User Charges for Inland Waterways: A Review of Issues in Policy and Economic Impact,
W76-08847 4A

INORGANIC COMPOUNDS
Specific Pollutants in Urban Waste Waters and the Efficiency of their Purification (Spetsificheskie zagryazneniya gorodskikh stochnykh vod i effektivnost' ikh ochistki),
W76-09002 5A

INSECT ATTRACTANTS
Acute Toxicity to Juvenile Rainbow Trout (Salmo Gairdneri) of Naturally Occurring Insect Juvenile Hormone Analogues,
W76-09282 5C

INSECTICIDES
Insecticide Residues in Two Turtle Species Following Treatment with DDT,
W76-08778 5C

INSECTS
Problem of Blood-Sucking Flies in the Zones Affected by Big Water Reservoirs in the Ukrainian SSR, (In Russian),
W76-08991 5G

INSTALLATION
Pennsylvania Sewer Placed in Crowded Ditch,
W76-08965 8F

Pipelaying 'Horse' Preassembles and helps Install Ocean Outfall,
W76-08970 8F

INSTRUMENTATION
A Comparison of Aerial Infra-Red and In-Situ Thermal Plume Measurement Techniques,
W76-08860 5A

Instrumentation and Control for Water Works (Suidosetsubi no keisoku to seigyo),
W76-09024 5F

Instrumentation for Analyzing TOD (Instrumentelle TSB-Analytik),
W76-09185 5A

Methods and Instruments for Monitoring Surface Water and Waste Water Quality (Verfahren und Geraete zur Ueberwachung der Oberflaechen- und Abwasserqualitaet),
W76-09192 5A

An Automatic Release Instrument with Underwater Buoy for Marking of Field Equipment,
W76-09268 7B

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II.
W76-09371 5G

Development of a Water Quality Instrumentakage for Long-Term Operation from Other Unattended Marine Platforms,
W76-09372 5G

INTAKES
Stepped Baffled Trash Rack for Drop Inlets,
W76-09250 8B

INTER-BASIN TRANSFERS
Water Diversion and the Moratorium,
W76-09234 4A

INTERCEPTION
Interception of Rainfall at Different Growth Stages by the Canopy of Tobacco Plants, (In Japanese),
W76-08986 3F

INTERCEPTOR SEWERS
Pennsylvania Sewer Placed in Crowded Ditch,
W76-08965 8F

INTERSTATE
Water Diversion and the Moratorium,
W76-09234 4A

INTERTIDAL AREAS
Resilience of a Rocky Intertidal Fish Community in a Physically Unstable Environment,
W76-09126 5C

IODINATION
Chlorination and Iodination of Poliovirus and F2,
W76-09196 5A

ION EXCHANGE
Improved Procedure for Ion Exchange Experiments with Soils Using Leaching Tubes, and Handling of Water Repellent Soils, (In German),
W76-08762 2G

Ammonia Removal by Use of Clinoptilolite,
W76-09180 5D

ION INTERFERENCES
Some Comments on Interferences by CU(II) Ions and AG(I) Ions on the Wet Reduction-Flameless Atomic Absorption Determination of Mercury,
W76-09039 5A

IOWA
Soil and Water Conservation with Western Iowa Tillage Systems,
W76-08805 4D

IRAQ (SHATT-AL-ARAB)
Investigations on the Phytoplankton and Some Environmental Parameters of the Shattal-Arab (Iraq), (In German)
W76-09084 2L

IRON
Phosphorus Removal from Waste Water,
W76-08975 5D

Titration of Antimony (III) with Cerium (IV) Sulphate and Diphenylamine and its Derivatives as Reversible Indicators,
W76-09040 5A

IRRADIATION
Apparatus for Treatment of Water, Particularly Waste Water,
W76-08985 5D

Sludge Sterilization by Gamma Rays (La Sterilizzazione Dei Fanghi Con Raggi Gamma),
W76-09004 5D

Disinfection of Urban Sewage Sludge (La Desinfection Des Bous Residuaires Urbaines),
W76-09007 5D

IRRIGATED LAND
Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

IRRIGATION
Soluble Salts and Nitrate Distribution in Irrigated Lettuce Beds,
W76-08763 3C

Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

Pressure and Flow Regulation Device,
W76-09049 3F

Method and Device for Attaching Shut-Off Control Valve to Distributing Water Pipe Such as Service Pipe Without Stopping Passage of Water Therethrough,
W76-09050 3F

Water and Food Production Demands,
W76-09237 6D

Sewage Effluent Infiltrates Frozen Forest Soil,
W76-09288 5B

RRIGATION EFFECTS
Soluble Salts and Nitrate Distribution in Irrigated Lettuce Beds,
W76-08763 3C

Power Factors and Electrical Demands of Center-Pivot Irrigation Machines,
W76-08770 3F

RRIGATION EFFICIENCY
Impact of Changes in Irrigation water Management in Eastern Idaho,
W76-08925 3F

Pressure and Flow Regulation Device,
W76-09049 3F

Water Conservation and Irrigated Agriculture,
W76-09236 3F

RRIGATION ENGINEERING
Is Your Pump a Candidate for Inefficiency.,
W76-09352 3F

RRIGATION OPERATION AND AINTENANCE
Method and Device for Attaching Shut-Off Control Valve to Distributing Water Pipe Such as Service Pipe Without Stopping Passage of Water Therethrough,
W76-09050 3F

RRIGATION PRACTICES
Pressure and Flow Regulation Device,
W76-09049 3F

RRIGATION PUMPS
Pumps.
W76-09351 8C

RRIGATION SYSTEMS
Pressure and Flow Regulation Device,
W76-09049 3F

Method and Device for Attaching Shut-Off Control Valve to Distributing Water Pipe Such as Service Pipe Without Stopping Passage of Water Therethrough,
W76-09050 3F

RRIGATION WATER
Agricultural Water Demands in North Carolina,
W76-08841 3F

The Availability of Ground Water for Irrigation in the Rice Lake-Eau Claire Area, Wisconsin,
W76-09348 4B

OPODS
Responses of Arctic Marine Crustaceans to Crude Oil and Oil-Tainted Food,
W76-09123 5C

ALY (PO RIVER)
The Po River at the Island of Serafini, (In Italian),
W76-09305 2E

PAN
Recent Trends of Process Control for Water Works and Drainage (Jogesuido purosesu seigyo no doko),
W76-09214 5G

TS
Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

JOINTS (CONNECTIONS)
Storm Sewer Pipe Joints Tight After Ten Years,
W76-08966 8G

Pipelaying 'Horse' Preassembles and helps Install Ocean Outfall,
W76-08970 8F

JUVENILE FISH
Acclimation of Rainbow Trout to Sea Water,
W76-09125 2L

K/F RATIO
Determination of the Hydraulic Conductivity - Drainable Porosity Ratio from Water Table Measurements,
W76-09249 2F

KANSAS
Flood Plain Information: Sappa Creek, Oberlin, Kansas.
W76-08821 4A

Flood Plain Information: Arkansas River, Derby-Mulvane, Kansas.
W76-08822 4A

KINETICS
Kinetics and Mechanisms of the Oxidative Degradation of Nitrilotriacetic Acid (NTA) in Aqueous Solutions,
W76-08843 5B

Microbiology and Activated Sludge,
W76-09172 5D

Flow Velocity as a Rate Determining Factor for Self-Purification in Rivers (Uber Den Einfluss der Stromungsgeschwindigkeit auf die Selbstreinigung in Fliessgewaessern),
W76-09204 5F

Kinetics and Control Tests of Nitrification-Denitrication Process, Part I: Kinetics,
W76-09365 5D

Kinetics and Control Tests of Nitrification-Denitrification Process, Part II: Respiration and Control Tests,
W76-09366 5D

KINGS RIVER (CALIF)
Flood Plain Information: Kings River, Sanger, California.
W76-08813 4A

KOHLER METHOD
Intercontinental Comparison of Evaporation Estimates,
W76-08800 2D

KRAFT MILLS
Economic Considerations in the Selection of a Biological Treatment System,
W76-09290 5D

Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W76-09292 5D

The Benthos of Pictou Harbor and Northumberland Strait, Canada -- A Measure of the Impact of Treated Kraft Pulp Mill Effluent,
W76-09294 5C

Chemical Characteristics, Acute Toxicity and Detoxification of Foam in Two Aerated Lagoons,
W76-09295 5C

Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon,
W76-09298 5D

Economics and Energy: Reducing Mill Energy Consumption and Effluent Volume,
W76-09299 5G

Effects of Color and Toxic Constituents of Bleached Kraft Mill Effluent on Algal Growth,
W76-09300 5C

LA GRANDE (OREGON)
Special Flood Hazard Information: Mill Creek-Gekeler Slough, La Grande, Oregon.
W76-08811 4A

LABORATORY ANIMALS
The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

LABORATORY METHODS
Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

LABORATORY TESTS
Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

A Continuous Flow Bioassay Method to Evaluate the Effects of Outboard Motor Exhausts and Selected Aromatic Toxicants on Fish,
W76-08780 5C

Laboratory and Field Tests of Temperature Tolerance on Gambusia A. Affinis, the Western Mosquitofish,
W76-08798 5C

Expedient Technique of Permanent Observations -- An Indispensable Tool on Studying the Limnology of Rivers,
W76-09106 7B

LACLOCHE MOUNTAINS (ONTARIO)
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

LAGOONS
Hyperhaline Environments of the Complex of Bages-Sigean, the Lagoon of the Doul, (In French),
W76-08784 2L

Environmental Conditions and Productivity in the Terminos Lagoon, Campeche, Mexico, (In Spanish),
W76-08900 2L

Water Plant Waste Treatment: State of the Art, Part II,
W76-09045 5D

LAKE BAIKAL (USSR)
Phenols -- Products of Lignin Degradation -- in Effluents of the Baikal Pulp and Paper Mill (Fenoli -- produkty razrusheniya lignina -- v stochnykh vodakh Baikal'-skogo tsellyuloznogo zavoda),
W76-09281 5A

LAKE BURLEY GRIFFIN (AUSTRALIA)
Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

LAKE CHAD
Mollusks of the Ceratophyllum Carpets of Lake Chad: Biomasses and Seasonal Variations of the Density, (In French).
W76-09094 2H

LIBRARY U. OF I. URBANA-CHAMPAIGN

LAKE ERIE
Zooplankton of Western Lake Erie at Put-in-Bay: A Quantitative Study, April 1973-March 1974,
W76-08833 5C

Changes in the Algal Flora of East Harbor, Ottawa County, Ohio, Since 1900,
W76-08834 5C

Nutrient-Primary Production Relationships in Central Lake Erie: A Simple Correlation Approach,
W76-08836 5C

Temperature, Oxygen, and Nutrient Distribution Patterns in Lake Erie, 1970,
W76-09262 5B

Oxygen Depletion in the Central and Eastern Basins of Lake Erie, 1970,
W76-09263 5C

LAKE ETANG DE BERRE (FRANCE)
Distribution, Circulation and Evolution of Nutrients, Particularly Inorganic Phosphorus in Lake Etang DeBerre: Influence of River Durance Waters, (In French),
W76-09393 5B

LAKE MASKINONGE (CANADA)
Effects of Heat Enrichment on Species Succession and Primary Production in Fresh-Water Plankton,
W76-08879 5C

LAKE MICHIGAN
Behavioural Responses of Lake Michigan Fishes to a Nuclear Power Plant Discharge,
W76-08876 5C

LAKE ONTARIO
Biomass Parameters and Primary Production at a Nearshore and a Midlake Station of Lake Ontario During IFYGL,
W76-08825 5C

Environmental Changes in a Portion of Lake Ontario Following Pollution Abatement,
W76-09119 5C

LAKE SEDIMENTS
The Effects of Waste Water Diversion on Heavy Metal Levels in the Sediments of a Large Urban Lake,
W76-08754 5B

Sediment Loading, its Effect on a southern Arizona Lake and the Emerging Spring Zooplankton Community,
W76-09073 2J

Phosphorous Flux Through Fishes,
W76-09104 5C

The Formation and Detection of Metal Dispersion Halos in Organic Lake Sediments,
W76-09129 2J

The Sediments of High Mountain Lake: Structure: Nature and Populations, (In French),
W76-09347 2J

LAKE TEXOMA (TEXAS-OKLA)
A Reservoir Cove Ecosystem Model,
W76-08830 5C

LAKE TROUT
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

LAKE WASHINGTON (WASH)
The Effects of Waste Water Diversion on Heavy Metal Levels in the Sediments of a Large Urban Lake,
W76-08754 5B

LAKE WINGRA (WIS)
Phosphorous Flux Through Fishes,
W76-09104 5C

LAKES
Field Evaluation of a Predictive Model for Thermal Stratification in Lakes and Reservoirs,
W76-08920 2H

Discharge of Treated Waste Water in Lakes (Die Einleitung Von Gereinigtem Abwasser in Seen),
W76-09216 5B

Limnoplankton of Some Inland Waters of Dacca City,
W76-09400 5C

LAMELLA SETTLING TANKS
Lamella Settling Tanks (Lamella-Absetzbecken),
W76-09003 5F

LAND APPLICATION
Persistence of Fecal Coliform Indicator Bacteria on Alfalfa Irrigated with Municipal Sewage Lagoon Effluent,
W76-09217 5C

Agronomic and Cattle Studies with Municipal Liquid Digested Sludge,
W76-09367 5E

LAND DEVELOPMENT
Implications of Zoning as An Urban Water Management Measure,
W76-08755 6F

Methods of Estimating Residential Land Use for Water Resources Management,
W76-08924 4C

The Sahel: Time for a New Approach,
W76-09070 4C

LAND RECLAMATION
A Guide to State Programs for the Reclamation of Surface Mined Areas,
W76-09142 5G

Northern Great Plains Resource Program. Surface Resource Work Group--Regional Profile.
W76-09228 4C

LAND RELAMATION
Leaching Losses of Ammonium and Nitrate in the Reclamation of Sand Spoils in Cornwall,
W76-08760 3C

LAND TREATMENT
Treating Sewage as a Resource Revives Interest in Land Disposal.
W76-09151 5E

LAND USE
Implications of Zoning as An Urban Water Management Measure,
W76-08755 6F

Flood Plain Information: Middle River Rouge, Northville, Michigan.
W76-08820 4A

Methods of Estimating Residential Land Use for Water Resources Management,
W76-08924 4C

LAND USE ZONING
Implications of Zoning as An Urban Water Management Measure,
W76-08755 6F

LANDSLIDES
Vegetation and Landslides, (In French),
W76-09101 4C

LARVAE
Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

LATE SOWING
Effect of Late Sowing on Morphogenetic Development of Panicle in Rice (Oryza Sativa L.),
W76-08758 3F

LEACHING
Leaching Losses of Ammonium and Nitrate in the Reclamation of Sand Spoils in Cornwall,
W76-08760 3C

LEAD
Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

The Effect of Lead on Mouse Brain Development,
W76-09038 5C

Chemical Interference Effects in the Atomic Absorption Spectrometric Determination of Lead with Premixed Inert Gas (Entrained Air)-Hydrogen Flames.
W76-09043 5A

Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

LEAD ATOMIC ABSORPTION
Chemical Interference Effects in the Atomic Absorption Spectrometric Determination of Lead with Premixed Inert Gas (Entrained Air)-Hydrogen Flames.
W76-09043 5A

LEAVES
Effect of the Water Regime on the Heat-Resistance of Leaf Cells of Heat-Hardened Tradescantia Fluminensis Vell. Plants, (In Russian),
W76-09102 2I

LEECHES
The Biology of the Leech Myzobdella Lugubris Infesting Blue Crabs and Catfish,
W76-08932 5C

LEGAL ASPECTS
Water Diversion and the Moratorium,
W76-09234 4A

LEGISLATION
Pollution From Non-Point Sources,
W76-09232 5B

LETHAL LIMIT
Growth and Survival of Young-of-the-Year Emerald Shiners (Notropis Atherinoides) at Different Temperatures,
W76-08779 5C

ETTUCE
Soluble Salts and Nitrate Distribution in Irrigated Lettuce Beds,
W76-08763 3C

EUCOTHRIX MUCOR
Leucothrix: Absence of Demonstrable Fixation of N2,
W76-08953 5C

IBERTY COUNTY (TEX)
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74,
W76-09144 7C

FE HISTORY STUDIES
The Replication of Biological Events in Enclosed Water Columns,
W76-09226 5C

GAND EXCHANGE PROCESS
Ligand Exchange Process for Removal of Ammonia,
W76-09056 5D

GHT
Effects of Thermal Circulation on Phytoplankton Photosynthesis,
W76-08785 5C

GHT INTENSITY
Feeding Behavior and Temperature and Light Tolerance of Mysis Relicta in the Laboratory,
W76-08931 5C

GNINS
Need for an Integral Approach to to the Problem of Quantitative Determination of Lignosulfonic Acids in Mill Effluents and Surface Waters (O potrzebie kompleksowego ujnowania problemu ilosciowego oznaczania twasow ligninosulfonowych w sciekach ocelulozowych i wodach powierzchniowych),
W76-09277 5A

Mechanism of Conversion of Lignin and its Derivatives in Natural Waters (Mekhanizm prevrashcheniya lignina i ego proizvodnykh v prirodnoj vode),
W76-09280 5B

Phenols -- Products of Lignin Degradation -- in Effluents of the Baikal Pulp and Paper Mill Fenoli -- produkty razrusheniya lignina -- v stochnykh vodakh Baikal'-skogo tsellyuloznogo zavoda),
W76-09281 5A

GNOSULFONATES
Thermal Degradation of Drilling Mud Additives,
W76-08901 8G

GNOSULFONIC ACIDS
Need for an Integral Approach to to the roblem of Quantitative Determination of ignosulfonic Acids in Mill Effluents and Surace Waters (O potrzebie kompleksowego ujnowania problemu ilosciowego oznaczania wasow ligninosulfonowych w sciekach ocelulozowych i wodach powierzchniowych),
/76-09277 5A

IE
ffects of Lime, Phosphate and Soil Conditoner on Growth and Fruit Quality of Netted Melon, (In Japanese),
/76-08989 3C

Disinfection of Urban Sewage Sludge (La Desinfection Des Bous Residuaires Urbaines),
W76-09007 5D

LIME SLUDGE RECALCINATION
Experimental Report for Regeneration of Activated Carbon and Recalcination of Lime Sludge (Kasseitan, sekkai-oden no saisei jikken hokoku),
W76-09223 5D

LIMITING FACTOR
Summer Phytoplankton Photosynthesis in a Northeastern Ohio Glacial Lake,
W76-08828 5C

LINCOLN (MONT)
Ground-Water Levels and Chemical Quality of Ground Water in Lincoln, Montana,
W76-09132 7C

LINEAR PROGRAMMING
Unit Hydrographs - A Comparative Study,
W76-09254 2E

A Rapid Method of Estimating Mean Areal Rainfall,
W76-09368 2B

LITERATURE REVIEWS
The Time Stability of Dissolved Mercury in Water Samples-I. Literature Review,
W76-08767 5A

LITHUANIAN SSR
Infection of Broad-Clawed Crayfish with Branchiobdella and Control Measures Against them, (In Russian),
W76-09086 2H

LOGGING (RECORDING)
Fundamental Geologic Principles,
W76-09362 7C

LONG ISLAND (NY)
Prediction of Meteorological Factors Related to Beach Erosion at New Jersey and Long Island, N.Y.,
W76-09270 2L

LOW FLOW
Low-Flow Characteristics and Mean Annual Discharge of North Branch Manitowoc River at Potter, Wisconsin,
W76-09147 7C

LOWER PROVO RIVER (UTAH)
Ecology of an Annual Saprolegnia Sp. (Phycomycete) Outbreak in Wild Brown Trout,
W76-08786 5C

LOXECHINUS-ALBUS
Periodicity in the Biometric Variations of Loxechinus Albus Molina, (In Spanish),
W76-09089 2I

LYMNAEA OBRUSSA
Effect of Constant and Varying Temperature on Egg Production of Lymnaea Obrussa Say (Mollusca: Gastropoda),
W76-09120 5C

LYSIMETERS
Conditions for Using a Tensionplate as a Lysimeter, (In German),
W76-09082 2G

MAD RIVER (CALIF)
Sediment Transport, Turbidity, Channel Configuration, and Possible Effects of Impoundment of the Mad River, Humboldt County, California,
W76-09136 2J

MADISON (WIS)
Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

MAGNESIUM CHLORIDE
Chemical Interference Effects in the Atomic Absorption Spectrometric Determination of Lead with Premixed Inert Gas (Entrained Air)-Hydrogen Flames.
W76-09043 5A

MANGANESE
Chemiluminescent Method of Determining Manganese in Natural Waters, (In Russian),
W76-09077 2K

MANGROVES
First Observations on the Forest of Cameroon on Sandy Coastal Cordons, (In French)
W76-09100 2I

MANHOLES
Fiberglass Fights SO3 Attack on Sewers,
W76-08964 8G

MANURE PACT
Intact Manure Pack Halts Seepage,
W76-09344 5G

MAPS
Hydrologic Unit Map--1974, State of Minnesota.
W76-09131 7C

Ground-Water Levels and Chemical Quality of Ground Water in Lincoln, Montana,
W76-09132 7C

MARAIS METHOD
Comparison of Warburg and Marais Methods of Determining Oxygen Uptake Rate Constants,
W76-09189 5A

MARICOPA COUNTY (AZ)
Flood Plain Information: Maricopa County, Arizona, Volume I, Indian Bend Wash Report.
W76-08806 4A

Flood Plain Information: Maricopa County, Arizona, Volume IV, Wickenburg Report.
W76-08808 4A

Flood Plain Information: Maricopa County Arizona, Volume V, New River Report.
W76-08809 4A

MARINE ALGAE
Algal Growth Potential of Six Norwegian Waters Receiving Primary, Secondary and Tertiary Sewage Effluents,
W76-08794 5C

Investigations on the Phytoplankton and Some Environmental Parameters of the Shattal-Arab (Iraq), (In German)
W76-09084 2L

The Replication of Biological Events in Enclosed Water Columns,
W76-09226 5C

MARINE BIOLOGY
The Replication of Biological Events in Enclosed Water Columns,
W76-08948 5C

MARINE FISH
Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

MARINE FISH

Field Evaluation of Benzopyrene Hydroxylase Induction as a Monitor for Marine Petroleum Pollution,
W76-09116 5A

MARINE HETEROTROPHS
Amino Acid Uptake and Respiration by Marine Heterotrophs,
W76-08955 5C

MARINE SEDIMENTS
Environmental Implications of Sediment Bulk Analysis Techniques for Trace Metals in Offshore Well-Drilling Operations,
W76-08908 5A

MARSH BIRDS
Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

MARSH PLANTS
The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

MARSHES
The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

Phase IV: Biology,
W76-09242 2L

MARYLAND
Macroscopic Benthic Fauna of Three Tidal Creeks Adjoining the Rhode River, Maryland,
W76-09143 5B

Unit Hydrographs - A Comparative Study,
W76-09254 2E

MASS TRANSPORT
Mass Transport and Dispersion Off a Tidal Inlet,
W76-09381 5G

MASSACHUSETTS
Models for Evaluation of Freshwater Wetlands,
W76-08921 4A

MASSACHUSETTS BAY
Environmental Site Assessment for a Massachusetts Bay Deepwater Oil Terminal,
W76-09380 5G

MATHEMATICAL MODELS
Development of a Mathematical Model of Infiltration which Includes the Effects of Raindrop Impact,
W76-08844 2G

Field Evaluation of a Predictive Model for Thermal Stratification in Lakes and Reservoirs,
W76-08920 2H

Quality Control in Sewage Treatment Plant (Gesuishorijo no shishutsu seigyo),
W76-09205 5D

Finite Element Model for Cohesive Sediment Transport,
W76-09264 2L

MATHEMATICAL STUDIES
The Total Heat-Exchange Coefficient of Surface Waters,
W76-08867 5B

MEADOWS
The Phragmitetea and Molinietalia Associations in the Thaya, March and Danube River Basins of Austria, (In German),
W76-09076 4A

MEAN AREAL RAINFALL
A Rapid Method of Estimating Mean Areal Rainfall,
W76-09368 2B

MEASUREMENT
The Relationship Between Heat Conductance and the Moisture Content of the Soil, (In Dutch),
W76-08769 2G

A Comparison of Aerial Infra-Red and In-Situ Thermal Plume Measurement Techniques,
W76-08860 5A

Comparative Evaluation of Climatic Factors and Conditions at Fudhaliya Agro-Meteorological Station and Baghdad Airport Meteorological Station,
W76-09067 2B

Energy Saving--An Important Consideration,
W76-09187 5A

Recommendation for the Evaluation of the Biological Degradability of Effluents of Varying Origin (Vorschlag zur Beurteilung der Biologischen Abbaubarkeit von Abwaessern Unterschiedlicher Herkunft),
W76-09198 5A

Design of Nationwide Water-Quality-Monitoring Networks,
W76-09209 5A

Analytical Chemistry in Water Pollution Control,
W76-09221 5A

MELONS
Effects of Lime, Phosphate and Soil Conditioner on Growth and Fruit Quality of Netted Melon, (In Japanese),
W76-08989 3C

MEMBRANES
Reverse Osmosis Separation of Polar Organic Compounds in Aqueous Solution,
W76-09165 5D

MERCURY
The Time Stability of Dissolved Mercury in Water Samples-I. Literature Review,
W76-08767 5A

Mercury Concentrations in Spring and Fall Zooplankton of the Estuary of the Arosa River, (In Spanish),
W76-08768 5C

Mercury Content of Biota in Coastal Waters in Hawaii,
W76-08776 5C

Treatment of Waste Water Containing Mercurials by Activated Sludge. I. Mechanism of Removal of Mercurials in waste Water (Kassei odei ni yoru suigin ganyu haisui no shori ni kansuru kenkyu. I Kassei odei no suigin jokyo kiko),
W76-09017 5D

Treatment of Waste Water Containing Mercurials by Activated Sludge. 2. Mercury Volatilization and the Capacity of Activated Sludge for Waste Water Containing Mercurials (Kasseiodei ni yoru suigin ganyu haisui no sho ni kansuru kenkyu. 2),
W76-09018 5D

Behavioral Impairment Produced by Exposur to Subclinical Amounts of Methylmercur Chloride,
W76-09037 5

Some Comments on Interferences by CU(I Ions and AG(I) Ions on the Wet Reductio Flameless Atomic Absorption Determination Mercury,
W76-09039 5

Mercury Uptake in Rooted Higher Aquat Plants; Laboratory Studies,
W76-09111 5

Possible Influence of Atmospheric Transpo on the Total Mercury Content of Southeaste Atlantic Continental Shelf Surface Waters,
W76-09224 5

Canadian Experience with the Reduction Mercury at Chlor-Alkali Plants,
W76-09273 5

MESOCYCLOPS
The Crustacean Plankton of an Acid Reservoi
W76-09109 5

MESOPHYLL CONDUCTIVITY
Effect of Air Humidity on Stomatal a Mesophyll Conductivity of Bean Leaves Two Soil Moisture Levels, (In Russian)
W76-09097

METABOLISM
Physiological Effects of Sublethal Levels Acid Water on Fish,
W76-08927 5

A Thermodynamic Model for Steady St Metabolism of Phytoplankton, Part I. Theory
W76-08944 5

METALS
Experiments on the Effects of Inorganic E richment of Rivers on Periphyton Prima Production,
W76-08787 5

Specific Pollutants in Urban Waste Waters a the Efficiency of their Purificatio (Spetsificheskie zagryazneniya gorodski stochnykh vod i effektivnost' ikh ochistki),
W76-09002 5

Effects of Copper on the Coral Reef Echino Echinometra Mathaei,
W76-09113 5

Measurement of Metal Toxicity by Biochemic Oxygen Demand,
W76-09127 5

METEOROLOGICAL DATA
Comparative Evaluation of Yearly Climat Factors with the Five Years Averages for Fu haliya Agro-Meteorological Station,
W76-09066 2

Comparative Evaluation of Climatic Facto and Conditions at Fudhaliya Agro-Meteorolo cal Station and Baghdad Airport Meteorologic Station,
W76-09067 2

METEOROLOGY
Cooling Tower Experience and the Meteorolo ical Consequences of Thermal Discharges fro

uclear Power Plants in the Federal Republic f Germany,
776-08855 5G

rediction of Meteorological Factors Related to each Erosion at New Jersey and Long Island, .Y.,
776-09270 2L

THANE
naerobic Digestion of Solid Waste and ewage Sludge into Methane,
76-09153 5D

THLMERCURY CHLORIDE
ehavioral Impairment Produced by Exposure Subclinical Amounts of Methylmercury hloride,
76-09037 5C

THODOLOGY
n the Criteria and Methodology Used for dioactive Discharges be Applied to Thermal scharges. (Les Criteres et La Methodologie tenus Pour les Rejets Radioactifs Sont-Ils ansposables Aux Rejets Thermiques.),
76-08887 5G

SE RIVER
anges in the Composition of the Plankton of e Rivers Rhine and Meuse in the Netherlands ring the Last Fifty Five Years,
76-09105 5C

ICO
vironmental Conditions and Productivity in e Terminos Lagoon, Campeche, Mexico, (In anish),
76-08900 2L

HIGAN
od Plain Information: Middle River Rouge, rthville, Michigan.
76-08820 4A

ROBIAL DEGRADATION
crobial Petroleum Degradation: The Role of dosporium Resinae,
76-09327 5C

ROBIOLOGY
crobiology and Activated Sludge,
76-09172 5D

crobiological and Algological Survey of A mary Stage of Eutrophication in a Stream, French),
6-09399 5C

ROCLIMATOLOGY
Preliminary Water and Energy Budget Anal- of Montezuma Well, Arizona,
6-09072 4B

OFLOCCULATION
roflocculation--Comparative Experiments ween Single and Double Layer Filters with and Aluminum Sulfate (Microflockung--gleichsversuche Zwischen ein-und eischicteiltern mit eisen-und Aluminum-at),
6-09206 5F

OORGANISMS
paratus for Treatment of Water, Particularly te Water,
6-08985 5D

robiology and Activated Sludge,
6-09172 5D

MIDDLE RIVER ROUGE (MI)
Flood Plain Information: Middle River Rouge, Northville, Michigan.
W76-08820 4A

MILITARY RESERVATIONS
The Effects of Ground-Water Development on the Water Supply in the Post Headquarters Area, White Sands Missile Range, New Mexico,
W76-09137 5B

MILL CREEK (CALIF)
Flood Plain Information: Kings River, Sanger, California.
W76-08813 4A

MINE DRAINAGE
The Crustacean Plankton of an Acid Reservoir,
W76-09109 5C

Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo Boreas),
W76-09115 5C

MINE WASTES
Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo Boreas),
W76-09115 5C

MINERAL INDUSTRY
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

MINERALOGY
Areal and Seasonal Variations in the Chemistry of Suspended Particulate Matter in a Deep Water Fjord,
W76-08829 2L

MINEROLOGY
Contents of Eleven Trace Elements in Ureilite Achondrites,
W76-09041 5A

MINING
Northern Great Plains Resource Program. Surface Resource Work Group--Regional Profile.
W76-09228 4C

MINNESOTA
Hydrologic Unit Map--1974, State of Minnesota.
W76-09131 7C

MINNOWS
Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

MISSISSIPPI
Ground-Water Data for Sunflower County, Mississippi,
W76-09140 7C

Ground-Water Data for Carroll County, Mississippi,
W76-09141 7C

Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi.
W76-09238 2L

Phase I: Area Description,
W76-09239 2L

Phase II: Hydrology,
W76-09240 2L

Phase III: Sedimentology,
W76-09241 2L

Phase IV: Biology,
W76-09242 2L

MISSISSIPPI SOUND
Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi.
W76-09238 2L

Phase I: Area Description,
W76-09239 2L

Phase II: Hydrology,
W76-09240 2L

Phase III: Sedimentology,
W76-09241 2L

MISSOURI
Flood Plain Information: Dardenne and Belleau Creeks, St. Charles County, Missouri.
W76-08818 4A

Flood Plain Information: St. Charles County, Missouri, Part 2, Peruque Creek.
W76-08819 4A

MISSOURI RIVER
River Pollution by Anticholinesterase Agents,
W76-08782 5C

MIXING
Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

MODEL STUDIES
A Simulation Model of Biophysiochemical Transformations of Nitrogen in tile-Drained Corn Belt Soil,
W76-08761 5B

Wind-Driven Flow of Water Influenced by a Canopy,
W76-08801 2H

A Two-Dimensional Hydrodynamic Model for Cooling-Tower Plumes,
W76-08851 5B

Combined Dry/Wet-Cooling Towers: Their Environmental Promise and Their Problems,
W76-08852 5B

Cooling Tower Experience and the Meteorological Consequences of Thermal Discharges from Nuclear Power Plants in the Federal Republic of Germany,
W76-08855 5G

Computations of the Temperature Response of Stratified Sill Fjords to Cooling-Water Discharges,
W76-08857 5B

Heat Discharges into the Sea at the Olkiluoto Site: Laboratory Model Test Results and Reasons for Selected Arrangements,
W76-08858 5B

Heating of Estuarine and Coastal Waters by Nuclear Power Stations in France, (Echauffement Des Eaux Par Des Centrales Nucleaires En Estuaire Et Bord De Mer En France),
W76-08859

LIBRARY U. OF A. UNIVERSITY CAMPUS

MODEL STUDIES

A Model for Salt Drift Deposition from Spray Ponds,
W76-08866 5B

Models for Evaluation of Freshwater Wetlands,
W76-08921 4A

Transform Approach to Solution of Groundwater Flow Equations,
W76-08922 2F

A Thermodynamic Model for Steady State Metabolism of Phytoplankton, Part I. Theory,
W76-08944 5C

A Thermodynamic Model for Steady State Metabolism of Phytoplankton, Part II. Light and Carbon Limited Growth,
W76-08945 5C

Urban Runoff Modelling,
W76-09033 4A

Mountainous Winter Precipitation: A Stochastic Event-Based Approach,
W76-09062 2B

Flow Velocity as a Rate Determining Factor for Self-Purification in Rivers (Uber Den Einfluss der Stromungsgeschwindigkeit auf die Selbstreinigung in Fliessgewaessern),
W76-09204 5F

Probability Models of Wastewater Treatment Plant Operation,
W76-09210 5D

Criteria for Selecting a Water Quality Model for 208 Planning,
W76-09212 5G

Simulation of Deep Seepage to a Water Table,
W76-09245 2F

Evaluation of a Monthly Water Yield Model,
W76-09246 2A

A Theory of Flow Resistance for Vegetated Channels,
W76-09252 4A

A Finite Element Model of Contaminant Movement in Groundwater,
W76-09253 5B

Oxygen Depletion in the Central and Eastern Basins of Lake Erie, 1970,
W76-09263 5C

MODEL STUDY

A Reservoir Cove Ecosystem Model,
W76-08830 5C

MOISTURE CONTENT

Effect of the Water Regime on the Heat-Resistance of Leaf Cells of Heat-Hardened Tradescantia Fluminensis Vell. Plants, (In Russian),
W76-09102 2I

MOISTURE METERS

Conditions for Using a Tensionplate as a Lysimeter, (In German),
W76-09082 2G

MOISTURE UPTAKE

Water Regime in Growing Points of Wheat Shoots, (In Russian),
W76-08757 2I

Growth, Water Consumption, and Salt Uptake of Tomato Plants in High Humidity- High Carbon Dioxide Greenhouse Environments,
W76-09075 3C

MOLINIETALIA

The Phragmitetea and Molinietalia Associations in the Thaya, March and Danube River Basins of Austria, (In German),
W76-09076 4A

MOLYBDENUM

Multi-Reaction Proton Activation Analysis for Traces of Molybdenum,
W76-09036 5A

MONITORING

Observation and Monitoring of Water Quality by use of Experimental Biological Methods,
W76-08793 5A

Expedient Technique of Permanent Observations -- An Indispensable Tool on Studying the Limnology of Rivers,
W76-09106 7B

Field Evaluation of Benzopyrene Hydroxylase Induction as a Monitor for Marine Petroleum Pollution,
W76-09116 5A

Circulatory Adaptations to the Oxygen Minimum Layer in the Bathypelagic Mysid Gnathophausia ingens,
W76-09128 5C

Methods and Instruments for Monitoring Surface Water and Waste Water Quality (Verfahren und Geraete zur Ueberwachung der Oberflaechen- und Abwasserqualitaet).
W76-09192 5A

Water Pollution Monitoring Using Matched Spatial Filters,
W76-09194 5A

Monitoring Dissolved-Oxygen Content to Assure Clean Wastewater,
W76-09202 5A

Design of Nationwide Water-Quality-Monitoring Networks,
W76-09209 5A

Recent Trends of Process Control for Water Works and Drainage (Jogesuido purosesu seigyo no doko),
W76-09214 5G

Analytical Chemistry in Water Pollution Control,
W76-09221 5A

Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming,
W76-09349 5A

MONITORING WELLS

Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming,
W76-09349 5A

MONTANA

Ground-Water Levels and Chemical Quality of Ground Water in Lincoln, Montana,
W76-09132 7C

Results of Phytoplankton Sampling at National Stream Quality Accounting Network Stations in Montana--1975 Water Year,
W76-09146 5A

MONTEZUMA WELL (ARIZ)

A Preliminary Water and Energy Budget Analysis of Montezuma Well, Arizona,
W76-09072 4B

MONTGOMERY COUNTY (TEX)

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74,
W76-09144 7C

MORTALITY

Growth and Survival of Young-of-the-Year Emerald Shiners (Notropis Atherinoides) at Different Temperatures,
W76-08779 5C

Ecology of an Annual Saprolegnia Sp. (Phycomycete) Outbreak in Wild Brown Trout,
W76-08786 5C

Selective Fish Mortality Resulting from Low Winter Oxygen,
W76-08788 5C

Phosphorous Flux Through Fishes,
W76-09104 5C

Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

Acclimation of Rainbow Trout to Sea Water,
W76-09125 2I

MOSCOW (USSR)

Ozonization of Water in Moscow (Ozonisatio De L'Eau a Moscou),
W76-08997 5I

MOSQUITO FISH

Laboratory and Field Tests of Temperatur Tolerance on Gambusia A. Affinis, the Weste Mosquitofish,
W76-08798 5

MOUNTAIN LAKES

The Sediments of High Mountain Lake: Struc ture: Nature and Populations, (In French),
W76-09347 2

MOUNTAINS

Mountainous Winter Precipitation: Stochastic Event-Based Approach,
W76-09062 2

MUD

The Effect of Polyacrylamide on the Settling Thames Mud,
W76-09243

MUNICIPAL WASTES

Reclamation and Use of Municipal Was Water (Toshi ni okeru seikatsu haisui no s riyo),
W76-09001 5

Problems Caused by Industrial Residual Wate Treated in Conjunction with Urban Wate (Problemas planteados por las aguas residual industriales en su tratamiento conjunto con l aguas urbanas),
W76-09285

MYSIDS

Circulatory Adaptations to the Oxyg Minimum Layer in the Bathypelagic My Gnathophausia ingens,
W76-09128

SIS RELICTA
eeding Behavior and Temperature and Light olerance of Mysis Relicta in the Laboratory, '76-08931 5C

ZOBDELLA LUGUBRIS
he Biology of the Leech Myzobdella Lugubris festing Blue Crabs and Catfish, '76-08932 5C

EGLERI FOWLERI
he Effect of Thermal Pollution on the Dis- ibution of Naegleri Fowleri, '76-08930 5C

AS-MARINA
ant Associations of Lake Mieliwo and the djacent Peat Bogs in the Brodnica District, n Polish), '76-09099 2H

IONAL STANDARDS
PA Standards for Drinking Water become Ef- ctive in June, 1977. '76-09356 5F

URAL FLOW
rout Population Responses to Streamflow uctuation and Habitat Management in Big oche-A-Cri Creek, Wisconsin, '76-08789 4A

URAL RESOURCES
orthern Great Plains Resource Program. Sur- ce Resource Work Group--Regional Profile. '76-09228 4C

URAL STREAMS
rout Population Responses to Streamflow uctuation and Habitat Management in Big oche-A-Cri Creek, Wisconsin, '76-08789 4A

udy to Define Changes in Pulp Mill Effluent- ontributed Color in Receiving Waters De- ctable by Human Observers, '76-09276 5C

KAR RIVER (GERMANY)
xpedient Technique of Permanent Observa- ns -- An Indispensable Tool on Studying the mnology of Rivers, '76-09106 7B

AL
bservations of Colonial Multiplication in a pidly Growing Alga, Gonium Multicoccum cock (Volvocaceae), '76-08826 5C

HERLANDS
anges in the Composition of the Plankton of e Rivers Rhine and Meuse in the Netherlands ring the Last Fifty Five Years, '76-09105 5C

WORKS
sign of Nationwide Water-Quality-Monitor- Networks, '76-09209 5A

alytical Chemistry in Water Pollution Con- l, '76-09221 5A

ROLOGICAL RETARDATION
e Effect of Lead on Mouse Brain Develop- nt, '76-09038 5C

NEVADA
The Effects of Increasing Salinity on the Pyramid Lake Fishery, W76-08753 5C

NEW JERSEY
Methods of Estimating Residential Land Use for Water Resources Management, W76-08924 4C

Prediction of Meteorological Factors Related to Beach Erosion at New Jersey and Long Island, N.Y., W76-09270 2L

NEW MEXICO
The Effects of a Synthetic Chili Waste on Biological Sewage Treatment Plant Operations, W76-08845 5D

The Effects of Ground-Water Development on the Water Supply in the Post Headquarters Area, White Sands Missile Range, New Mexico, W76-09137 5B

NEW YORK
Prediction of Meteorological Factors Related to Beach Erosion at New Jersey and Long Island, N.Y., W76-09270 2L

NEW ZEALAND
Chemical Analyses of Campbell Island Fresh Water, W76-09395 2K

NICKEL
Simultaneous Spectrophotometric Determination of Nickel and Cobalt in Mixtures with 3-Hydroxypicolinealdehyde Azine, W76-09042 5A

NIPHARGUS-SPP.
Protection of Romanian Underground Water Fauna, (In Romanian), W76-09085 2I

NITRATES
Leaching Losses of Ammonium and Nitrate in the Reclamation of Sand Spoils in Cornwall, W76-08760 3C

Soluble Salts and Nitrate Distribution in Irrigated Lettuce Beds, W76-08763 3C

Self-Purification of Small Freshwater Streams: Phosphate, Nitrate, and Ammonia Removal, W76-09398 5G

NITRIFICATION
Waste Water Purification, W76-08972 5D

Methods for Filtering Nitrified Effluents, W76-09015 5D

Advanced Waste Treatment Plant Features Nitrification, W76-09020 5D

Kinetics and Control Tests of Nitrification-Denitrication Process, Part I: Kinetics, W76-09365 5D

Kinetics and Control Tests of Nitrification-Denitrification Process, Part II: Respiration and Control Tests, W76-09366 5D

NITRILOTRIACETIC ACID
Kinetics and Mechanisms of the Oxidative Degradation of Nitrilotriacetic Acid (NTA) in Aqueous Solutions, W76-08843 5B

NITROGEN
A Simulation Model of Biophysiochemical Transformations of Nitrogen in tile-Drained Corn Belt Soil, W76-08761 5B

Natural (15)N Abundance in Soil, Leaves, and Grain as Influenced by Long Term Additions of Fertilizer N at Several Rates, W76-08765 3F

Experiments on the Effects of Inorganic Enrichment of Rivers on Periphyton Primary Production, W76-08787 5C

Algal Growth Potential of Six Norwegian Waters Receiving Primary, Secondary and Tertiary Sewage Effluents, W76-08794 5C

Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality, W76-09117 4C

Nutrient Mass Balance in Columns Representing Fill Systems for Disposal of Septic Tank Effluents, W76-09164 5E

Identification of Nitrogen as a Growth-Limiting Nutrient in Wastewaters and Coastal Marine Waters Through Continuous Culture Algal Assays, W76-09195 5A

Nitrogen and Phosphorus Levels in Soils Beneath Sewage Disposal Ponds, W76-09197 5A

Determination of Ammonia and Kjeldahl Nitrogen by Indophenol Method, W76-09201 5A

NITROGEN FIXATION
Leucothrix: Absence of Demonstrable Fixation of N2, W76-08953 5C

NOAA-2
An Evaluation of ERTS Data for Oceanographic uses Through Great Lake Studies, W76-09244 2H

NOMOGRAMS
Dimensioning of Underground Sewer Pipelines Made of Plastic Tubes (Raschet podzemnykh kanalizatsionnykh truboprovodov iz polimernykh trub), W76-08962 8B

NON-STRUCTURAL ALTERNATIVES
Flood Plain Information: Maricopa County, Arizona, Volume II, Cave Creek Report, W76-08807 4A

Flood Plain Information: Maricopa County Arizona, Volume V, New River Report. W76-08809 4A

NON-TILLAGE PRACTICES
No-Till Seeding of Irrigated Sorghum Double Cropped After Wheat, W76-08756 3F

LIBRARY U. OF I. URBANA-CHAMPAIGN

NORMAL EQUATIONS
Unit Hydrographs - A Comparative Study,
W76-09254 2E

NORTH BRANCH MANITOWOC RIVER (WISC)
Low-Flow Characteristics and Mean Annual Discharge of North Branch Manitowoc River at Potter, Wisconsin,
W76-09147 7C

NORTH CAROLINA
Agricultural Water Demands in North Carolina,
W76-08841 3F

NORTHUMBERLAND STRAIT (CANADA)
The Benthos of Pictou Harbor and Northumberland Strait, Canada -- A Measure of the Impact of Treated Kraft Pulp Mill Effluent,
W76-09294 5C

NORWAY
Observation and Monitoring of Water Quality by use of Experimental Biological Methods,
W76-08793 5A

Algal Growth Potential of Six Norwegian Waters Receiving Primary, Secondary and Tertiary Sewage Effluents,
W76-08794 5C

NUCLEAR POWERPLANTS
United Kingdom Experience of the Physical Behaviour of Heated Effluents in the Atmosphere and in Various Types of Aquatic Systems,
W76-08863 5B

Geotechnical Aspects of Rock Borrow for Large Breakwaters,
W76-09386 5G

Evaluation of Offshore Breakwater Stability Under Wave Action,
W76-09387 5G

Effect of Offshore Structures on Shoreline Evolution, Atlantic Generating Station,
W76-09388 5G

NUMERICAL ANALYSIS
On the Components of Time Series; The Removal of Spatial Dependence,
W76-08803 2B

Computations of the Temperature Response of Stratified Sill Fjords to Cooling-Water Discharges,
W76-08857 5B

NUTRIENT
Phosphorous Flux Through Fishes,
W76-09104 5C

NUTRIENT CYCLING
Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

NUTRIENT LOADING
Digestive Activities of Carp as a Major Contributor to the Nutrient Loading of Lakes,
W76-09103 5C

NUTRIENT REGENERATION
Nutrient Regeneration by Oceanic Zooplankton: A Comparison of Methods,
W76-08950 5C

NUTRIENT REMOVAL
Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth,
W76-08842 5D

Phosphorus Removal from Waste Water,
W76-08975 5D

Phosphorus Removal from Wastewater,
W76-08994 5D

Review of Advanced Treatment Techniques for Waste Water,
W76-09159 5D

Chemical Feed: It's A Way of Life at Windsor,
W76-09162 5D

Nutrient Mass Balance in Columns Representing Fill Systems for Disposal of Septic Tank Effluents,
W76-09164 5E

Two-Step Phosphate Removal from Solution Using Aluminum Salts,
W76-09182 5D

NUTRIENT REQUIREMENTS
Dynamics of Phosphorus Cycling in the Euphotic Waters of the Central North Pacific Ocean,
W76-08939 5C

Silicic Acid Uptake and Incorporation by Natural Marine Phytoplankton Populations,
W76-08941 5C

NUTRIENTS
Nutrient-Primary Production Relationships in Central Lake Erie: A Simple Correlation Approach,
W76-08836 5C

Nutrient Regeneration by Oceanic Zooplankton: A Comparison of Methods,
W76-08950 5C

Temperature, Oxygen, and Nutrient Distribution Patterns in Lake Erie, 1970,
W76-09262 5B

Distribution, Circulation and Evolution of Nutrients, Particularly Inorganic Phosphorus in Lake Etang DeBerre: Influence of River Durance Waters, (In French),
W76-09393 5B

OBSERVATION WELLS
Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming,
W76-09349 5A

OBSTRUCTION TO FLOW
Special Flood Hazard Information: Mill Creek-Gekeler Slough, La Grande, Oregon.
W76-08811 4A

OCEAN DUMPING
Ocean Dumping--A Rational Approach to an International Problem,
W76-09304 5G

New York Alternative Dumpsite Assessment - Reconnaissance Study of Surficial Sediments,
W76-09383 5G

OCHROMONAS
Laboratory Experiments to Determine the Limits of Tolerance of Flagellates to Some Abiotic Factors,
W76-09110 5C

OCHROMONAS SOCIABILIS
Laboratory Experiments to Determine the Limits of Tolerance of Flagellates to Some Abiotic Factors,
W76-09110 5C

ODOR
Municipal Wastewater Odor Still a Problem Part 2,
W76-09044 5

Destructive Air Deodorisation at a Dubl Sewage Works,
W76-09158 5

ODOR CONTROL
Municipal Wastewater Odor Still a Proble Part 2,
W76-09044 5

ODOR-PRODUCING ALGAE
Municipal Wastewater Odor Still a Proble Part 2,
W76-09044 5

OFFSHORE PLATFORMS
Potential Effects of Oil Drilling and Dumpi Activities on Marine Biota,
W76-08907 /5

Features of Various Offshore Structures,
W76-09311 8

Seventh Annual Offshore Technology Co ference, May 5-8, 1975, Houston, Tex Preprints, Volume II.
W76-09371 2

Development of a Water Quality Instrumen tion Package for Long-Term Operation fr Buoys and Other Unattended Marine Pl forms,
W76-09372 2

On the Risk Assessment of Offshore Str tures,
W76-09373 5

Seventh Annual Offshore Technology Co ference, May 5-8, 1975, Houston, Tex Preprints, Volume III.
W76-09374 6

Evaluation of Multi-Purpose Industrial-P Islands: Sea Island Structure Engineeri Research Study,
W76-09375 5

Offshore Multi-Use Port Islands and Their E vironment,
W76-09376 5

Evaluation of Seismicity and Earthquake Sh ing at Offshore Sites,
W76-09379 5

OFFSHORE POWERPLANTS
Evaluation of Offshore Breakwater Stabil Under Wave Action,
W76-09387 5

Effect of Offshore Structures on Shoreli Evolution, Atlantic Generating Station,
W76-09388 5

OFFSHORE SPOIL DISPOSAL
Report on the Hydrologic and Sedimentolo Study of the Offshore Spoil Disposal Ar Savannah, Georgia,
W76-09309 5

OFFSHORE STRUCTURES
Features of Various Offshore Structures,
W76-09311 5

OFFSHORE TECHNOLOGY
Wind and Current Effects on Large-Scale Slicks,
W76-09310 5

: Analysis of Oil Outflows Due to Tanker Ac-
lents,
76-09313 5B

ccurrence, Cause and Avoidance of the
illing of Oil by Tankers,
'6-09314 5B

port of the Conference on Marine Resources
the Coastal Plains States, December 11-12,
'5, Savannah, Georgia.
'6-09329 5G

: OCS Forgotten Land: Territorial Sea,
arshore, and Estuary,
6-09330 5G

: Role of Engineering in Minimizing
'shore Impacts,
6-09331 5G

'shore Petroleum Drilling and Production,
6-09332 5G

th Annual Offshore Technology Con-
ence, May 6-8, 1974, Houston, Texas.
prints, Volume II,
6-09333 5G

ter Pollution Aspects from Waste Drilling
d Disposal in Canada's Arctic,
6-09334 5G

ch-Offshore Dredging: Some Environmen-
Consequences,
6-09335 5G

ironmental Studies for Major Offshore
elopments,
6-09336 5G

enth Annual Offshore Technology Con-
nce, May 5-8, 1975, Houston, Texas.
prints, Volume II.
6-09371 5G

elopment of a Water Quality Instrumenta-
Package for Long-Term Operation from
ys and Other Unattended Marine Plat-
ns,
6-09372 5G

the Risk Assessment of Offshore Struc-
s,
-09373 5G

enth Annual Offshore Technology Con-
nce, May 5-8, 1975, Houston, Texas.
rints, Volume III.
-09374 5G

uation of Multi-Purpose Industrial-Port
ds: Sea Island Structure Engineering
arch Study,
-09375 5G

hore Multi-Use Port Islands and Their En-
ment,
-09376 5G

stry Candidates and General Locations for
icial Industrial-Port Islands,
09377 5G

ting Industrial Processes for Multi-Pur-
Industrial Port Islands,
09378 5G

uation of Seismicity and Earthquake Shak-
Offshore Sites,
09379 5G

Environmental Site Assessment for a Massachusetts Bay Deepwater Oil Terminal,
W76-09380 5G

The Offshore Ecology Investigation,
W76-09382 5G

Geotechnical Aspects of Rock Borrow for Large Breakwaters,
W76-09386 5G

Evaluation of Offshore Breakwater Stability Under Wave Action,
W76-09387 5G

Effect of Offshore Structures on Shoreline Evolution, Atlantic Generating Station,
W76-09388 5G

OHIO

Summer Phytoplankton Photosynthesis in a Northeastern Ohio Glacial Lake,
W76-08828 5C

Zooplankton of Western Lake Erie at Put-in-Bay: A Quantitative Study, April 1973-March 1974,
W76-08833 5C

Changes in the Algal Flora of East Harbor, Ottawa County, Ohio, Since 1900,
W76-08834 5C

OHLE'S METHOD

Improved Method for the Phosphate Determination in Waste Water (Verbesserte Methode Zur Phosphatbestimmung im Abwasser),
W76-09190 5A

OIL-BASE DRILLING FLUIDS

Handling and Treatment of Oil-Base Drilling Muds,
W76-08913 8G

OIL BASE MUDS

Drilling Fluid Principles and Operations,
W76-08893 8G

OIL POLLUTION

Apparatus and Process of Separating Packing House Waste,
W76-09046 5D

Environment Protective Oil Skimming and Removal Apparatus,
W76-09048 5G

Method for Clarifying Oily Water Mixtures,
W76-09057 5G

Field Evaluation of Benzopyrene Hydroxylase Induction as a Monitor for Marine Petroleum Pollution,
W76-09116 5A

Surface Effects Skimmer Developments,
W76-09308 5G

Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

An Analysis of Oil Outflows Due to Tanker Accidents,
W76-09313 5B

Occurrence, Cause and Avoidance of the Spilling of Oil by Tankers,
W76-09314 5B

Petroleum Residues in the Sargasso Sea and on Bermuda Beaches,
W76-09315 5C

Simulation of Movement of Oil Slicks in the Strait of Georgia using Simple Atmosphere and Ocean Dynamics,
W76-09316 5C

Toxicity and Avoidance Tests with Prudhoe Bay Oil and Pink Salmon Fry,
W76-09317 5C

A Salt Marsh Microcosm: An Experimental Unit for Marine Pollution Studies,
W76-09318 5C

Microbial Ecology of Petroleum Utilization in Chesapeake Bay,
W76-09319 5C

Effects of Seawater Extracts of Crude Oil on Carbon Budgets in Two Species of Mussels,
W76-09320 5C

The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

Biological Effects of Refinery Effluents,
W76-09322 5C

Respiratory Response of Juvenile Chinook Salmon and Striped Bass Exposed to Benzene, A Water-Soluble Component of Crude Oil,
W76-09323 5C

Interagency Investigations of a Persistent Oil Spill on the Washington Coast. Animal Population Studies, Hydrocarbon Uptake by Marine Organisms, and Algae Response Following the Grounding of the Troopship General M.C. Meigs,
W76-09324 5C

Effects of Water Soluble Extracts of Oil on Phytoplankton,
W76-09325 5C

Effect of a Bunker Fuel on the Beach Bacterial Flora,
W76-09326 5C

Microbial Petroleum Degradation: The Role of Cladosporium Resinae,
W76-09327 5C

The Fate of a Bunker Fuel in Beach Sand,
W76-09328 5C

Development of a Water Quality Instrumentation Package for Long-Term Operation from Buoys and Other Unattended Marine Platforms,
W76-09372 5G

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III.
W76-09374 5G

Evaluation of Multi-Purpose Industrial-Port Islands: Sea Island Structure Engineering Research Study,
W76-09375 5G

Offshore Multi-Use Port Islands and Their Environment,
W76-09376 5G

Evaluation of Seismicity and Earthquake Shaking at Offshore Sites,
W76-09379 5G

The Offshore Ecology Investigation,
W76-09382 5G

LIBRARY U. OF A. UNIVERSITY, ...

OIL POLLUTION

Hydrocarbons in Water and Sediment Samples from Coal Oil Point Area, Offshore California,
W76-09384 5B

Influx of Petroleum Hydrocarbons into the Ocean,
W76-09385 5G

Degradation of Bunker C Oil under Different Coastal Environments of Chedabucto Bay, Nova Scotia,
W76-09394 5B

OIL SLICKS

Surface Effects Skimmer Developments,
W76-09308 5G

OIL SPILLS

Potential Effects of Oil Drilling and Dumping Activities on Marine Biota,
W76-08907 5C

Environment Protective Oil Skimming and Removal Apparatus,
W76-09048 5G

Responses of Arctic Marine Crustaceans to Crude Oil and Oil-Tainted Food,
W76-09123 5C

Surface Effects Skimmer Developments,
W76-09308 5G

Wind and Current Effects on Large-Scale Oil Slicks,
W76-09310 5G

Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

An Analysis of Oil Outflows Due to Tanker Accidents,
W76-09313 5B

Occurrence, Cause and Avoidance of the Spilling of Oil by Tankers,
W76-09314 5B

Petroleum Residues in the Sargasso Sea and on Bermuda Beaches,
W76-09315 5C

Simulation of Movement of Oil Slicks in the Strait of Georgia using Simple Atmosphere and Ocean Dynamics,
W76-09316 5C

Toxicity and Avoidance Tests with Prudhoe Bay Oil and Pink Salmon Fry,
W76-09317 5C

A Salt Marsh Microcosm: An Experimental Unit for Marine Pollution Studies,
W76-09318 5C

Microbial Ecology of Petroleum Utilization in Chesapeake Bay,
W76-09319 5C

The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

Respiratory Response of Juvenile Chinook Salmon and Striped Bass Exposed to Benzene, A Water-Soluble Component of Crude Oil,
W76-09323 5C

Interagency Investigations of a Persistent Oil Spill on the Washington Coast. Animal Population Studies, Hydrocarbon Uptake by Marine Organisms, and Algae Response Following the Grounding of the Troopship General M.C. Meigs,
W76-09324 5C

The Fate of a Bunker Fuel in Beach Sand,
W76-09328 5C

Environmental Studies for Major Offshore Developments,
W76-09336 5G

Countermeasures to Control Oil Spills in Western Canada,
W76-09346 5G

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III.
W76-09374 5G

Evaluation of Multi-Purpose Industrial-Port Islands: Sea Island Structure Engineering Research Study,
W76-09375 5G

Influx of Petroleum Hydrocarbons into the Ocean,
W76-09385 5G

Degradation of Bunker C Oil under Different Coastal Environments of Chedabucto Bay, Nova Scotia,
W76-09394 5B

OIL STORAGE TANKS

Application of Ground-Water Flow Theory to a Subsurface Oil Spill,
W76-09350 2L

OIL WASTES

Regulation of Onshore and Offshore Oil Field Waste Disposal,
W76-08919 5E

Field Evaluation of Benzopyrene Hydroxylase Induction as a Monitor for Marine Petroleum Pollution,
W76-09116 5A

Responses of Arctic Marine Crustaceans to Crude Oil and Oil-Tainted Food,
W76-09123 5C

Photooxidation as a Factor in the Environmental Dispersal of Curde Oil,
W76-09389 5B

OIL-WATER INTERFACES

Countermeasures to Control Oil Spills in Western Canada,
W76-09346 5G

OIL WELLS

Environmental Aspects of Chemical Use in Well Drilling Operations.
W76-08889 5G

Techniques of Deep Well Drilling,
W76-08890 8D

Chemical Applications in Oil and Gas Well-Drilling and Completion Operations,
W76-08903 8G

Potential Effects of Oil Drilling and Dumping Activities on Marine Biota,
W76-08907 5C

OILY WATER

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09054 5D

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09055 5D

Method for Clarifying Oily Water Mixtures,
W76-09057 5G

OKLAHOMA

A Reservoir Cove Ecosystem Model,
W76-08830 5C

Effects of Initial Flooding on Forest Vegetation at Two Oklahoma Lakes,
W76-08831 4A

Subsurface Brine Disposal - Be Reasonable,
W76-09261 5B

OLIVER METHOD

Intercontinental Comparison of Evaporation Estimates,
W76-08800 2D

ON-SITE DATA COLLECTIONS

Expedient Technique of Permanent Observations -- An Indispensable Tool on Studying the Limnology of Rivers,
W76-09106 7B

ON-SITE INVESTIGATIONS

Effects of Thermal Circulation on Phytoplankton Photosynthesis,
W76-08785 5C

Cruise Summary, A. Southern California Bight Studies (SCBS).
W76-08960 5C

OPEN CHANNEL FLOW

Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

OPERATING COSTS

Cost Estimation.
W76-09354 4B

OPERATIONS

Probability Models of Wastewater Treatment Plant Operation,
W76-09210 5D

OREGON

Special Flood Hazard Information: Mill Creek Gekeler Slough, La Grande, Oregon.
W76-08811 4A

Flood Plain Information: Umatilla River Tributaries, Mckay, Tutuilla and Wildhorse Creek Pendleton, Oregon and Vicinity.
W76-08816 4A

ORGANIC COMPOUNDS

Waste-Water Purification,
W76-08979 5D

Method and Apparatus for Treating a Continuous Flow of Fluid Waste Products and Other Materials,
W76-08993 5D

Combination of Physical Chemical Processes for Waste Water Purification with Ozone Treatment (Kombination Physi-Kalisch-Chemischer Verfahren Der Abwasserreiningung Mit Ozon Behandlung).
W76-09156 5D

ORGANIC LOADING

Evaluating Rotating Biological Contactor Performance,
W76-09173 5D

ORGANIC MATTER
Surface Residue, Water Application, and Soil Texture Effects on Water Accumulation,
W76-09258 2G

Papeteries De L'AA -- Suspended Solids Reduced by 98%, Organic Materials by 74% (Papeteries de l'Aa -- mes reduites de 98%, et MO de 74%),
W76-09341 5D

ORGANIC WASTES
Specific Pollutants in Urban Waste Waters and the Efficiency of their Purification (Spetsificheskie zagryazneniya gorodskikh stochnykh vod i effektivnost' ikh ochistki),
W76-09002 5A

Apparatus and Process of Separating Packing House Waste,
W76-09046 5D

Reverse Osmosis Separation of Polar Organic Compounds in Aqueous Solution,
W76-09165 5D

ORGANOPHOSPHOROUS PESTICIDES
The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

River Pollution by Anticholinesterase Agents,
W76-08782 5C

Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

ORTHOPHOSPHATES
Digestive Activities of Carp as a Major Contributor to the Nutrient Loading of Lakes,
W76-09103 5C

OSMOTIC STRESS
Acclimation of Rainbow Trout to Sea Water,
W76-09125 2L

OUTBOARD MOTOR EXHAUST (OME)
A Continuous Flow Bioassay Method to Evaluate the Effects of Outboard Motor Exhausts and Selected Aromatic Toxicants on Fish,
W76-08780 5C

OUTER CONTINENENTAL SHELF
Offshore Petroleum Drilling and Production,
W76-09332 5G

OUTER CONTINENTAL SHELF
Ocean Dumping--A Rational Approach to an International Problem,
W76-09304 5G

Mineral Resource Management of the Outer Continental Shelf.
W76-09306 6G

Ecological Effects of Offshore Construction,
W76-09307 6G

Surface Effects Skimmer Developments,
W76-09308 5G

Wind and Current Effects on Large-Scale Oil Slicks,
W76-09310 5G

Features of Various Offshore Structures,
W76-09311 8A

Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

An Analysis of Oil Outflows Due to Tanker Accidents,
W76-09313 5B

Occurrence, Cause and Avoidance of the Spilling of Oil by Tankers,
W76-09314 5B

Petroleum Residues in the Sargasso Sea and on Bermuda Beaches,
W76-09315 5C

Simulation of Movement of Oil Slicks in the Strait of Georgia using Simple Atmosphere and Ocean Dynamics,
W76-09316 5C

Toxicity and Avoidance Tests with Prudhoe Bay Oil and Pink Salmon Fry,
W76-09317 5C

A Salt Marsh Microcosm: An Experimental Unit for Marine Pollution Studies,
W76-09318 5C

Microbial Ecology of Petroleum Utilization in Chesapeake Bay,
W76-09319 5C

Effects of Seawater Extracts of Crude Oil on Carbon Budgets in Two Species of Mussels,
W76-09320 5C

The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

Biological Effects of Refinery Effluents,
W76-09322 5C

Respiratory Response of Juvenile Chinook Salmon and Striped Bass Exposed to Benzene, A Water-Soluble Component of Crude Oil,
W76-09323 5C

Interagency Investigations of a Persistent Oil Spill on the Washington Coast. Animal Population Studies, Hydrocarbon Uptake by Marine Organisms, and Algae Response Following the Grounding of the Troopship General M.C. Meigs,
W76-09324 5C

Effects of Water Soluble Extracts of Oil on Phytoplankton,
W76-09325 5C

Effect of a Bunker Fuel on the Beach Bacterial Flora,
W76-09326 5C

Microbial Petroleum Degradation: The Role of Cladosporium Resinae,
W76-09327 5C

The Fate of a Bunker Fuel in Beach Sand,
W76-09328 5C

Report of the Conference on Marine Resources of the Coastal Plains States, December 11-12, 1975, Savannah, Georgia.
W76-09329 5G

The OCS Forgotten Land: Territorial Sea, Nearshore, and Estuary,
W76-09330 5G

The Role of Engineering in Minimizing Offshore Impacts,
W76-09331 5G

Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II,
W76-09333 5G

Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic,
W76-09334 5G

Beach-Offshore Dredging: Some Environmental Consequences,
W76-09335 5G

Environmental Studies for Major Offshore Developments,
W76-09336 5G

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II.
W76-09371 5G

Development of a Water Quality Instrumentation Package for Long-Term Operation from Buoys and Other Unattended Marine Platforms,
W76-09372 5G

On the Risk Assessment of Offshore Structures,
W76-09373 5G

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III.
W76-09374 5G

Evaluation of Multi-Purpose Industrial-Port Islands: Sea Island Structure Engineering Research Study,
W76-09375 5G

Offshore Multi-Use Port Islands and Their Environment,
W76-09376 5G

Industry Candidates and General Locations for Artificial Industrial-Port Islands,
W76-09377 5G

Adapting Industrial Processes for Multi-Purpose Industrial Port Islands,
W76-09378 5G

Evaluation of Seismicity and Earthquake Shaking at Offshore Sites,
W76-09379 5G

Environmental Site Assessment for a Massachusetts Bay Deepwater Oil Terminal,
W76-09380 5G

Mass Transport and Dispersion Off a Tidal Inlet,
W76-09381 5G

The Offshore Ecology Investigation,
W76-09382 5G

New York Alternative Dumpsite Assessment - Reconnaissance Study of Surficial Sediments,
W76-09383 5G

Hydrocarbons in Water and Sediment Samples from Coal Oil Point Area, Offshore California,
W76-09384 5B

Influx of Petroleum Hydrocarbons into the Ocean,
W76-09385 5G

Geotechnical Aspects of Rock Borrow for Large Breakwaters,
W76-09386 5G

LIBRARY U. OF J. URBAN-CHAMP...

OUTER CONTINENTAL SHELF

Evaluation of Offshore Breakwater Stability Under Wave Action,
W76-09387 5G

Effect of Offshore Structures on Shoreline Evolution, Atlantic Generating Station,
W76-09388 5G

OUTFALL SEWERS
Water Control Solves Tough Sewer Problem,
W76-08967 8B

OUTLETS
Diffuser Design,
W76-09291 8A

OXIDATION
Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms,
W76-08752 5B

Kinetics and Mechanisms of the Oxidative Degradation of Nitrilotriacetic Acid (NTA) in Aqueous Solutions,
W76-08843 5B

Ammonia Nitrogen Removal from Waste Water Effluents by Zeolite Ion Exchange and Electrolysis Combination (Zeoraito ni yoru ion-kokan-denkai no kumiawase ni yoru haisui karano ammoniasei chisso jokyo),
W76-09023 5D

Chlorinated Resin Intended for Water Treatment,
W76-09060 5F

OXYGEN
Current Aeration Techniques--An Overview,
W76-09009 5D

Experimental Study of the Effect of Temperature and Degree of Oxygen Saturation on the Destruction rate of Soluble Proteins in Natural Waters, (In Russian),
W76-09078 5C

The Use of Oxygen in the Treatment of Waste Water,
W76-09167 5D

Energy Saving--An Important Consideration,
W76-09187 5A

Oxygen Depletion in the Central and Eastern Basins of Lake Erie, 1970,
W76-09263 5C

Studies on Oxygen-Alkali Treatment of Ligneous Materials. Part V. Recycle and Reuse of Waste Liquor in O-PA-P Bleaching Sequence (In Japanese),
W76-09337 3E

OXYGEN DEMAND
Biological Effects of Primary, Secondary, and Tertiary Sewage Treatment in Lotic Analog Recipients,
W76-08792 5C

Instrumentation for Analyzing TOD (Instrumentelle TSB-Analytik),
W76-09185 5A

OXYGEN DEPLETION RATE
Oxygen Depletion in the Central and Eastern Basins of Lake Erie, 1970,
W76-09263 5C

OXYGEN REQUIREMENTS
Physiological Effects of Sublethal Levels of Acid Water on Fish,
W76-08927 5C

Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

Circulatory Adaptations to the Oxygen Minimum Layer in the Bathypelagic Mysid Gnathophausia ingens,
W76-09128 5C

OXYGEN SAG
Selective Fish Mortality Resulting from Low Winter Oxygen,
W76-08788 5C

OXYGEN UPTAKE CONSTANT
Comparison of Warburg and Marais Methods of Determining Oxygen Uptake Rate Constants,
W76-09189 5A

OXYGENATION
Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

The Use of Oxygen in the Treatment of Waste Water,
W76-09167 5D

OYSTERS
Interrelation Between Weight and Linear Indices in Black Sea Oysters, (In Russian),
W76-09087 2I

OZONE
Ozonization of Water in Moscow (Ozonisation De L'Eau a Moscou),
W76-08997 5F

Municipal Waste Water Treatment by Ozone (Ozon ni yoru toshigesui shori),
W76-09025 5D

Decolorization of Night Soil Treatment Plant Effluent by Ozone (Ozon ni yoru shinyo shorisui no dasshoku),
W76-09026 5D

Combination of Physical Chemical Processes of Waste Water Purification with Ozone Treatment (Kombination Physi-Kalisch-Chemischer Verfahren Der Abwasserreiningung Mit Ozon-Behandlung),
W76-09156 5D

PACIFIC COAST REGION
Water Requirements for Energy,
W76-09231 3E

PACIFIC NORTHWEST
Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

PACIFIC OCEAN
Photosynthetic Measurements in the Central North Pacific: The Dark Loss of Carbon in 24-Hour Incubations,
W76-08940 5C

Distribution, Morphometry, and Seasonal Biology of the Planktonic Copepods, Neocalanus Robustior and N. Gracilis, in the Pacific Ocean,
W76-08951 5C

Copepod Slick in the Northwest Pacific Ocean,
W76-08959 5C

PACKAGE PLANTS
Package Sewage Treatment Process,
W76-09170 5D

PACKING HOUSE WASTES
Apparatus and Process of Separating Packing House Waste,
W76-09046 5D

PALO CEDRO (CA)
Flood Plain Information: Cow Creek, Palo Cedro, California.
W76-08817 4A

PAPER MACHINES
Closing the White Water System of Paper Machines -- Effective Protection of the Environment (Fechamento do sistema de agua branca das maquinas de papel -- uma potecao lucrativa do meio ambiente),
W76-09342 3E

PARALLEL DRAINS
Determination of the Hydraulic Conductivity - Drainable Porosity Ratio from Water Table Measurements,
W76-09249 2F

PARTICLE SIZE
Atmospheric Dispersion of Cooling-Tower Blowdown,
W76-08853 5B

PATENT
Mobile Sewer Cleaning Machine,
W76-08973 8C

Apparatus and Method for Making Snow with Uniform Drop Size,
W76-09051 7B

PATENTS
Biological Purification of Waste Waters,
W76-08971 5D

Waste Water Purification,
W76-08972 5D

Phosphorus Removal from Waste Water,
W76-08975 5D

Method and Apparatus for Chemically Purifying Sewage,
W76-08976 5D

Waste Water Treatment Plant,
W76-08977 5D

Waste Treatment Process,
W76-08978 5D

Waste-Water Purification,
W76-08979 5D

Activated Sludge Plant,
W76-08980 5D

Aerobic Sewage Treatment System,
W76-08982 5D

Up-Flow Separator,
W76-08983 5D

Process for Treating Sewage Sludge and Fertilizer Products Thereof,
W76-08984 5D

Apparatus for Treatment of Water, Particularly Waste Water,
W76-08985 5D

Fluidized Furnace Construction for Burning Partly Dehydrated Sludge,
W76-08988 5E

Centrifuge Preventing Air Admission During Sludge Discharge,
W76-08990 5D

Sewage Treatment System,
W76-08992 5D

Method and Apparatus for Treating a Continuous Flow of Fluid Waste Products and Other Materials,
W76-08993 5D

Phosphorus Removal from Wastewater,
W76-08994 5D

Biological Treatment of Sterilised Aqueous Waste.
W76-08995 5D

Sewage Pipe Fitting,
W76-08996 8G

Double Funnel with Baffle Cascade Aeration Unit,
W76-09027 5D

Apparatus and Process of Separating Packing House Waste,
W76-09046 5D

Method for Biologically Treating Sewage and an Installation for Carrying out the Method,
W76-09047 5D

Environment Protective Oil Skimming and Removal Apparatus,
W76-09048 5G

Pressure and Flow Regulation Device,
W76-09049 3F

Method and Device for Attaching Shut-Off Control Valve to Distributing Water Pipe Such as Service Pipe Without Stopping Passage of Water Therethrough,
W76-09050 3F

Direct Contact Multi-Stage Flash Desalination,
W76-09052 3A

Process for Electrolysis of Brine,
W76-09053 5D

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09054 5D

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09055 5D

Ligand Exchange Process for Removal of Ammonia,
W76-09056 5D

Method for Clarifying Oily Water Mixtures,
W76-09057 5G

Split Stream Ultraviolet Purification Device,
W76-09058 5D

Water Purification Process and Apparatus,
W76-09059 5D

Chlorinated Resin Intended for Water Treatment,
W76-09060 5F

Separation by Solvent Extraction,
W76-09061 5D

SH OF POLLUTANTS

River Pollution by Anticholinesterase Agents,
W76-08782 5C

Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

Movement of Chemical Contaminants in Ground Water,
W76-08905 5B

Cycling of Organic Carbon in the Ocean: Use of Naturally-Occurring Radiocarbon as a Long and Short Term Tracer,
W76-08956 5C

Endrin Toxicity and Distribution in Freshwater: A Review,
W76-09122 5C

Hydrologic Environmental Effects of Sprayed Sewage Effluent, Tallahassee, Florida,
W76-09134 5B

A Technique for Estimating the Time of Travel of Water in Indiana Streams,
W76-09138 4A

Nitrogen and Phosphorus Levels in Soils Beneath Sewage Disposal Ponds,
W76-09197 5A

Photographic Analysis of Water Quality Changes,
W76-09199 5A

Possible Influence of Atmospheric Transport on the Total Mercury Content of Southeastern Atlantic Continental Shelf Surface Waters,
W76-09224 5B

A Finite Element Model of Contaminant Movement in Groundwater,
W76-09253 5B

Phytoplankton Distribution in the Vicinity of the Peru Current Near 8 Degrees S. Latitude, (In Russian),
W76-09283 5B

Interaction Between Surfactant and Dye IV. Application of the Acridine Orange Method to the Survey of Pollution of Alkylbenzene Sulfonate in Rivers and the Survey of Water Pollution in Kinokawa,
W76-09364 5A

Influx of Petroleum Hydrocarbons into the Ocean,
W76-09385 5G

Photooxidation as a Factor in the Environmental Dispersal of Curde Oil,
W76-09389 5B

PATRICIA BAY (BRITISH COLUMBIA)

The Replication of Biological Events in Enclosed Water Columns,
W76-09226 5C

PEAK DISCHARGE

Flood Plain Information: Northeast Stream Group, Stockton, California.
W76-08810 4A

PENDLETON (OR)

Flood Plain Information: Umatilla River Tributaries, Mckay, Tutuilla and Wildhorse Creeks, Pendleton, Oregon and Vicinity.
W76-08816 4A

PERCUSSION DRILLING

Combination Rigs,
W76-09345 8C

PERIPHYTON

Experiments on the Effects of Inorganic Enrichment of Rivers on Periphyton Primary Production,
W76-08787 5C

PERMAFROST

Solutions for Some Problems Resulting from Refreezing of Permafrost Around a Wellbore,
W76-08892 8G

PERU CURRENT

Phytoplankton Distribution in the Vicinity of the Peru Current Near 8 Degrees S. Latitude, (In Russian),
W76-09283 5B

PERUQUE CREEK (MO)

Flood Plain Information: St. Charles County, Missouri, Part 2, Peruque Creek.
W76-08819 4A

PEST CONTROL

Infection of Broad-Clawed Crayfish with Branchiobdella and Control Measures Against them, (In Russian),
W76-09086 2H

PESTICIDE RESIDUES

Insecticide Residues in Two Turtle Species Following Treatment with DDT,
W76-08778 5C

An Investigation of Antibiotic and Drug Residues in Fish,
W76-09124 5C

Wood Preservatives: Their Depletion as Fungicides and Fate in the Environment,
W76-09275 5B

PESTICIDE TOXICITY

River Pollution by Anticholinesterase Agents,
W76-08782 5C

PESTICIDES

The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

PETROLEUM

Petroleum Residues in the Sargasso Sea and on Bermuda Beaches,
W76-09315 5C

PETROLEUM HYDROCARBONS

Influx of Petroleum Hydrocarbons into the Ocean,
W76-09385 5G

PHENOL-SULFURIC ACID TEST

The Phenol-Sulfuric Acid Test,
W76-09191 5A

PHENOLS

The Phenol-Sulfuric Acid Test,
W76-09191 5A

Phenols -- Products of Lignin Degradation -- in Effluents of the Baikal Pulp and Paper Mill (Fenoli -- produkty razrusheniya lignina -- v stochnykh vodakh Baikal'-skogo tsellyuloznogo zavoda),
W76-09281 5A

PHOSPHATE

Effects of Lime, Phosphate and Soil Conditioner on Growth and Fruit Quality of Netted Melon, (In Japanese),
W76-08989 3C

LIBRARY U. OF J. URBANA-CHAMPAIGN

PHOSPHATE ANALYSIS
Phosphate Determinations in Waters Using an Anion Exchange Resin,
W76-09370 5A

PHOSPHATES
Studies on Phosphorylation Coupled with Denitrification and Aerobic Respiration in Pseudomonas Denitrificans,
W76-08823 5C

Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth,
W76-08842 5D

Phosphate Utilization by an Oceanic Diatom in Phosphorus-Limited Chemostat Culture and in the Oligotrophic Waters of the Central North Pacific,
W76-08938 5C

Two-Step Phosphate Removal from Solution Using Aluminum Salts,
W76-09182 5D

Improved Method for the Phosphate Determination in Waste Water (Verbesserte Methode Zur Phosphatbestimmung im Abwasser),
W76-09190 5A

Phosphate Determinations in Waters Using an Anion Exchange Resin,
W76-09370 5A

Self-Purification of Small Freshwater Streams: Phosphate, Nitrate, and Ammonia Removal,
W76-09398 5G

PHOSPHOROUS
Experiments on the Effects of Inorganic Enrichment of Rivers on Periphyton Primary Production,
W76-08787 5C

Phosphorous Flux Through Fishes,
W76-09104 5C

Changes in the Composition of the Plankton of the Rivers Rhine and Meuse in the Netherlands During the Last Fifty Five Years,
W76-09105 5C

Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

PHOSPHOROUS COMPOUND
Digestive Activities of Carp as a Major Contributor to the Nutrient Loading of Lakes,
W76-09103 5C

PHOSPHORUS
Algal Growth Potential of Six Norwegian Waters Receiving Primary, Secondary and Tertiary Sewage Effluents,
W76-08794 5C

Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

Dynamics of Phosphorus Cycling in the Euphotic Waters of the Central North Pacific Ocean,
W76-08939 5C

Phosphorus Removal from Waste Water,
W76-08975 5D

Phosphorus Removal from Wastewater,
W76-08994 5D

Nutrient Mass Balance in Columns Representing Fill Systems for Disposal of Septic Tank Effluents,
W76-09164 5E

Nitrogen and Phosphorus Levels in Soils Beneath Sewage Disposal Ponds,
W76-09197 5A

Probability Models of Wastewater Treatment Plant Operation,
W76-09210 5D

Distribution, Circulation and Evolution of Nutrients, Particularly Inorganic Phosphorus in Lake Etang DeBerre: Influence of River Durance Waters, (In French),
W76-09393 5B

PHOSPHORUS COMPOUNDS
Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

PHOSPHORUS REMOVAL
Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth,
W76-08842 5D

PHOSPHORYLATION
Studies on Phosphorylation Coupled with Denitrification and Aerobic Respiration in Pseudomonas Denitrificans,
W76-08823 5C

PHOTOGRAPHY
Photographic Analysis of Water Quality Changes,
W76-09199 5A

PHOTOMETRY
Chemiluminescent Method of Determining Manganese in Natural Waters, (In Russian),
W76-09077 2K

PHOTOOXIDATION
Photooxidation as a Factor in the Environmental Dispersal of Curde Oil,
W76-09389 5B

PHOTOSYNTHESIS
Effects of Thermal Circulation on Phytoplankton Photosynthesis,
W76-08785 5C

Summer Phytoplankton Photosynthesis in a Northeastern Ohio Glacial Lake,
W76-08828 5C

A Comparison of Short-Term Effects of Thermal Addition on Photosynthesis and Plant-Water Stress in Three Ecosystems,
W76-08884 5C

Photosynthetic Measurements in the Central North Pacific: The Dark Loss of Carbon in 24-Hour Incubations,
W76-08940 5C

Silicic Acid Uptake and Incorporation by Natural Marine Phytoplankton Populations,
W76-08941 5C

Chlorine Reactions with Seawater Constituents and the Inhibition on Photosynthesis of Natural Marine Phytoplankton,
W76-08946 5C

Amino Acid Uptake and Respiration by Marine Heterotrophs,
W76-08955 5C

Nutrient Cycling Between the Water Colum and a Marine Sediment. I. Organic Carbon,
W76-08957 5C

PHOTOSYNTHSIS
A Thermodynamic Model for Steady Stat Metabolism of Phytoplankton, Part II. Ligh and Carbon Limited Growth,
W76-08945 5C

PHRAGMITETEA
The Phragmitetea and Molinietalia Association in the Thaya, March and Danube River Basin of Austria, (In German),
W76-09076 4

PHYSICO-CHEMICAL TREATMENT
Combination of Physical Chemical Processes Waste Water Purification with Ozone Trea ment (Kombination Physi-Kalisch-Chemische Verfahren Der Abwasserreiningung Mit Ozo Behandlung),
W76-09156 5

PHYSIOLOGICAL ECOLOGY
Ecological and Physiological Implications Greenbelt Irrigation,
W76-08840 5

Physiological Ecology of Gonyaulax Polyedr a Red Water Dinoflagellate Off Southe California,
W76-08936 5

PHYTOPLANKTON
The Effect of Dursban Upon Fresh Wat Phytoplankton,
W76-08773 5

Effects of Thermal Circulation on Phytoplan ton Photosynthesis,
W76-08785 5

Biomass Parameters and Primary Production a Nearshore and a Midlake Station of Lake O tario During IFYGL,
W76-08825 5

Summer Phytoplankton Photosynthesis in Northeastern Ohio Glacial Lake,
W76-08828 5

Phosphate Utilization by an Oceanic Diatom Phosphorus-Limited Chemostat Culture and the Oligotrophic Waters of the Central No Pacific,
W76-08938 5

Dynamics of Phosphorus Cycling in Euphotic Waters of the Central North Paci Ocean,
W76-08939 5

Photosynthetic Measurements in the Cen North Pacific: The Dark Loss of Carbon in Hour Incubations,
W76-08940 5

Silicic Acid Uptake and Incorporation by Na ral Marine Phytoplankton Populations,
W76-08941 5

Primary Production and the Factors Control Phytoplankton Growth in the Antarctic Seas,
W76-08942 5

A Thermodynamic Model for Steady St Metabolism of Phytoplankton, Part I. Theory
W76-08944 5

Thermodynamic Model for Steady State
letabolism of Phytoplankton, Part II. Light
nd Carbon Limited Growth,
/76-08945 5C

hlorine Reactions with Seawater Constituents
nd the Inhibition on Photosynthesis of Natural
larine Phytoplankton,
/76-08946 5C

ffects of Copper on Natural Marine
hytoplankton Communities,
/76-08947 5C

nvestigations on the Phytoplankton and Some
nvironmental Parameters of the Shattal-Arab
raq), (In German)
/76-09084 2L

hanges in the Composition of the Plankton of
he Rivers Rhine and Meuse in the Netherlands
uring the Last Fifty Five Years,
/76-09105 5C

eclamation of Acidified Lakes - Middle and
ohi, Sudbury, Ontario,
/76-09108 5G

aboratory Experiments to Determine the
imits of Tolerance of Flagellates to Some
biotic Factors,
/76-09110 5C

esults of Phytoplankton Sampling at National
tream Quality Accounting Network Stations
n Montana--1975 Water Year,
/76-09146 5A

hytoplankton Distribution in the Vicinity of
he Peru Current Near 8 Degrees S. Latitude,
In Russian),
/76-09283 5B

he Toxicity of Crude Oil and Its Components
o Freshwater Algae,
/76-09321 5C

CTOU HARBOR (CANADA)
he Benthos of Pictou Harbor and Northum-
erland Strait, Canada -- A Measure of the Im-
act of Treated Kraft Pulp Mill Effluent,
/76-09294 5C

KES
elective Fish Mortality Resulting from Low
Winter Oxygen,
/76-08788 5C

LOT PLANTS
tudies of High-Rate Biological Treatment of
pswich Sewage on Pilot Filters using Plastics
Media,
/76-09029 5D

Wastewater Research Facility Designed for
Comparative Testing,
/76-09031 5D

PE FLOW
reston Sewage Lift Station Meets Fluctuation
n Flow,
/76-09160 8C

PE SIZES
Dimensioning of Underground Sewer Pipelines
Made of Plastic Tubes (Raschet podzemnykh
kanalizatsionnykh truboprovodov iz polimer-
nykh trub),
/76-08962 8B

PIPELINES
Dimensioning of Underground Sewer Pipelines Made of Plastic Tubes (Raschet podzemnykh kanalizatsionnykh truboprovodov iz polimernykh trub),
W76-08962 8B

Problem: Low Headroom, Solution: Pipe Arch,
W76-08968 8G

Pipelaying 'Horse' Preassembles and helps Install Ocean Outfall,
W76-08970 8F

Sewage Pipe Fitting,
W76-08996 8G

Hydraulic Calculation of Sludge Pipelines in Waste Water Treatment Plants (De hydraulische berekening van slibwaterleidingen op rioolwaterzuiveringstallaties),
W76-09208 8C

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II.
W76-09371 5G

PIPES
Storm Sewer Pipe Joints Tight After Ten Years,
W76-08966 8G

Pipelaying 'Horse' Preassembles and helps Install Ocean Outfall,
W76-08970 8F

Sewage Pipe Fitting,
W76-08996 8G

Preston Sewage Lift Station Meets Fluctuation in Flow,
W76-09160 8C

PLANKTON
Effects of Heat Enrichment on Species Succession and Primary Production in Fresh-Water Plankton,
W76-08879 5C

Changes in the Composition of the Plankton of the Rivers Rhine and Meuse in the Netherlands During the Last Fifty Five Years,
W76-09105 5C

A New Device For Subsampling Plankton Samples,
W76-09396 7B

Limnoplankton of Some Inland Waters of Dacca City,
W76-09400 5C

PLANKTON SAMPLERS
A New Stratified Plankton Sampler for Shallow Waters, (In Spanish),
W76-09193 7B

PLANNING
Special Flood Hazard Information: Mill Creek-Gekeler Slough, La Grande, Oregon.
W76-08811 4A

Industrial Development Through Water-Resources Planning,
W76-09034 3E

Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

Criteria for Selecting a Water Quality Model for 208 Planning,
W76-09212 5G

PLANT FOSSILS
Late Pleistocene and Modern Plant Communities of Shinumo Creek and Peach Springs Wash, Lower Grand Canyon, Arizona,
W76-09074 2I

PLANT GROUPING
Effect of the Water Regime on the Heat-Resistance of Leaf Cells of Heat-Hardened Tradescantia Fluminensis Vell. Plants, (In Russian),
W76-09102 2I

PLANT GROUPINGS
Late Pleistocene and Modern Plant Communities of Shinumo Creek and Peach Springs Wash, Lower Grand Canyon, Arizona,
W76-09074 2I

Plant Associations of Lake Mieliwo and the Adjacent Peat Bogs in the Brodnica District, (In Polish),
W76-09099 2H

PLANT GROWTH
Effect of Late Sowing on Morphogenetic Development of Panicle in Rice (Oryza Sativa L.),
W76-08758 3F

Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

Primary Production and the Factors Controlling Phytoplankton Growth in the Antarctic Seas,
W76-08942 5C

Interception of Rainfall at Different Growth Stages by the Canopy of Tobacco Plants, (In Japanese).
W76-08986 3F

Effect of Soil-Moisture Regimes and N and P Fertilization on Berseem Grown for Fodder,
W76-08987 3F

Effects of Lime, Phosphate and Soil Conditioner on Growth and Fruit Quality of Netted Melon, (In Japanese),
W76-08989 3C

Mercury Uptake in Rooted Higher Aquatic Plants; Laboratory Studies,
W76-09111 5C

PLANT GROWTH REGULATORS
Growth, Water Consumption, and Salt Uptake of Tomato Plants in High Humidity- High Carbon Dioxide Greenhouse Environments,
W76-09075 3C

PLANT POPULATIONS
Late Pleistocene and Modern Plant Communities of Shinumo Creek and Peach Springs Wash, Lower Grand Canyon, Arizona,
W76-09074 2I

PLANTING MANAGEMENT
Effect of Late Sowing on Morphogenetic Development of Panicle in Rice (Oryza Sativa L.),
W76-08758 3F

Plant Collection for Saltland Revegetation and Soil Conservation,
W76-09071 2I

PLASTIC PIPES
Structural Performance of Buried Plastic Drain Tubing,
W76-08771 8G

LIBRARY U. OF I. URBANA-CHAMPAIGN

PLEISTOCENE EPOCH
Late Pleistocene and Modern Plant Communities of Shinumo Creek and Peach Springs Wash, Lower Grand Canyon, Arizona,
W76-09074 2I

PLUMES
Combined Dry/Wet-Cooling Towers: Their Environmental Promise and Their Problems,
W76-08852 5B

PODZOLS
Effect of the Mozhaysk Reservoir on Soil of the Bank Area of the Surrounding Territory, (In Russian),
W76-09081 2G

POLAND
Influence of Mineral Fertilization of Lakes on Fish Growth,
W76-08799 5C

Analytical Chemistry in Water Pollution Control,
W76-09221 5A

POLAND (GNIEWKOWO)
The Peripheral Flood Zones of Gniewkowo Lowland from 1969 to 1972, (In Polish),
W76-09079 2I

POLAND (LAKE MIELIWO)
Plant Associations of Lake Mieliwo and the Adjacent Peat Bogs in the Brodnica District, (In Polish),
W76-09099 2H

POLAND (PRADNIK STREAM)
Ciliate Associations (Ciliata) in the Pradnik Stream, Which is Polluted by Residual Waters of a Dairy, (In French),
W76-08777 5C

POLIOVIRUS III
Chlorination and Iodination of Poliovirus and F2,
W76-09196 5A

POLITICAL CONSTAINTS
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

POLLUTANT IDENTIFICATION
The Time Stability of Dissolved Mercury in Water Samples-I. Literature Review,
W76-08767 5A

Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

A Comparison of Aerial Infra-Red and In-Situ Thermal Plume Measurement Techniques,
W76-08860 5A

The Significance of Isomery in Hygienic Standardization of Industrial Contaminations of Water Bodies, (In Russian),
W76-08864 5A

Environmental Implications of Sediment Bulk Analysis Techniques for Trace Metals in Offshore Well-Drilling Operations,
W76-08908 5A

A Method for Estimating the Toxicity of Chlorinated Discharges,
W76-08928 5C

Assay of Nitrate Reductase from Plasmolyzed Marine Phytoplankton,
W76-08943 5C

Improved Methodology for ATP Determination in Marine Environments,
W76-08958 5C

Specific Pollutants in Urban Waste Waters and the Efficiency of their Purification (Spetsificheskie zagryazneniya gorodskikh stochnykh vod i effektivnost' ikh ochistki),
W76-09002 5A

Multi-Reaction Proton Activation Analysis for Traces of Molybdenum,
W76-09036 5A

Titration of Antimony (III) with Cerium (IV) Sulphate and Diphenylamine and its Derivatives as Reversible Indicators,
W76-09040 5A

Contents of Eleven Trace Elements in Ureilite Achondrites,
W76-09041 5A

Simultaneous Spectrophotometric Determination of Nickel and Cobalt in Mixtures with 3-Hydroxypicolinealdehyde Azine,
W76-09042 5A

Chemical Interference Effects in the Atomic Absorption Spectrometric Determination of Lead with Premixed Inert Gas (Entrained Air)-Hydrogen Flames.
W76-09043 5A

Expedient Technique of Permanent Observations -- An Indispensable Tool on Studying the Limnology of Rivers,
W76-09106 7B

Field Evaluation of Benzopyrene Hydroxylase Induction as a Monitor for Marine Petroleum Pollution,
W76-09116 5A

Axenic Cultures of Tetrahymena Pyriformis as Toxicological Tools,
W76-09121 5A

Measurement of Metal Toxicity by Biochemical Oxygen Demand,
W76-09127 5A

Circulatory Adaptations to the Oxygen Minimum Layer in the Bathypelagic Mysid Gnathophausia ingens,
W76-09128 5C

The Formation and Detection of Metal Dispersion Halos in Organic Lake Sediments,
W76-09129 2J

Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

Instrumentation for Analyzing TOD (Instrumentelle TSB-Analytik),
W76-09185 5A

Representative Analytical Waste Water Samples. Note I--A New Sampler (Significativa di Campioni Analitici di Acque Reflue. Nota I -- Nuovo Dispositivo di Campionamento),
W76-09186 5A

Energy Saving--An Important Consideration,
W76-09187 5A

Comparison of Warburg and Marais Methods of Determining Oxygen Uptake Rate Constants,
W76-09189 5A

Improved Method for the Phosphate Determination in Waste Water (Verbesserte Methode Zur Phosphatbestimmung im Abwasser),
W76-09190 5A

The Phenol-Sulfuric Acid Test,
W76-09191 5A

Methods and Instruments for Monitoring Surface Water and Waste Water Quality (Verfahren und Geraete zur Ueberwachung der Oberflaechen- und Abwasserqualitaet).
W76-09192 5A

Water Pollution Monitoring Using Matched Spatial Filters,
W76-09194 5A

Identification of Nitrogen as a Growth-Limiting Nutrient in Wastewaters and Coastal Marine Waters Through Continuous Culture Algal Assays,
W76-09195 5A

Chlorination and Iodination of Poliovirus and F2,
W76-09196 5A

Recommendation for the Evaluation of the Biological Degradability of Effluents of Varying Origin (Vorschlag zur Beurteilung der Biologischen Abbaubarkeit von Abwaessern Unterschiedlicher Herkunft),
W76-09198 5A

Photographic Analysis of Water Quality Changes,
W76-09199 5A

Factors Affecting the Extraction and Analysis of Polynuclear Aromatic Hydrocarbons in Water,
W76-09200 5A

Determination of Ammonia and Kjeldahl Nitrogen by Indophenol Method,
W76-09201 5A

Monitoring Dissolved-Oxygen Content to Assure Clean Wastewater,
W76-09202 5A

An Improved Determination of Chemical Oxygen Demand in Water and Wastes by a Simplified Acid Dichromate Digestion,
W76-09203 5A

Analytical Chemistry in Water Pollution Control,
W76-09221 5A

Study on the Balance of Heavy Metals in Activated Sludge Treatment Process (Gesui shori shisetsu ni okeru jukinzokurui no shushi ni kansuru kenkyu),
W76-09222 5A

The Application of the Scanning Electron Microscope to Freshwater Phytoplankton Taxonomy and Morphology,
W76-09225 5A

Need for an Integral Approach to to the Problem of Quantitative Determination of Lignosulfonic Acids in Mill Effluents and Surface Waters (O potrzebie kompleksowego ujmowania problemu ilosciowego oznaczania

vasow ligninosulfonowych w sciekach celulozowych i wodach powierzchniowych),
76-09277 5A

enols -- Products of Lignin Degradation -- in fluents of the Baikal Pulp and Paper Mill enoli -- produkty razrusheniya lignina -- v chnykh vodakh Baikal'-skogo tsellyuloznogo voda),
76-09281 5A

andardization of Methods for the Determina- n of Traces of Some Volatile Chlorinated iphatic Hydrocarbons in Air and Water by s Chromatography,
76-09287 5A

Spent Semichemical Pulping Liquors. (4) lan in Neutral Sulfite Semichemical Spent quor (In Japanese),
76-09338 5C

w Injection Analysis. Part IV. Stream Sam- Splitting and Its Application to the Continu- s Spectrophotometric Determination of loride in Brackish Waters,
76-09339 5A

eraction Between Surfactant and Dye IV. plication of the Acridine Orange Method to e Survey of Pollution of Alkylbenzene Sul- nate in Rivers and the Survey of Water Pollu- n in Kinokawa,
76-09364 5A

osphate Determinations in Waters Using an ion Exchange Resin,
76-09370 5A

mparison of Two Methods for Determina- n of Primary Productivity on Coastal Waters the Gulf of Mexico, (In Spanish),
76-09391 5A

LUTANTS
tionale for a Water Pollution Code Part 1: e Waste System and the Natural System,
76-08839 5G

LUTION ABATEMENT
vironment Protective Oil Skimming and moval Apparatus,
76-09048 5G

ethod and Apparatus for Separating Oil from ueous Liquids,
76-09055 5D

vironmental Changes in a Portion of Lake tario Following Pollution Abatement,
76-09119 5C

pabilities and Costs of Technology As- ciated with the Achievement of the Require- nts and Goals of the FWPCA of 1972 for lp and Paper Industry.
76-09229 5G

act Manure Pack Halts Seepage,
76-09344 5G

LUTION IDENTIFICATION
oceedings of Joint Conference on Prevention d Control of Oil Spills, March 13-15, 1973, ashington, D.C.,
76-09312 5B

YACRYLAMIDE
e Effect of Polyacrylamide on the Settling of ames Mud,
76-09243 2J

POLYACRYLAMIDES
The Effect of Certain Synthetic Macromolecular Substances on the Physico-Chemical Properties of Soil and on the Fertilizer Utilization Coefficient, (In French),
W76-08981 2G

POLYELECTROLYTES
Application of Centrifuges. Dewatering of Sludges from Waterworks (Applicazione Di Centrifughe. Disidratazione Di Fanghi Provenienti Da Impianti Di Potabilizzazione),
W76-09008 5F

The Performance-Potential of Polyelectrolytes and High Velocity Gradients in the Treatment of Wastewaters,
W76-09179 5D

Ammonia Removal by Use of Clinoptilolite,
W76-09180 5D

POLYMER MUDS
Drilling Fluid Principles and Operations,
W76-08893 8G

POLYMERS
Sewage Treatment System,
W76-08992 5D

Chemical Feed: It's A Way of Life at Windsor,
W76-09162 5D

POLYNUCLEAR AROMATIC HYDROCARBONS
Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms,
W76-08752 5B

PONDS
Hyperhaline Environments of the Complex of Bages-Sigean, the Lagoon of the Doul, (In French),
W76-08784 2L

Limnoplankton of Some Inland Waters of Dacca City,
W76-09400 5C

POPULATIONS
Microplankton of the North Pacific Central Gyre. I. Population Structure and Abundance, June 1973,
W76-08949 5C

POROSITY
Determination of the Hydraulic Conductivity - Drainable Porosity Ratio from Water Table Measurements,
W76-09249 2F

POROUS MEDIA
Hydraulic Properties of a Porous Medium: Measurement and Empirical Representation,
W76-09255 2G

PORT ISLANDS
Offshore Multi-Use Port Islands and Their Environment,
W76-09376 5G

Industry Candidates and General Locations for Artificial Industrial-Port Islands,
W76-09377 5G

Adapting Industrial Processes for Multi-Purpose Industrial Port Islands,
W76-09378 5G

PORTS
Environmental Site Assessment for a Massachusetts Bay Deepwater Oil Terminal,
W76-09380 5G

POTABLE WATER
Ozonization of Water in Moscow (Ozonisation De L'Eau a Moscou),
W76-08997 5F

Quality Assurance for Groundwater,
W76-09213 5G

Monograph of the Effectiveness and Cost of Water Treatment Processes for Removal of Specific Contaminants. Vol. 1. Technical Manual,
W76-09227 5F

EPA Standards for Drinking Water become Effective in June, 1977.
W76-09356 5F

POTOMAC RIVER
Unit Hydrographs - A Comparative Study,
W76-09254 2E

POTTER (WISC)
Low-Flow Characteristics and Mean Annual Discharge of North Branch Manitowoc River at Potter, Wisconsin,
W76-09147 7C

PRE-IMPOUNDMENT
Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

Sediment Transport, Turbidity, Channel Configuration, and Possible Effects of Impoundment of the Mad River, Humboldt County, California,
W76-09136 2J

Low-Flow Characteristics and Mean Annual Discharge of North Branch Manitowoc River at Potter, Wisconsin,
W76-09147 7C

PRECIPITATION (ATMOSPHERIC)
On the Components of Time Series; The Removal of Spatial Dependence,
W76-08803 2B

Mountainous Winter Precipitation: A Stochastic Event-Based Approach,
W76-09062 2B

Comparative Evaluation of Climatic Factors and Conditions at Fudhaliya Agro-Meteorological Station and Baghdad Airport Meteorological Station,
W76-09067 2B

PREDATION
Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

PRICING
Private Wells Prove to be a Better Buy,
W76-09343 4B

PRIMARY PRODUCTIVITY
Effects of Thermal Circulation on Phytoplankton Photosynthesis,
W76-08785 5C

LIBRARY U. OF A. ORONO-CAMPUS

Experiments on the Effects of Inorganic Enrichment of Rivers on Periphyton Primary Production,
W76-08787 5C

Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

Biological Effects of Primary, Secondary, and Tertiary Sewage Treatment in Lotic Analog Recipients,
W76-08792 5C

Biomass Parameters and Primary Production at a Nearshore and a Midlake Station of Lake Ontario During IFYGL,
W76-08825 5C

Nutrient-Primary Production Relationships in Central Lake Erie: A Simple Correlation Approach,
W76-08836 5C

Effects of Heat Enrichment on Species Succession and Primary Production in Fresh-Water Plankton,
W76-08879 5C

A Comparison of Short-Term Effects of Thermal Addition on Photosynthesis and Plant-Water Stress in Three Ecosystems,
W76-08884 5C

Primary Production and the Factors Controlling Phytoplankton Growth in the Antarctic Seas,
W76-08942 5C

Vegetational Strata in Perhumid and Perarid Regions of the Tropical Andes, (In German)
W76-09083 2I

Comparison of Two Methods for Determination of Primary Productivity on Coastal Waters of the Gulf of Mexico, (In Spanish),
W76-09391 5A

PRIORITIES
A Critical Study of Flood Protection Planning in the Susquehanna River Basin: 1936-1972,
W76-08846 6F

PRODUCTIVITY
Environmental Conditions and Productivity in the Terminos Lagoon, Campeche, Mexico, (In Spanish),
W76-08900 2L

PROGRAMS
Research on the Marine Food Chain.
W76-08935 5C

A Guide to State Programs for the Reclamation of Surface Mined Areas,
W76-09142 5G

PROJECTIONS
Industrial Development Through Water-Resources Planning,
W76-09034 3E

PROJECTS
Research on the Marine Food Chain.
W76-08935 5C

PROSPECTING MEDIUMS
The Formation and Detection of Metal Dispersion Halos in Organic Lake Sediments,
W76-09129 2J

PROTECTION
Fish Habitat in Forest Lands,
W76-09233 8I

Protection of Free-Flowing Rivers,
W76-09235 6E

PROTON ANALYSIS (MULTI-REACTION)
Multi-Reaction Proton Activation Analysis for Traces of Molybdenum,
W76-09036 5A

PROTOZOA
Ciliate Associations (Ciliata) in the Pradnik Stream, Which is Polluted by Residual Waters of a Dairy, (In French),
W76-08777 5C

Axenic Cultures of Tetrahymena Pyriformis as Toxicological Tools,
W76-09121 5A

PSEUDOMONAS
Studies on Phosphorylation Coupled with Denitrification and Aerobic Respiration in Pseudomonas Denitrificans,
W76-08823 5C

PUBLIC HEALTH
Removal of Faecal Coliform from Waste Water by Proper Aerobic Biological Treatment,
W76-09171 5D

Hepatitis Attributed to Polluted Stream,
W76-09220 5C

PUBLIC OPINION
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

PUBLIC PARTICIPATION
A Critical Study of Flood Protection Planning in the Susquehanna River Basin: 1936-1972,
W76-08846 6F

PUBLIC POLICY
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

PUERTO RICE
Thermal Studies on Tropical Marine Ecosystems in Puerto Rico,
W76-08872 5C

PULP AND PAPER INDUSTRY
Capabilities and Costs of Technology Associated with the Achievement of the Requirements and Goals of the FWPCA of 1972 for Pulp and Paper Industry.
W76-09229 5G

Separation Processes Used for Pollution Control in the Pulp and Paper Industry,
W76-09340 5D

PULP WASTES
Environmental Changes in a Portion of Lake Ontario Following Pollution Abatement,
W76-09119 5C

Study to Define Changes in Pulp Mill Effluent-Contributed Color in Receiving Waters Detectable by Human Observers,
W76-09276 5C

Need for an Integral Approach to to the Problem of Quantitative Determination of Lignosulfonic Acids in Mill Effluents and Surface Waters (O potrzebie kompleksowego ujmowania problemu ilosciowego oznaczania kwasow ligninosulfonowych w sciekach pocelulozowych i wodach powierzchniowych),
W76-09277 5A

Mechanism of Conversion of Lignin and its Derivatives in Natural Waters (Mekhanizm prevrashcheniya lignina i ego proizvodnykh v prirodnoj vode),
W76-09280 5B

Phenols -- Products of Lignin Degradation -- in Effluents of the Baikal Pulp and Paper Mill (Fenoli -- produkty razrusheniya lignina -- v stochnykh vodakh Baikal'-skogo tsellyuloznogo zavoda),
W76-09281 5A

Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

Filter Media Comparison at Prince George Pulp and Paper (Limited),
W76-09286 5D

Economic Considerations in the Selection of a Biological Treatment System,
W76-09290 5D

Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W76-09292 5D

Practical Application of the Toxicity Emission Rate Concept in a Survey of Maritime Pulp and Paper Mills,
W76-09293 5A

The Benthos of Pictou Harbor and Northumberland Strait, Canada -- A Measure of the Impact of Treated Kraft Pulp Mill Effluent,
W76-09294 5C

Chemical Characteristics, Acute Toxicity and Detoxification of Foam in Two Aerated Lagoons,
W76-09295 5C

Colour Measurement of Pulp Mill Effluents,
W76-09296 5A

Secondary Effluent Treatment at Northwood Pulp and Timber Limited,
W76-09297 5D

Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon,
W76-09298 5D

Economics and Energy: Reducing Mill Energy Consumption and Effluent Volume,
W76-09299 5G

Effects of Color and Toxic Constituents of Bleached Kraft Mill Effluent on Algal Growth,
W76-09300 5C

Secondary Treatment at Ontario-Minnesota Pulp and Paper Company Limited, Fort Frances, Ontario,
W76-09301 5D

Historic Heat curve of Recovery Operations,
W76-09303 5E

On Spent Semichemical Pulping Liquors (4) Xylan in Neutral Sulfite Semichemical Spent Liquor (In Japanese),
W76-09338 5C

Papeteries De L'AA -- Suspended Solids Reduced by 98%, Organic Materials by 74% (Papeteries de l'Aa -- mes reduites de 98%, et MO de 74%),
W76-09341 5D

UMP PERFORMANCE
Pumps.
W76-09351 8C

UMP SPECIFICATIONS
Pumps.
W76-09351 8C

UMP TURBINES
Pumps.
W76-09351 8C

UMPING
Belleville Plant Uses 15 Pumps in Four Stations,
W76-08969 8C

UMPING PLANTS
Belleville Plant Uses 15 Pumps in Four Stations,
W76-08969 8C

UMPS
Belleville Plant Uses 15 Pumps in Four Stations,
W76-08969 8C

Preston Sewage Lift Station Meets Fluctuation in Flow,
W76-09160 8C

Computer Control of Sewage and Rain Water Pumps at Sewage Treatment Plant (Gesuishorijo no osui, amamizu ponpu no keisanki seigyo),
W76-09215 8C

Pumps.
W76-09351 8C

Is Your Pump a Candidate for Inefficiency.,
W76-09352 3F

UT-IN-BAY (LAKE ERIE)
Zooplankton of Western Lake Erie at Put-in-Bay: A Quantitative Study, April 1973-March 1974,
W76-08833 5C

YCNOCLINE
Phytoplankton Distribution in the Vicinity of the Peru Current Near 8 Degrees S. Latitude, (In Russian),
W76-09283 5B

YRAMID LAKE (NEV)
The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W76-08753 5C

ADIOACTIVE WASTES
The Availability of 137-CS to Fishes from Ingested Clays,
W76-09118 5C

ADIOACTIVITY EFFECTS
Can the Criteria and Methodology Used for Radioactive Discharges be Applied to Thermal Discharges. (Les Criteres et La Methodologie Retenus Pour les Rejets Radioactifs Sont-Ils Transposables Aux Rejets Thermiques.),
W76-08887 5G

AIN WATER
Computer Control of Sewage and Rain Water Pumps at Sewage Treatment Plant (Gesuishorijo no osui, amamizu ponpu no keisanki seigyo),
W76-09215 8C

RAINBOW TROUT
Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

Trout Population Responses to Streamflow Fluctuation and Habitat Management in Big Roche-A-Cri Creek, Wisconsin,
W76-08789 4A

Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

Acute Toxicity of Well-Drilling to Rainbow Trout,
W76-08899 5A

An Investigation of Antibiotic and Drug Residues in Fish,
W76-09124 5C

Acclimation of Rainbow Trout to Sea Water,
W76-09125 2L

Acute Toxicity to Juvenile Rainbow Trout (Salmo Gairdneri) of Naturally Occurring Insect Juvenile Hormone Analogues,
W76-09282 5C

RAINDROP IMPACT
Development of a Mathematical Model of Infiltration which Includes the Effects of Raindrop Impact,
W76-08844 2G

RAINDROPS
Interception of Rainfall at Different Growth Stages by the Canopy of Tobacco Plants, (In Japanese).
W76-08986 3F

RAINFALL
Interception of Rainfall at Different Growth Stages by the Canopy of Tobacco Plants, (In Japanese).
W76-08986 3F

A Rapid Method of Estimating Mean Areal Rainfall,
W76-09368 2B

RAINFALL DISPOSITION
The Nature and Causes of Desertization,
W76-09069 4C

RAINFALL ESTIMATION
A Rapid Method of Estimating Mean Areal Rainfall,
W76-09368 2B

RAINFALL-RUNOFF RELATIONSHIPS
Sediment Loading, its Effect on a southern Arizona Lake and the Emerging Spring Zooplankton Community,
W76-09073 2J

RAINFALL SIMULATORS
Development of a Mathematical Model of Infiltration which Includes the Effects of Raindrop Impact,
W76-08844 2G

RAINFALL TRENDS
Rainfall Trends in the West African Sahel,
W76-09269 2B

RECIRCULATED WATER
Studies on Oxygen-Alkali Treatment of Ligneous Materials. Part V. Recycle and Reuse of Waste Liquor in O-PA-P Bleaching Sequence (In Japanese),
W76-09337 3E

Closing the White Water System of Paper Machines -- Effective Protection of the Environment (Fechamento do sistema de agua branca das maquinas de papel -- uma potecao lucrativa do meio ambiente),
W76-09342 3E

RECREATION DEMAND
Recreation Use Patterns and User Attitudes on the Snake River,
W76-08751 6B

RECYCLING
Rationale for a Water Pollution Code Part 1: The Waste System and the Natural System,
W76-08839 5G

Wastewater Recycling Utilizes Pesky Nutrients,
W76-09010 5D

RED TIDE
Physiological Ecology of Gonyaulax Polyedra, a Red Water Dinoflagellate Off Southern California,
W76-08936 5C

REFINERY WASTES
Biological Effects of Refinery Effluents,
W76-09322 5C

REGENERATION
Experimental Report for Regeneration of Activated Carbon and Recalcination of Lime Sludge (Kasseitan, sekkai-oden no saisei jikken hokoku),
W76-09223 5D

REGENERATION FURNACE
Experimental Report for Regeneration of Activated Carbon and Recalcination of Lime Sludge (Kasseitan, sekkai-oden no saisei jikken hokoku),
W76-09223 5D

REGIONAL DEVELOPMENT
Recent Trends of Process Control for Water Works and Drainage (Jogesuido purosesu seigyo no doko),
W76-09214 5G

REGRESSION ANALYSIS
Statistics of Data Transfer,
W76-09133 4A

REGULATION
Waste-Heat Disposal from Steam Electric Plants with Reference to the Stochastic Nature of Some Environmental Conditions and to Thermal Pollution Control Regulations,
W76-08865 5G

Regulations and Environmental Investigations Associated with Nuclear Station Thermal Discharges,
W76-08886 5G

Objectives of Well-Drilling Regulations,
W76-08917 5G

REMOTE SENSING
An Evaluation of ERTS Data for Oceanographic uses Through Great Lake Studies,
W76-09244 2H

REPRODUCTION
Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

LIBRARY U. OF J. WATER RESOURCES CENTER

Effects of Copper on the Coral Reef Echinoid Echinometra Mathaei,
W76-09113 5C

Effect of Constant and Varying Temperature on Egg Production of Lymnaea Obrussa Say (Mollusca: Gastropoda),
W76-09120 5C

RESEARCH FACILITIES
Making the World Safe for Ground Water,
W76-09360 5B

RESERVOIR
A Reservoir Cove Ecosystem Model,
W76-08830 5C

RESERVOIRS
Effects of Initial Flooding on Forest Vegetation at Two Oklahoma Lakes,
W76-08831 4A

Field Evaluation of a Predictive Model for Thermal Stratification in Lakes and Reservoirs,
W76-08920 2H

Problem of Blood-Sucking Flies in the Zones Affected by Big Water Reservoirs in the Ukrainian SSR, (In Russian),
W76-08991 5G

Effect of the Mozhaysk Reservoir on Soil of the Bank Area of the Surrounding Territory, (In Russian),
W76-09081 2G

Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

Formation of Fish Fauna of the Berdyansk Reservoir in the First Twelve Years of its Existence, (In Russian),
W76-09392 2H

RESINS
Chlorinated Resin Intended for Water Treatment,
W76-09060 5F

RESOURCE DEVELOPMENT
Offshore Petroleum Drilling and Production,
W76-09332 5G

RESOURCES DEVELOPMENT
Mineral Resource Management of the Outer Continental Shelf.
W76-09306 6G

Ecological Effects of Offshore Construction,
W76-09307 6G

Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

Report of the Conference on Marine Resources of the Coastal Plains States, December 11-12, 1975, Savannah, Georgia.
W76-09329 5G

The OCS Forgotten Land: Territorial Sea, Nearshore, and Estuary,
W76-09330 5G

The Role of Engineering in Minimizing Offshore Impacts,
W76-09331 5G

Adapting Industrial Processes for Multi-Purpose Industrial Port Islands,
W76-09378 5G

RESPIRATION
Physiological Effects of Sublethal Levels of Acid Water on Fish,
W76-08927 5C

Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

Circulatory Adaptations to the Oxygen Minimum Layer in the Bathypelagic Mysid Gnathophausia ingens,
W76-09128 5C

Kinetics and Control Tests of Nitrification-Denitrification Process, Part II: Respiration and Control Tests,
W76-09366 5D

REUSED WATER
Industrial Development Through Water-Resources Planning,
W76-09034 3E

REVEGETATION
Plant Collection for Saltland Revegetation and Soil Conservation,
W76-09071 2I

REVERSE OSMOSIS
Reverse Osmosis Separation of Polar Organic Compounds in Aqueous Solution,
W76-09165 5D

Reverse Osmosis Today,
W76-09169 5D

REVIEWS
Current Aeration Techniques--An Overview,
W76-09009 5D

Endrin Toxicity and Distribution in Freshwater: A Review,
W76-09122 5C

Wood Preservatives: Their Depletion as Fungicides and Fate in the Environment,
W76-09275 5B

RHINE RIVER
Changes in the Composition of the Plankton of the Rivers Rhine and Meuse in the Netherlands During the Last Fifty Five Years,
W76-09105 5C

RHIZOPHORA-RACEMOSA
First Observations on the Forest of Cameroon on Sandy Coastal Cordons, (In French)
W76-09100 2I

RHODE RIVER (MD)
Macroscopic Benthic Fauna of Three Tidal Creeks Adjoining the Rhode River, Maryland,
W76-09143 5B

RIBBLE RIVER (ENGLAND)
Diatom Community Response to Variations in Effluent Concentration,
W76-08835 5C

RICE
Effect of Late Sowing on Morphogenetic Development of Panicle in Rice (Oryza Sativa L.),
W76-08758 3F

Zinc Nutrition of Rice in Relation to Iron and Manganese Uptake Under Different Water Regimes,
W76-08974 3F

RICE LAKE-EAU CLAIRE AREA (WIS)
The Availability of Ground Water for Irrigation in the Rice Lake-Eau Claire Area, Wisconsin,
W76-09348 4B

RISKS
On the Risk Assessment of Offshore Structures,
W76-09373 5G

RIVER BASINS
A Critical Study of Flood Protection Planning in the Susquehanna River Basin: 1936-1972,
W76-08846 6F

Industrial Development Through Water-Resources Planning,
W76-09034 3E

The Phragmitetea and Molinietalia Associations in the Thaya, March and Danube River Basins of Austria, (In German),
W76-09076 4A

RIVER FLOW
Diatom Community Response to Variations in Effluent Concentration,
W76-08835 5C

RIVERS
Flow Velocity as a Rate Determining Factor for Self-Purification in Rivers (Uber Den Einfluss der Stromungsgeschwindigkeit auf die Selbstreinigung in Fliessgewaessern),
W76-09204 5F

ROCK BORROW
Geotechnical Aspects of Rock Borrow for Large Breakwaters,
W76-09386 5G

ROMANIA
Protection of Romanian Underground Water Fauna, (In Romanian),
W76-09085 2I

ROOT DEVELOPMENT
Effects of Lime, Phosphate and Soil Conditioner on Growth and Fruit Quality of Netted Melon, (In Japanese),
W76-08989 3C

ROOTED AQUATIC PLANTS
Mercury Uptake in Rooted Higher Aquatic Plants; Laboratory Studies,
W76-09111 5C

ROSEVILLE (CALIF)
Flood Plain Information: Dry Creek and Tributaries, Roseville, California.
W76-08814 4A

ROTARY DRILLING
Combination Rigs,
W76-09345 8C

Water for the Ivory Coast.
W76-09355 8C

How to Get Good Samples by Rotary Drilling,
W76-09363 8G

ROTATING DISCS
Municipal Waste Water Treatment by Rotating Disc Method (Kaiten enbaho ni yoru hisui shori),
W76-09022 5D

ROTIFERS
On the Histological Structure and Function of Digestive Organs of the Fed and Starved Lar-

vae of the Yellowtail, Seriola Quinqueradiata, (In Japanese),
W76-09088 2I

RUNOFF
Flood Plain Information: Umatilla River Tributaries, Mckay, Tutuilla and Wildhorse Creeks, Pendleton, Oregon and Vicinity.
W76-08816 4A

Flood Plain Information: Arkansas River, Derby-Mulvane, Kansas.
W76-08822 4A

Urban Runoff Modelling,
W76-09033 4A

The Effect of Road Deicing Salts on Sodium Concentration in an Urban Water Course,
W76-09218 5B

Evaluation of a Monthly Water Yield Model,
W76-09246 2A

RYE
Effect of Hardening on the State of Water in Seedlings of Winter Cultures, (In Russian),
W76-09095 2I

SAFE DRINKING WATER ACT OF 1974
EPA Standards for Drinking Water become Effective in June, 1977.
W76-09356 5F

SAFE YIELD
Methods of Estimating Residential Land Use for Water Resources Management,
W76-08924 4C

SAGITTARIA LATIFOLIA
Mercury Uptake in Rooted Higher Aquatic Plants; Laboratory Studies,
W76-09111 5C

SAHEL
The Sahel: Time for a New Approach,
W76-09070 4C

SALINE SOILS
Soluble Salts and Nitrate Distribution in Irrigated Lettuce Beds,
W76-08763 3C

Salt Tolerance and Suitability of Various Grasses for Saline Roadsides,
W76-08764 3C

Plant Collection for Saltland Revegetation and Soil Conservation,
W76-09071 2I

SALINITY
The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W76-08753 5C

Soluble Salts and Nitrate Distribution in Irrigated Lettuce Beds,
W76-08763 3C

Salt Tolerance and Suitability of Various Grasses for Saline Roadsides,
W76-08764 3C

Hyperhaline Environments of the Complex of Bages-Sigean, the Lagoon of the Doul, (In French),
W76-08784 2L

Acclimation of Rainbow Trout to Sea Water,
W76-09125 2L

SALT DRIFT DEPOSITION
A Model for Salt Drift Deposition from Spray Ponds,
W76-08866 5B

SALT MARSHES
The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

A Salt Marsh Microcosm: An Experimental Unit for Marine Pollution Studies,
W76-09318 5C

SALT TOLERANCE
Salt Tolerance and Suitability of Various Grasses for Saline Roadsides,
W76-08764 3C

Isolation and Characterization of Actinopolyspora Halophila, Gen. ET SP. Nov., An Extremely Halophilic Actinomycete,
W76-08837 5C

SALTS
A Model for Salt Drift Deposition from Spray Ponds,
W76-08866 5B

The Po River at the Island of Serafini, (In Italian),
W76-09305 2E

SAMPLE PREPARATION
Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

SAMPLING
The Time Stability of Dissolved Mercury in Water Samples-I. Literature Review,
W76-08767 5A

Expedient Technique of Permanent Observations -- An Indispensable Tool on Studying the Limnology of Rivers,
W76-09106 7B

Representative Analytical Waste Water Samples. Note I--A New Sampler (Significativa di Campioni Analitici di Acque Reflue. Nota I -- Nuovo Dispositivo di Campionamento),
W76-09186 5A

A New Stratified Plankton Sampler for Shallow Waters, (In Spanish),
W76-09193 7B

A Light Weight Corer for Sampling Soft Subaqueous Deposits,
W76-09266 2J

How to Get Good Samples by Rotary Drilling,
W76-09363 8G

A New Device For Subsampling Plankton Samples,
W76-09396 7B

A Method for the Rapid Sorting of Plankton into a Number of Size Groups,
W76-09397 7B

SAND SPOILS
Leaching Losses of Ammonium and Nitrate in the Reclamation of Sand Spoils in Cornwall,
W76-08760 3C

SANDSTONES
The Availability of Ground Water for Irrigation in the Rice Lake-Eau Claire Area, Wisconsin,
W76-09348 4B

SANDY LAKE (OHIO)
Summer Phytoplankton Photosynthesis in a Northeastern Ohio Glacial Lake,
W76-08828 5C

SANTA BARBARA (CA)
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

SAPPA CREEK (KANSAS)
Flood Plain Information: Sappa Creek, Oberlin, Kansas.
W76-08821 4A

SAPROLEGNIA SP
Ecology of an Annual Saprolegnia Sp. (Phycomycete) Outbreak in Wild Brown Trout,
W76-08786 5C

SATELLITES (ARTIFICIAL)
An Evaluation of ERTS Data for Oceanographic uses Through Great Lake Studies,
W76-09244 2H

SAVANNAH RIVER (GA)
Report on the Hydrologic and Sedimentologic Study of the Offshore Spoil Disposal Area, Savannah, Georgia,
W76-09309 5E

SCIRPUS CYPERINUS
Mercury Uptake in Rooted Higher Aquatic Plants; Laboratory Studies,
W76-09111 5C

SEA URCHIN
Periodicity in the Biometric Variations of Loxechinus Albus Molina, (In Spanish),
W76-09089 2I

SEA WATER
Acclimation of Rainbow Trout to Sea Water,
W76-09125 2L

The Effect of Polyacrylamide on the Settling of Thames Mud,
W76-09243 2J

SEASONAL
Effect of Late Sowing on Morphogenetic Development of Panicle in Rice (Oryza Sativa L.),
W76-08758 3F

Distribution, Morphometry, and Seasonal Biology of the Planktonic Copepods, Neocalanus Robustior and N. Gracilis, in the Pacific Ocean,
W76-08951 5C

Mollusks of the Ceratophyllum Carpets of Lake Chad: Biomasses and Seasonal Variations of the Density, (In French).
W76-09094 2H

SEDIMENT CORERS
A Light Weight Corer for Sampling Soft Subaqueous Deposits,
W76-09266 2J

SEDIMENT LOAD
Sediment Loading, its Effect on a southern Arizona Lake and the Emerging Spring Zooplankton Community,
W76-09073 2J

SEDIMENT TRANSPORT
Sediment Transport, Turbidity, Channel Configuration, and Possible Effects of Impoundment of the Mad River, Humboldt County, California,
W76-09136 2J

LIBRARY U. OF I. URBANA-CHAMPAIGN

SEDIMENT TRANSPORT

Finite Element Model for Cohesive Sediment Transport,
W76-09264 2L

New York Alternative Dumpsite Assessment - Reconnaissance Study of Surficial Sediments,
W76-09383 5G

SEDIMENTARY STRUCTURES
Fundamental Geologic Principles,
W76-09362 7C

SEDIMENTATION
Coccolith Sedimentation by Fecal Pellets: Laboratory Experiments and Field Observations,
W76-08954 5C

Lamella Settling Tanks (Lamella-Absetzbecken),
W76-09003 5F

Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

SEDIMENTOLOGY
Phase III: Sedimentology,
W76-09241 2L

SEDIMENTS
Environmental Implications of Sediment Bulk Analysis Techniques for Trace Metals in Offshore Well-Drilling Operations,
W76-08908 5A

The Availability of 137-CS to Fishes from Ingested Clays,
W76-09118 5C

A Light Weight Corer for Sampling Soft Subaqueous Deposits,
W76-09266 2J

SEEPAGE
Effect of the Mozhaysk Reservoir on Soil of the Bank Area of the Surrounding Territory, (In Russian),
W76-09081 2G

Simulation of Deep Seepage to a Water Table,
W76-09245 2F

Hydrocarbons in Water and Sediment Samples from Coal Oil Point Area, Offshore California,
W76-09384 5B

SEISMIC DESIGN
Evaluation of Seismicity and Earthquake Shaking at Offshore Sites,
W76-09379 5G

SEISMIC STUDIES
Evaluation of Seismicity and Earthquake Shaking at Offshore Sites,
W76-09379 5G

SELF-PURIFICATION
Flow Velocity as a Rate Determining Factor for Self-Purification in Rivers (Uber Den Einfluss der Stromungsgeschwindigkeit auf die Selbstreinigung in Fliessgewaessern),
W76-09204 5F

Self-Purification of Small Freshwater Streams: Phosphate, Nitrate, and Ammonia Removal,
W76-09398 5G

SEPARATION TECHNIQUES
Up-Flow Separator,
W76-08983 5D

Biological Treatment of Sterilised Aqueous Waste.
W76-08995 5D

Gravity Separation of Coarse Solids in Wastewater,
W76-09028 5D

Apparatus and Process of Separating Packing House Waste,
W76-09046 5D

Environment Protective Oil Skimming and Removal Apparatus,
W76-09048 5G

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09054 5D

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09055 5D

Method for Clarifying Oily Water Mixtures,
W76-09057 5G

Separation by Solvent Extraction,
W76-09061 5D

Separation Processes Used for Pollution Control in the Pulp and Paper Industry,
W76-09340 5D

SEPTIC TANKS
Ground-Water Levels and Chemical Quality of Ground Water in Lincoln, Montana,
W76-09132 7C

Nutrient Mass Balance in Columns Representing Fill Systems for Disposal of Septic Tank Effluents,
W76-09164 5E

SESSILE ALGAE
Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

SESTON
Observation and Monitoring of Water Quality by use of Experimental Biological Methods,
W76-08793 5A

SETTLING BASINS
Lamella Settling Tanks (Lamella-Absetzbecken),
W76-09003 5F

Method for Clarifying Oily Water Mixtures,
W76-09057 5G

Sewerage Project on Upstream Area of the Yamato River,
W76-09168 5D

SETTLING VELOCITY
The Effect of Polyacrylamide on the Settling of Thames Mud,
W76-09243 2J

SEWAGE
The Effects of Waste Water Diversion on Heavy Metal Levels in the Sediments of a Large Urban Lake,
W76-08754 5B

Experiments on the Effects of Inorganic Enrichment of Rivers on Periphyton Primary Production,
W76-08787 5C

Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

Basingstoke Sewage Treatment Works, 1961-1975,
W76-09030 5D

Computer Control of Sewage and Rain Water Pumps at Sewage Treatment Plant (Gesuishorijo no osui, amamizu ponpu no keisanki seigyo),
W76-09215 8C

SEWAGE DISPOSAL
Nitrogen and Phosphorus Levels in Soils Beneath Sewage Disposal Ponds,
W76-09197 5A

SEWAGE EFFLUENTS
Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

Hydrologic Environmental Effects of Sprayed Sewage Effluent, Tallahassee, Florida,
W76-09134 5B

Sewage Effluent Infiltrates Frozen Forest Soil,
W76-09288 5B

SEWAGE SLUDGE
The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

Anaerobic Digestion of Solid Waste and Sewage Sludge into Methane,
W76-09153 5D

SEWAGE TREATMENT
Biological Effects of Primary, Secondary, and Tertiary Sewage Treatment in Lotic Analog Recipients,
W76-08792 5C

The Effects of a Synthetic Chili Waste on Biological Sewage Treatment Plant Operations,
W76-08845 5D

Waste Water Purification,
W76-08972 5D

Method and Apparatus for Chemically Purifying Sewage,
W76-08976 5D

Activated Sludge Plant,
W76-08980 5D

Aerobic Sewage Treatment System,
W76-08982 5D

Sewage Treatment System,
W76-08992 5D

Sewage Pipe Fitting,
W76-08996 5G

An Experimental Investigation of Tertiary Treatment with a Submerged Filter (Sesshoku bakkiho ni yoru gesui sanjishori no jikkenteki kenkyu),
W76-08999 5D

Electric Equipment for Mukogawa Sewage Treatment Plant, Hyogo Prefecture (Hyogoken mukogawa shorijo no denki setsubi),
W76-09000 5D

Pollution Control Plant is Designed to be an Attractive Neighbor, Too.
W76-09011 5D

Portland Adds Secondary Treatment,
W76-09013 5D

Costs of Biological Waste Water Purification (Die Kosten Der Biologischen Abwasserreinigung),
W76-09016 5D

Canadian Clarifier is Low in Cost,
W76-09019 5D

Basingstoke Sewage Treatment Works, 1961-1975,
W76-09030 5D

Method for Biologically Treating Sewage and an Installation for Carrying out the Method,
W76-09047 5D

Ligand Exchange Process for Removal of Ammonia,
W76-09056 5D

Split Stream Ultraviolet Purification Device,
W76-09058 5D

Water Purification Process and Apparatus,
W76-09059 5D

Treating Sewage as a Resource Revives Interest in Land Disposal.
W76-09151 5E

Processes Make Sewage Come Clean More Cheaply.
W76-09154 5D

Destructive Air Deodorisation at a Dublin Sewage Works,
W76-09158 5D

Preston Sewage Lift Station Meets Fluctuation in Flow,
W76-09160 8C

Chemical Feed: It's A Way of Life at Windsor,
W76-09162 5D

Water Supply and Sewage Treatment in Arid Areas,
W76-09166 5D

Package Sewage Treatment Process,
W76-09170 5D

Newmarket's Replacement Sewage Treatment Works,
W76-09176 5D

The Performance-Potential of Polyelectrolytes and High Velocity Gradients in the Treatment of Wastewaters,
W76-09179 5D

Sewage Treatment with Activated Fly-Ash and Regenerated Alum Sludge,
W76-09183 5D

The Tyneside Sewerage Scheme,
W76-09184 5D

Quality Control in Sewage Treatment Plant (Gesuishorijo no shishutsu seigyo),
W76-09205 5D

Computer Control of Sewage and Rain Water Pumps at Sewage Treatment Plant (Gesuishorijo no osui, amamizu ponpu no keisanki seigyo),
W76-09215 8C

Secondary Effluent Treatment at Northwood Pulp and Timber Limited,
W76-09297 5D

SEWER CLEANING MACHINES
Mobile Sewer Cleaning Machine,
W76-08973 8C

SEWER SYSTEMS
Up-Flow Separator,
W76-08983 5D

SEWERAGE
Dimensioning of Underground Sewer Pipelines Made of Plastic Tubes (Raschet podzemnykh kanalizatsionnykh truboprovodov iz polimernykh trub),
W76-08962 8B

The Tyneside Sewerage Scheme,
W76-09184 5D

Decision Perspectives on Urban Storm Water Pollution,
W76-09207 5G

SEWERS
Dimensioning of Underground Sewer Pipelines Made of Plastic Tubes (Raschet podzemnykh kanalizatsionnykh truboprovodov iz polimernykh trub),
W76-08962 8B

Giant Mole to Dig Sanitary District Tunnels,
W76-08963 5D

Fiberglass Fights SO3 Attack on Sewers,
W76-08964 8G

Pennsylvania Sewer Placed in Crowded Ditch,
W76-08965 8F

Storm Sewer Pipe Joints Tight After Ten Years,
W76-08966 8G

Water Control Solves Tough Sewer Problem,
W76-08967 8B

Problem: Low Headroom, Solution: Pipe Arch,
W76-08968 8G

Belleville Plant Uses 15 Pumps in Four Stations,
W76-08969 8C

Mobile Sewer Cleaning Machine,
W76-08973 8C

Sewer Cleaner Flushes Out Acids,
W76-09032 8G

SHEET FLOWS
Flood Plain Information: Maricopa County, Arizona, Volume I, Indian Bend Wash Report.
W76-08806 4A

SHELLFISH FARMING
Interrelation Between Weight and Linear Indices in Black Sea Oysters, (In Russian),
W76-09087 2I

SHINERS
Growth and Survival of Young-of-the-Year Emerald Shiners (Notropis Atherinoides) at Different Temperatures,
W76-08779 5C

SHORELINE COVER
Trout Population Responses to Streamflow Fluctuation and Habitat Management in Big Roche-A-Cri Creek, Wisconsin,
W76-08789 4A

SHRIMP
Toxicity of Some Chemical Therapeutics to the Commercial Shrimp, Penaeus Californiensis,
W76-08796 5C

Feeding Behavior and Temperature and Light Tolerance of Mysis Relicta in the Laboratory,
W76-08931 5C

SIDERITE
Toxicity Study - Drilling Fluid Chemicals on Aquatic Life,
W76-08895 5C

SIEVES
A Method for the Rapid Sorting of Plankton into a Number of Size Groups,
W76-09397 7B

SILVER
Some Comments on Interferences by CU(II) Ions and AG(I) Ions on the Wet Reduction-Flameless Atomic Absorption Determination of Mercury,
W76-09039 5A

SIMULATION ANALYSIS
A Simulation Model of Biophysiochemical Transformations of Nitrogen in tile-Drained Corn Belt Soil,
W76-08761 5B

SLUDGE
Sludge Handling and Disposal: A Special Report,
W76-09012 5D

The Phenol-Sulfuric Acid Test,
W76-09191 5A

Hydraulic Calculation of Sludge Pipelines in Waste Water Treatment Plants (De hydraulische berekening van slibwaterleidingen op rioolwaterzuiveringstallaties),
W76-09208 8C

SLUDGE DISPOSAL
The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

Fluidized Furnace Construction for Burning Partly Dehydrated Sludge,
W76-08988 5E

Sludge Handling and Disposal: A Special Report,
W76-09012 5D

Utilization of Wastewater Sludge for Agricultural Soil Enrichment,
W76-09219 5D

Agronomic and Cattle Studies with Municipal Liquid Digested Sludge,
W76-09367 5E

SLUDGE FILTER CAKE
Process for Treating Sewage Sludge and Fertilizer Products Thereof,
W76-08984 5D

SLUDGE PIPELINES
Hydraulic Calculation of Sludge Pipelines in Waste Water Treatment Plants (De hydraulische berekening van slibwaterleidingen op rioolwaterzuiveringstallaties),
W76-09208 8C

SLUDGE TREATMENT
Waste Water Treatment Plant,
W76-08977 5D

LIBRARY U. OF I. URBANA-CHAMPAIGN

Process for Treating Sewage Sludge and Fertilizer Products Thereof,
W76-08984 5D

Centrifuge Preventing Air Admission During Sludge Discharge,
W76-08990 5D

Removal of Water from Sludges with Filter Presses (Schlammentwaesserung Mit Pressfiltern),
W76-08998 5D

Sludge Sterilization by Gamma Rays (La Sterilizzazione Dei Fanghi Con Raggi Gamma),
W76-09004 5D

Disinfection of Urban Sewage Sludge (La Desinfection Des Bous Residuaires Urbaines),
W76-09007 5D

Application of Centrifuges. Dewatering of Sludges from Waterworks (Applicazione Di Centrifughe. Disidratazione Di Fanghi Provenienti Da Impianti Di Potabilizzazione),
W76-09008 5F

Sludge Handling and Disposal: A Special Report,
W76-09012 5D

Modern Filter Press Technology for Sewage Sludge Dewatering,
W76-09021 5D

Basingstoke Sewage Treatment Works, 1961-1975,
W76-09030 5D

Wastewater Plant will Use no Chemicals for Sludge Conditioning,
W76-09161 5D

Alum Sludge from Water Plant Conditions Sewage Sludge,
W76-09163 5F

The Effect of Flocculants on Postcoagulation Sludge Dewatering (Wplyw flokulantow na odwadnialnosc osadow pokoagulacyjnych),
W76-09174 5D

Conditioning Improves Sludge Filterability,
W76-09181 5D

Study on the Balance of Heavy Metals in Activated Sludge Treatment Process (Gesui shori shisetsu ni okeru jukinzokurui no shushi ni kansuru kenkyu),
W76-09222 5A

New Method for Removing Sodium Sulfide from Sludge,
W76-09278 5D

Continuous Filter for Dewatering Sludges (Filtre continu de deshydratation des boues),
W76-09279 5D

SLUICE GATES
Pressure Fluctuations in Submerged Jump,
W76-09265 8B

SNAIL EGG PRODUCTION
Effect of Constant and Varying Temperature on Egg Production of Lymnaea Obrussa Say (Mollusca: Gastropoda),
W76-09120 5C

SNAILS
Mollusks of the Ceratophyllum Carpets of Lake Chad: Biomasses and Seasonal Variations of the Density, (In French).
W76-09094 2H

Effect of Constant and Varying Temperature on Egg Production of Lymnaea Obrussa Say (Mollusca: Gastropoda),
W76-09120 5C

SNAKE RIVER (WASH)
Recreation Use Patterns and User Attitudes on the Snake River,
W76-08751 6B

SNOW
Apparatus and Method for Making Snow with Uniform Drop Size,
W76-09051 7B

SNOW MANAGEMENT
Zonation of Snow Conditions in Forest-Tundra, Hudson Bay, New Quebec, (In French),
W76-08759 2C

SNOWMELT
Oversnow Runoff Events Affect Streamflow and Water Quality,
W76-09274 2C

SOCKEYE SALMON
Chemical Characteristics, Acute Toxicity and Detoxification of Foam in Two Aerated Lagoons,
W76-09295 5C

SODIUM
The Effect of Road Deicing Salts on Sodium Concentration in an Urban Water Course,
W76-09218 5B

SODIUM SULFIDE
New Method for Removing Sodium Sulfide from Sludge,
W76-09278 5D

SOIL AMENDMENTS
The Effect of Certain Synthetic Macromolecular Substances on the Physico-Chemical Properties of Soil and on the Fertilizer Utilization Coefficient, (In French),
W76-08981 2G

Effects of Lime, Phosphate and Soil Conditioner on Growth and Fruit Quality of Netted Melon, (In Japanese),
W76-08989 3C

SOIL ANALYSIS
Improved Procedure for Ion Exchange Experiments with Soils Using Leaching Tubes, and Handling of Water Repellent Soils, (In German),
W76-08762 2G

Nitrogen and Phosphorus Levels in Soils Beneath Sewage Disposal Ponds,
W76-09197 5A

SOIL CONSERVATION
Soil and Water Conservation with Western Iowa Tillage Systems,
W76-08805 4D

Plant Collection for Saltland Revegetation and Soil Conservation,
W76-09071 2I

Wind Erosion: The Protective Role of Simulated Standing Stubble,
W76-09247 4D

SOIL EROSION
Wind Erosion: The Protective Role of Simulated Standing Stubble,
W76-09247 4D

SOIL MANAGEMENT
Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

SOIL MICROORGANISMS
Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms,
W76-08752 5B

Desert Ecosystems: Higher Trophic Levels,
W76-09064 2A

SOIL MOISTURE
Water Retention by Core and Sieved Soil Samples,
W76-08802 2G

Effect of Soil-Moisture Regimes and N and P Fertilization on Berseem Grown for Fodder,
W76-08987 3F

Effect of Air Humidity on Stomatal and Mesophyll Conductivity of Bean Leaves at Two Soil Moisture Levels, (In Russian)
W76-09097 2I

SOIL PHYSICAL PROPERTIES
The Effect of Certain Synthetic Macromolecular Substances on the Physico-Chemical Properties of Soil and on the Fertilizer Utilization Coefficient, (In French),
W76-08981 2G

SOIL PROPERTIES
The Relationship Between Heat Conductance and the Moisture Content of the Soil, (In Dutch),
W76-08769 2G

Variability of Hydraulic Conductivity in Two Subsurface Horizons of Two Silt Loam Soils,
W76-09257 2G

Drainage System Effects on Physical Properties of a Lakebed Clay Soil,
W76-09259 2G

Determining Both Water Characteristics and Hydraulic Conductivity of a Soil Core at High Water Contents from a Transient Flow Experiment,
W76-09271 2G

SOIL STRENGTH
Evaluation of Offshore Breakwater Stability Under Wave Action,
W76-09387 5G

SOIL TESTS
Determining Both Water Characteristics and Hydraulic Conductivity of a Soil Core at High Water Contents from a Transient Flow Experiment,
W76-09271 2G

SOIL WATER
Water Retention by Core and Sieved Soil Samples,
W76-08802 2G

Hydraulic Properties of a Porous Medium: Measurement and Empirical Representation,
W76-09255 2G

Surface Residue, Water Application, and Soil Texture Effects on Water Accumulation,
W76-09258 2G

OIL WATER MOVEMENT
Conditions for Using a Tensionplate as a Lysimeter, (In German),
W76-09082 2G

Vertical Flow of Air and Water with a Flux Boundary Condition,
W76-09251 2G

OIL-WATER-PLANT RELATIONSHIPS
Zinc Nutrition of Rice in Relation to Iron and Manganese Uptake Under Different Water Regimes,
W76-08974 3F

Effect of Soil-Moisture Regimes and N and P Fertilization on Berseem Grown for Fodder,
W76-08987 3F

Plant Collection for Saltland Revegetation and Soil Conservation,
W76-09071 2I

SOILS
Determining the Hydraulic Conductivity of Soil Cores by Centrifugation,
W76-09256 2G

Variability of Hydraulic Conductivity in Two Subsurface Horizons of Two Silt Loam Soils,
W76-09257 2G

SOLAR ENERGY
There is Something New Under the Sun,
W76-09152 5D

SOLID WASTES
Anaerobic Digestion of Solid Waste and Sewage Sludge into Methane,
W76-09153 5D

SOLIDS REMOVAL
Gravity Separation of Coarse Solids in Wastewater,
W76-09028 5D

SOLVENT EXTRACTIONS
Separation by Solvent Extraction,
W76-09061 5D

SORGHUM
No-Till Seeding of Irrigated Sorghum Double Cropped After Wheat,
W76-08756 3F

SOUTH AFRICA
On the Components of Time Series; The Removal of Spatial Dependence,
W76-08803 2B

SOUTH AMERICA
Vegetational Strata in Perhumid and Perarid Regions of the Tropical Andes, (In German)
W76-09083 2I

SOUTH CALIFORNIA BIGHT
Cruise Summary, A. Southern California Bight Studies (SCBS).
W76-08960 5C

SOUTH CAROLINA
Ecology of Artificially Heated Streams, Swamps and Reservoirs on the Savannah River Plant, the Thermal Studies Program of the Savannah River Ecology Laboratory,
W76-08870 5C

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards Experimental Studies,
W76-09157 5D

SOUTH WALES
Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

SOUTHWEST U.S.
Potentially Beneficial Uses of Sulfuric Acid in Southwestern Agriculture,
W76-08766 3F

Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

SOYBEANS
Natural (15)N Abundance in Soil, Leaves, and Grain as Influenced by Long Term Additions of Fertilizer N at Several Rates,
W76-08765 3F

SPAIN (AROSA RIVER ESTUARY)
Mercury Concentrations in Spring and Fall Zooplankton of the Estuary of the Arosa River, (In Spanish),
W76-08768 5C

SPATIAL DISTRIBUTION
The Replication of Biological Events in Enclosed Water Columns,
W76-09226 5C

SPAWNING
Ecology of an Annual Saprolegnia Sp. (Phycomycete) Outbreak in Wild Brown Trout,
W76-08786 5C

SPECIES DIVERSITY
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

SPECIFIC YIELD
Determination of the Hydraulic Conductivity - Drainable Porosity Ratio from Water Table Measurements,
W76-09249 2F

SPECTRAL ANALYSIS
On the Components of Time Series; The Removal of Spatial Dependence,
W76-08803 2B

SPECTROPHOTOMETRY
Simultaneous Spectrophotometric Determination of Nickel and Cobalt in Mixtures with 3-Hydroxypicolinealdehyde Azine,
W76-09042 5A

Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

Flow Injection Analysis. Part IV. Stream Sample Splitting and Its Application to the Continuous Spectrophotometric Determination of Chloride in Brackish Waters,
W76-09339 5A

SPILLWAYS
Stepped Baffled Trash Rack for Drop Inlets,
W76-09250 8B

SPIRULINA-PLATENSIS
Biochemical Characteristics of Spirulina Platensis (GOM.) Geitl.: I. Water-Soluble Group B Vitamins, (In Ukranian),
W76-09091 2I

SPOIL BANKS
Report on the Hydrologic and Sedimentologic Study of the Offshore Spoil Disposal Area, Savannah, Georgia,
W76-09309 5E

SPRINKLER IRRIGATION
Pressure and Flow Regulation Device,
W76-09049 3F

STANDARDS
Indicators of Air and Water Quality are Tackled by CEQ for Consistency,
W76-08838 5A

Can the Criteria and Methodology Used for Radioactive Discharges be Applied to Thermal Discharges. (Les Criteres et La Methodologie Retenus Pour les Rejets Radioactifs Sont-Ils Transposables Aux Rejets Thermiques.),
W76-08887 5G

Objectives of Well-Drilling Regulations,
W76-08917 5G

STATE GOVERNMENTS
A Guide to State Programs for the Reclamation of Surface Mined Areas,
W76-09142 5G

STATISTICAL METHODS
On the Components of Time Series; The Removal of Spatial Dependence,
W76-08803 2B

Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

Statistics of Data Transfer,
W76-09133 4A

Rainfall Trends in the West African Sahel,
W76-09269 2B

STATISTICS
Interrelation Between Weight and Linear Indices in Black Sea Oysters, (In Russian),
W76-09087 2I

STEEL PIPES
Problem: Low Headroom, Solution: Pipe Arch,
W76-08968 8G

STOCHASTIC PROCESSES
On the Components of Time Series; The Removal of Spatial Dependence,
W76-08803 2B

Mountainous Winter Precipitation: A Stochastic Event-Based Approach,
W76-09062 2B

STOCKTON (CA)
Flood Plain Information: Northeast Stream Group, Stockton, California.
W76-08810 4A

STOMATA
Effect of Air Humidity on Stomatal and Mesophyll Conductivity of Bean Leaves at Two Soil Moisture Levels, (In Russian)
W76-09097 2I

STORM RUNOFF
Storm Sewer Pipe Joints Tight After Ten Years,
W76-08966 8G

Decision Perspectives on Urban Storm Water Pollution,
W76-09207 5G

STREAM FISHERIES
Fish Habitat in Forest Lands,
W76-09233 8I

LIBRARY U. OF A. ARBORETUM-BOTANICAL GARDEN

STREAMFLOW
Discharge Data at Water-Quality Monitoring Stations in Arkansas,
W76-09145 7C

Low-Flow Characteristics and Mean Annual Discharge of North Branch Manitowoc River at Potter, Wisconsin,
W76-09147 7C

Oversnow Runoff Events Affect Streamflow and Water Quality,
W76-09274 2C

STREAMFLOW FORECASTING
Flood Plain Information: Northeast Stream Group, Stockton, California.
W76-08810 4A

Flood Plain Information: Cow Creek, Palo Cedro, California.
W76-08817 4A

Statistics of Data Transfer,
W76-09133 4A

STREAMS
A Technique for Estimating the Time of Travel of Water in Indiana Streams,
W76-09138 4A

Results of Phytoplankton Sampling at National Stream Quality Accounting Network Stations in Montana--1975 Water Year,
W76-09146 5A

STRIP MINES
A Guide to State Programs for the Reclamation of Surface Mined Areas,
W76-09142 5G

STRUCTURAL PERFORMANCE (DRAINS)
Structural Performance of Buried Plastic Drain Tubing,
W76-08771 8G

SUBMERGED JUMP
Pressure Fluctuations in Submerged Jump,
W76-09265 8B

SUBMERGED LANDS ACT
Responsibilities of Offshore Drilling Regulations,
W76-08918 5G

SUBMERGENCE
Pressure Fluctuations in Submerged Jump,
W76-09265 8B

SUBSIDENCE
Flood Plain Information: Guadalupe River, Santa Clara County, California.
W76-08815 4A

SUBSURFACE DRAINAGE
Application of Ground-Water Flow Theory to a Subsurface Oil Spill,
W76-09350 2L

SUBSURFACE FLOW
Application of Ground-Water Flow Theory to a Subsurface Oil Spill,
W76-09350 2L

SUBSURFACE INVESTIGATION
How to Get Good Samples by Rotary Drilling,
W76-09363 8G

SUBSURFACE OIL SPILL
Application of Ground-Water Flow Theory to a Subsurface Oil Spill,
W76-09350 2L

SUCCESSION
Changes in the Algal Flora of East Harbor, Ottawa County, Ohio, Since 1900,
W76-08834 5C

Environmental Changes in a Portion of Lake Ontario Following Pollution Abatement,
W76-09119 5C

SULFITE
The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

SULFITE LIQUORS
On Spent Semichemical Pulping Liquors. (4) Xylan in Neutral Sulfite Semichemical Spent Liquor (In Japanese),
W76-09338 5C

SULFUR COMPOUNDS
The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

SULFUR DIOXIDE
The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

SULFURIC ACID
Potentially Beneficial Uses of Sulfuric Acid in Southwestern Agriculture,
W76-08766 3F

SUMMER
Summer Phytoplankton Photosynthesis in a Northeastern Ohio Glacial Lake,
W76-08828 5C

SUNFISHES
Physiological Effects of Sublethal Levels of Acid Water on Fish,
W76-08927 5C

Phosphorous Flux Through Fishes,
W76-09104 5C

The Availability of 137-CS to Fishes from Ingested Clays,
W76-09118 5C

SUPERPORTS
Microbial Ecology of Petroleum Utilization in Chesapeake Bay,
W76-09319 5C

Evaluation of Multi-Purpose Industrial-Port Islands: Sea Island Structure Engineering Research Study,
W76-09375 5G

Offshore Multi-Use Port Islands and Their Environment,
W76-09376 5G

SURFACE RESIDUE
Surface Residue, Water Application, and Soil Texture Effects on Water Accumulation,
W76-09258 2G

SURFACE ROLLING
Pressure Fluctuations in Submerged Jump,
W76-09265 8B

SURFACE RUNOFF
Oversnow Runoff Events Affect Streamflow and Water Quality,
W76-09274 2C

SURFACE WATERS
Summary of Hydrologic Data Collected During 1974 in Dade County Florida,
W76-09135 7C

Summary Appraisals of the Nation's Ground-Water Resources--California Region,
W76-09139 4B

Water Resources of Walton County, Florida,
W76-09149 4A

SURFACTANTS
Interaction Between Surfactant and Dye IV. Application of the Acridine Orange Method to the Survey of Pollution of Alkylbenzene Sulfonate in Rivers and the Survey of Water Pollution in Kinokawa,
W76-09364 5A

SURVEYS
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

Microbiological and Algological Survey of A Primary Stage of Eutrophication in a Stream, (In French),
W76-09399 5C

SUSPENDED SOLIDS
Areal and Seasonal Variations in the Chemistry of Suspended Particulate Matter in a Deep Water Fjord,
W76-08829 2L

Application of Centrifuges. Dewatering of Sludges from Waterworks (Applicazione Di Centrifughe. Disidratazione Di Fanghi Provenienti Da Impianti Di Potabilizzazione),
W76-09008 5F

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards Experimental Studies,
W76-09157 5D

Filter Media Comparison at Prince George Pulp and Paper (Limited),
W76-09286 5D

Suspended Solids Removal from Woodroom Effluent,
W76-09289 5D

Papeteries De L'AA -- Suspended Solids Reduced by 98%, Organic Materials by 74% (Papeteries de l'Aa -- mes reduites de 98%, et MO de 74%),
W76-09341 5D

SUSQUEHANNA RIVER BASIN
A Critical Study of Flood Protection Planning in the Susquehanna River Basin: 1936-1972,
W76-08846 6F

SWEDEN
Closing the White Water System of Paper Machines -- Effective Protection of the Environment (Fechamento do sistema de agua branca das maquinas de papel -- uma potecao lucrativa do meio ambiente),
W76-09342 3E

SWEET CORN
Effect of Drilling Fluid Components Mixtures on Plants and Soils,
W76-08897 5C

SWITZERLAND
Costs of Biological Waste Water Purification (Die Kosten Der Biologischen Abwasserreinigung),
W76-09016 5D

STEMATICS
Isolation and Characterization of Actinopolyspora Halophila, Gen. ET SP. Nov., An Extremely Halophilic Actinomycete,
W76-08837 5C

The Application of the Scanning Electron Microscope to Freshwater Phytoplankton Taxonomy and Morphology,
W76-09225 5A

LLAHASSEE (FLA)
Hydrologic Environmental Effects of Sprayed Sewage Effluent, Tallahassee, Florida,
W76-09134 5B

NKERS
An Analysis of Oil Outflows Due to Tanker Accidents,
W76-09313 5B

Occurrence, Cause and Avoidance of the Spilling of Oil by Tankers,
W76-09314 5B

R-NEUSE RIVER BASIN (NC)
Agricultural Water Demands in North Carolina,
W76-08841 3F

CHNOLOGY
Monograph of the Effectiveness and Cost of Water Treatment Processes for Removal of Specific Contaminants. Vol. 1. Technical Manual,
W76-09227 5F

Capabilities and Costs of Technology Associated with the Achievement of the Requirements and Goals of the FWPCA of 1972 for Pulp and Paper Industry.
W76-09229 5G

EMEFOS
Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

EMPERATURE
Growth and Survival of Young-of-the-Year Emerald Shiners (Notropis Atherinoides) at Different Temperatures,
W76-08779 5C

Feeding Behavior and Temperature and Light Tolerance of Mysis Relicta in the Laboratory,
W76-08931 5C

Temperature Influence on Chemical Toxicity to Aquatic Organisms,
W76-08934 5C

Experimental Study of the Effect of Temperature and Degree of Oxygen Saturation on the Destruction rate of Soluble Proteins in Natural Waters, (In Russian),
W76-09078 5C

Temperature, Oxygen, and Nutrient Distribution Patterns in Lake Erie, 1970,
W76-09262 5B

ENSIOMETERS
Conditions for Using a Tensionplate as a Lysimeter, (In German),
W76-09082 2G

ERTIARY TREATMENT
Biological Effects of Primary, Secondary, and Tertiary Sewage Treatment in Lotic Analog Recipients,
W76-08792 5C

An Experimental Investigation of Tertiary Treatment with a Submerged Filter (Sesshoku bakkiho ni yoru gesui sanjishori no jikkenteki kenkyu),
W76-08999 5D

Advanced Waste Treatment Plant Features Nitrification,
W76-09020 5D

Municipal Waste Water Treatment by Ozone (Ozon ni yoru toshigesui shori),
W76-09025 5D

Decolorization of Night Soil Treatment Plant Effluent by Ozone (Ozon ni yoru shinyo shorisui no dasshoku),
W76-09026 5D

Review of Advanced Treatment Techniques for Waste Water,
W76-09159 5D

Regina Tertiary Treatment Plant Study and Design, Part I, Case History,
W76-09178 5D

TEST WELLS
How to Get Good Samples by Rotary Drilling,
W76-09363 8G

TESTING PROCEDURES
Observation and Monitoring of Water Quality by use of Experimental Biological Methods,
W76-08793 5A

The Application of the Scanning Electron Microscope to Freshwater Phytoplankton Taxonomy and Morphology,
W76-09225 5A

TETRAHYMENA PYRIFORMIS
Axenic Cultures of Tetrahymena Pyriformis as Toxicological Tools,
W76-09121 5A

TEXAS
A Reservoir Cove Ecosystem Model,
W76-08830 5C

Regulation of Onshore and Offshore Oil Field Waste Disposal,
W76-08919 5E

Quantitative Assessment of Changes in Urban Runoff,
W76-09267 4C

TEXAS COUNTY (OKLA)
Subsurface Brine Disposal - Be Reasonable,
W76-09261 5B

THALLIUM
Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

THAMES RIVER (ENGLAND)
The Effect of Polyacrylamide on the Settling of Thames Mud,
W76-09243 2J

THERMAL DISCHARGE
Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

THERMAL EFFECTS
Management of Waste Heat at Nuclear Power Stations, Its Possible Impact on the Environment, and Possibilities of its Economic Use,
W76-08849 5G

Environmental Aspects of the Cooling Systems of Thermal Power Stations: Report on the Seminar Held at Zurich, May Conclusions and Recommendations, (Les Aspects D'Environment Des Systems De Refroidissement Des Centralles Thermiques),
W76-08850 6G

THERMAL POLLUTION
Effects of Thermal Circulation on Phytoplankton Photosynthesis,
W76-08785 5C

Environmental Effects of Cooling Systems at Nuclear Power Plants,
W76-08848 5C

A Comparison of Aerial Infra-Red and In-Situ Thermal Plume Measurement Techniques,
W76-08860 5A

The Chalk Point Cooling Tower Project,
W76-08861 5B

Seasonal Feature of Thermal Abatement of Shoreline Discharges at Nuclear Sites,
W76-08862 5G

United Kingdom Experience of the Physical Behaviour of Heated Effluents in the Atmosphere and in Various Types of Aquatic Systems,
W76-08863 5B

Waste-Heat Disposal from Steam Electric Plants with Reference to the Stochastic Nature of Some Environmental Conditions and to Thermal Pollution Control Regulations,
W76-08865 5G

Thermal Discharge Studies on the Great Lakes-the Canadian Experience,
W76-08869 5G

Ecology of Artificially Heated Streams, Swamps and Reservoirs on the Savannah River Plant, the Thermal Studies Program of the Savannah River Ecology Laboratory,
W76-08870 5C

Effects of a Thermal Discharge into a River on the Movement of Fish Populations, (Incidences D'un Rejet Thermique En Milieu Fluvial Sur Les Mouvements Des Populations Ichtyologiques),
W76-08871 5C

Thermal Studies on Tropical Marine Ecosystems in Puerto Rico,
W76-08872 5C

Environmental Effects of the Heated Discharges From Bradwell Nuclear Power Station, and of the Cooling Systems of Other Stations,
W76-08873 5C

Influence of Heat from the Gentilly Nuclear Power Station on Water Temperature and Gastropoda, (Influence De L'Apport Thermique Originaire de la Centrale Nucleaire Gentilly Sur La Temperature De L'eau Et Sur Les Gasteropodes),
W76-08874 5C

Studies Carried out in France on the Ecological Consequences of Open-Circuit Cooling in Thermal Power Stations, (Etudes Realisees en France sur Les Consequences Ecologiques de la Refrigeration des Centrales Thermiques en Circuit Ouvert),
W76-08875 5C

LIBRARY U. OF A. UNDERWATER ENGR.

Behavioural Responses of Lake Michigan Fishes to a Nuclear Power Plant Discharge,
W76-08876 5C

Thermal Effects on Marine Biota in Experimental Systems,
W76-08877 5C

Effects of Temperature, Copper and Chlorine on Fish During Simulated Entrainment in Power-Plant Condenser Cooling Systems,
W76-08878 5C

Effects of Heat Enrichment on Species Succession and Primary Production in Fresh-Water Plankton,
W76-08879 5C

Aquatic Physiology of Thermal and Chemical Discharges,
W76-08880 5C

Thermal Ecology of Dragonflies in Habitats Receiving Reactor Effluent,
W76-08881 5C

Temperature Selection By Fish--A Factor in Power-Plant Impact Assessments,
W76-08882 5C

Predicting the Ecological Consequences of Thermal Pollution from Observations on Geothermal Habitats,
W76-08883 5C

A Comparison of Short-Term Effects of Thermal Addition on Photosynthesis and Plant-Water Stress in Three Ecosystems,
W76-08884 5C

Development and Application of Criteria for Marine Cooling Waters,
W76-08885 5G

Regulations and Environmental Investigations Associated with Nuclear Station Thermal Discharges,
W76-08886 5G

Can the Criteria and Methodology Used for Radioactive Discharges be Applied to Thermal Discharges. (Les Criteres et La Methodologie Retenus Pour les Rejets Radioactifs Sont-Ils Transposables Aux Rejets Thermiques.),
W76-08887 5G

Comparative Effects of Two Modes of Cooling Water Discharge on Mississippi River Biota and Environmental Ecosystems,
W76-08888 5C

Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

The Effect of Thermal Pollution on the Distribution of Naegleri Fowleri,
W76-08930 5C

THERMAL PROPERTIES

Thermal Degradation of Drilling Mud Additives,
W76-08901 8G

THERMAL STRATIFICATION

Field Evaluation of a Predictive Model for Thermal Stratification in Lakes and Reservoirs,
W76-08920 2H

Thermal Structure of Lake Mascardi (Province of Rio Negro, Argentina, (In Spanish),
W76-09358 2H

THERMAL STRESS

Laboratory and Field Tests of Temperature Tolerance on Gambusia A. Affinis, the Western Mosquitofish,
W76-08798 5C

THERMOCLINE

Sediment Loading, its Effect on a southern Arizona Lake and the Emerging Spring Zooplankton Community,
W76-09073 2J

THERMOPERIODISM

Effect of Constant and Varying Temperature on Egg Production of Lymnaea Obrussa Say (Mollusca: Gastropoda),
W76-09120 5C

THIXOTROPIC COLLOIDAL SUSPENSION

The Handling and Treating of Water-Based Drilling Muds,
W76-08912 5D

TIDAL EFFECTS

Mass Transport and Dispersion Off a Tidal Inlet,
W76-09381 5G

TIDE POOLS

Resilience of a Rocky Intertidal Fish Community in a Physically Unstable Environment,
W76-09126 5C

TIDES

Resilience of a Rocky Intertidal Fish Community in a Physically Unstable Environment,
W76-09126 5C

TIGRIS-EUPHRATES ESTUARIES

Investigations on the Phytoplankton and Some Environmental Parameters of the Shattal-Arab (Iraq), (In German)
W76-09084 2L

TIMING

An Automatic Release Instrument with Underwater Buoy for Marking of Field Equipment,
W76-09268 7B

TOADS

Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo Boreas),
W76-09115 5C

TOBACCO

Interception of Rainfall at Different Growth Stages by the Canopy of Tobacco Plants, (In Japanese).
W76-08986 3F

TOPSOIL

Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

TOTAL OXYGEN DEMAND

Instrumentation for Analyzing TOD (Instrumentelle TSB-Analytik),
W76-09185 5A

TOXIC INDUSTRIAL CHEMICALS

Environmental Aspects of Chemical Use in Well Drilling Operations.
W76-08889 5G

TOXICITY

The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

A Continuous Flow Bioassay Method to Evaluate the Effects of Outboard Motor Exhausts and Selected Aromatic Toxicants on Fish,
W76-08780 5C

Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

River Pollution by Anticholinesterase Agents,
W76-08782 5C

Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

Toxicity of Some Chemical Therapeutics to the Commercial Shrimp, Penaeus Californiensis,
W76-08796 5C

Toxicity Study - Drilling Fluid Chemicals on Aquatic Life,
W76-08895 5C

Effect of Drilling Fluid Components Mixtures on Plants and Soils,
W76-08897 5C

Acute Toxicity of Well-Drilling to Rainbow Trout,
W76-08899 5A

Toxicity and Environmental Properties of Chemicals used in Well-Drilling Operations,
W76-08906 5C

The Toxicity of Drilling Fluids, Their Testing and Disposal,
W76-08911 5D

A Method for Estimating the Toxicity of Chlorinated Discharges,
W76-08928 5C

Temperature Influence on Chemical Toxicity to Aquatic Organisms,
W76-08934 5C

Behavioral Impairment Produced by Exposure to Subclinical Amounts of Methylmercury Chloride,
W76-09037 5C

The Effect of Lead on Mouse Brain Development,
W76-09038 5C

Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo Boreas),
W76-09115 5C

Axenic Cultures of Tetrahymena Pyriformis as Toxicological Tools,
W76-09121 5A

Endrin Toxicity and Distribution in Freshwater: A Review,
W76-09122 5C

Measurement of Metal Toxicity by Biochemical Oxygen Demand,
W76-09127 5A

Acute Toxicity to Juvenile Rainbow Trout (Salmo Gairdneri) of Naturally Occurring Insect Juvenile Hormone Analogues,
W76-09282 5C

Practical Application of the Toxicity Emission Rate Concept in a Survey of Maritime Pulp and Paper Mills,
W76-09293 5A

Chemical Characteristics, Acute Toxicity and Detoxification of Foam in Two Aerated Lagoons,
W76-09295 5C

Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon,
W76-09298 5D

Effects of Color and Toxic Constituents of Bleached Kraft Mill Effluent on Algal Growth,
W76-09300 5C

The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

Biological Effects of Refinery Effluents,
W76-09322 5C

Respiratory Response of Juvenile Chinook Salmon and Striped Bass Exposed to Benzene, A Water-Soluble Component of Crude Oil,
W76-09323 5C

On Spent Semichemical Pulping Liquors. (4) Xylan in Neutral Sulfite Semichemical Spent Liquor (In Japanese),
W76-09338 5C

OXINS

Fish Toxicity of Dispersed Clay Drilling Mud Deflocculants,
W76-08896 5C

RACE ELEMENTS

Experiments on the Effects of Inorganic Enrichment of Rivers on Periphyton Primary Production,
W76-08787 5C

Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

Environmental Implications of Sediment Bulk Analysis Techniques for Trace Metals in Offshore Well-Drilling Operations,
W76-08908 5A

Contents of Eleven Trace Elements in Ureilite Achondrites,
W76-09041 5A

The Formation and Detection of Metal Dispersion Halos in Organic Lake Sediments,
W76-09129 2J

RACE METALS

Environmental Implications of Sediment Bulk Analysis Techniques for Trace Metals in Offshore Well-Drilling Operations,
W76-08908 5A

TRADESCENTIA-FLUMINENSIS

Effect of the Water Regime on the Heat-Resistance of Leaf Cells of Heat-Hardened Tradescantia Fluminensis Vell. Plants, (In Russian),
W76-09102 2I

TRASH RACKS

Stepped Baffled Trash Rack for Drop Inlets,
W76-09250 8B

TRAVEL TIME

A Technique for Estimating the Time of Travel of Water in Indiana Streams,
W76-09138 4A

TREATMENT FACILITIES

Waste Water Treatment Plant,
W76-08977 5D

Activated Sludge Plant,
W76-08980 5D

Ozonization of Water in Moscow (Ozonisation De L'Eau a Moscou),
W76-08997 5F

Electric Equipment for Mukogawa Sewage Treatment Plant, Hyogo Prefecture (Hyogoken mukogawa shorijo no denki setsubi),
W76-09000 5D

Waste Water Purification Plant Uhwiesen-Dachsen (Abwasserreingungsanlage Uhwiesen-Dachsen),
W76-09005 5D

Pollution Control Plant is Designed to be an Attractive Neighbor, Too.
W76-09011 5D

Portland Adds Secondary Treatment,
W76-09013 5D

Coatings for Wastewater Treatment Plants,
W76-09014 8G

Costs of Biological Waste Water Purification (Die Kosten Der Biologischen Abwasserreinigung),
W76-09016 5D

Advanced Waste Treatment Plant Features Nitrification,
W76-09020 5D

Basingstoke Sewage Treatment Works, 1961-1975,
W76-09030 5D

Wastewater Research Facility Designed for Comparative Testing,
W76-09031 5D

Water Plant Waste Treatment: State of the Art, Part II,
W76-09045 5D

Method for Biologically Treating Sewage and an Installation for Carrying out the Method,
W76-09047 5D

There is Something New Under the Sun,
W76-09152 5D

Three-Media Filtration Plant Treats a Problem Water,
W76-09155 5F

Wastewater Plant will Use no Chemicals for Sludge Conditioning,
W76-09161 5D

Sewerage Project on Upstream Area of the Yamato River,
W76-09168 5D

Package Sewage Treatment Process,
W76-09170 5D

Newmarket's Replacement Sewage Treatment Works,
W76-09176 5D

Combined Utility Provides Water and Wastewater Treatment.
W76-09177 5D

Regina Tertiary Treatment Plant Study and Design, Part I, Case History,
W76-09178 5D

The Tyneside Sewerage Scheme,
W76-09184 5D

Probability Models of Wastewater Treatment Plant Operation,
W76-09210 5D

Secondary Effluent Treatment at Northwood Pulp and Timber Limited,
W76-09297 5D

Secondary Treatment at Ontario-Minnesota Pulp and Paper Company Limited, Fort Frances, Ontario,
W76-09301 5D

TREES

Effects of Initial Flooding on Forest Vegetation at Two Oklahoma Lakes,
W76-08831 4A

TROPHIC LEVEL

Mercury Content of Biota in Coastal Waters in Hawaii,
W76-08776 5C

Desert Ecosystems: Higher Trophic Levels,
W76-09064 2A

TROPICAL REGIONS

Thermal Studies on Tropical Marine Ecosystems in Puerto Rico,
W76-08872 5C

TROUT

The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W76-08753 5C

Ecology of an Annual Saprolegnia Sp. (Phycomycete) Outbreak in Wild Brown Trout,
W76-08786 5C

Glycerophosphatide Content and Composition of Trout (Salvelinus Fontinalis M.) Brain,
W76-08929 5C

TUNDRA

Zonation of Snow Conditions in Forest-Tundra, Hudson Bay, New Quebec, (In French),
W76-08759 2C

TUNNELS

Giant Mole to Dig Sanitary District Tunnels,
W76-08963 5D

TURBIDITY

Sediment Transport, Turbidity, Channel Configuration, and Possible Effects of Impoundment of the Mad River, Humboldt County, California,
W76-09136 2J

TURTLES

Insecticide Residues in Two Turtle Species Following Treatment with DDT,
W76-08778 5C

TYNDALLIZATION

Disinfection of Urban Sewage Sludge (La Desinfection Des Bous Residuaires Urbaines),
W76-09007 5D

ULTRAVIOLET RADIATION

Split Stream Ultraviolet Purification Device,
W76-09058 5D

ULTRAVIOLET WATER PURIFICATION

Split Stream Ultraviolet Purification Device,
W76-09058 5D

LIBRARY U. OF I. URBANA-CHAMPAIGN

UNDERGROUND STORAGE
Hydrologic Concepts of Artificially Recharging the Floridan Aquifer in Eastern Orange County, Florida-A Feasibility Study,
W76-09150 4B

UNIT HYDROGRAPHS
Unit Hydrographs - A Comparative Study,
W76-09254 2E

UP-FLOW SEPARATORS
Up-Flow Separator,
W76-08983 5D

URBAN RUNOFF
Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

Urban Runoff Modelling,
W76-09033 4A

Decision Perspectives on Urban Storm Water Pollution,
W76-09207 5G

Quantitative Assessment of Changes in Urban Runoff,
W76-09267 4C

URBANIZATION
Implications of Zoning as An Urban Water Management Measure,
W76-08755 6F

Methods of Estimating Residential Land Use for Water Resources Management,
W76-08924 4C

UREAS
The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

UREILITE ACHONDRITES
Contents of Eleven Trace Elements in Ureilite Achondrites,
W76-09041 5A

USE RATES
User Charges for Inland Waterways: A Review of Issues in Policy and Economic Impact,
W76-08847 4A

USER CHARGES
User Charges for Inland Waterways: A Review of Issues in Policy and Economic Impact,
W76-08847 4A

USSR
Problem of Blood-Sucking Flies in the Zones Affected by Big Water Reservoirs in the Ukrainian SSR, (In Russian),
W76-08991 5G

Formation of Fish Fauna of the Berdyansk Reservoir in the First Twelve Years of its Existence, (In Russian),
W76-09392 2H

USSR (MOZHAYSK RESERVOIR)
Effect of the Mozhaysk Reservoir on Soil of the Bank Area of the Surrounding Territory, (In Russian),
W76-09081 2G

USSR (URAL RIVER FLOOD PLAIN)
Meadow Vegetation and Forage Resources of the Ural River Floodplain, (In Russian)
W76-09098 4A

UTAH
Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

Water-Resources Investigations of the U.S. Geological Survey in Selected Coal-Energy Areas of Utah,
W76-09148 4B

VARIABILITY
Comparative Evaluation of Yearly Climatic Factors with the Five Years Averages for Fudhaliya Agro-Meteorological Station,
W76-09066 2B

Variability of Hydraulic Conductivity in Two Subsurface Horizons of Two Silt Loam Soils,
W76-09257 2G

VEGETATION
Late Pleistocene and Modern Plant Communities of Shinumo Creek and Peach Springs Wash, Lower Grand Canyon, Arizona,
W76-09074 2I

Vegetational Strata in Perhumid and Perarid Regions of the Tropical Andes, (In German)
W76-09083 2I

Modern State of the Vegetation in the Donbas Small River Basins and its Antierosive and Water-Protective Role, (In Ukranian)
W76-09096 4C

Meadow Vegetation and Forage Resources of the Ural River Floodplain, (In Russian)
W76-09098 4A

First Observations on the Forest of Cameroon on Sandy Coastal Cordons, (In French)
W76-09100 2I

Vegetation and Landslides, (In French),
W76-09101 4C

VEGETATION EFFECTS
Wind-Driven Flow of Water Influenced by a Canopy,
W76-08801 2H

The Nature and Causes of Desertization,
W76-09069 4C

VEGETATION REGROWTH
Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

VIRUSES
Chlorination and Iodination of Poliovirus and F2,
W76-09196 5A

VITAMIN B
Biochemical Characteristics of Spirulina Platensis (GOM.) Geitl.: I. Water-Soluble Group B Vitamins, (In Ukranian),
W76-09091 2I

VITAMINS
Vitamins in the South Polar Seas, I. Distribution and Significance of Dissolved and Particulate Vitamin B 12, Thiamine, and Biotin in the Southern Indian Ocean,
W76-08952 5C

VOLATILIZATION
The Time Stability of Dissolved Mercury in Water Samples-I. Literature Review,
W76-08767 5A

WARBURG METHOD
Comparison of Warburg and Marais Methods of Determining Oxygen Uptake Rate Constants,
W76-09189 5A

WASHINGTON
Recreation Use Patterns and User Attitudes on the Snake River,
W76-08751 6B

The Effects of Waste Water Diversion on Heavy Metal Levels in the Sediments of a Large Urban Lake,
W76-08754 5B

WASTE ASSIMILATIVE CAPACITY
Mechanism of Conversion of Lignin and its Derivatives in Natural Waters (Mekhanizm prevrashcheniya lignina i ego proizvodnykh v prirodnoj vode),
W76-09280 5B

WASTE DISPOSAL
Rationale for a Water Pollution Code Part 1: The Waste System and the Natural System,
W76-08839 5G

Effects of Drilling Operations on the Marine Environment,
W76-08909 5G

Treatment and Disposal of Waste Fluids from Onshore Drilling Sites,
W76-08910 5D

The Toxicity of Drilling Fluids, Their Testing and Disposal,
W76-08911 5D

Waste Water Base Drilling Fluid Disposal,
W76-08914 5D

Disposal of Drilling Fluids and Drilled-up Solids in Offshore Drilling Operations,
W76-08915 5D

Regulation of Onshore and Offshore Oil Field Waste Disposal,
W76-08919 5E

Method and Apparatus for Treating a Continuous Flow of Fluid Waste Products and Other Materials,
W76-08993 5D

Discharge of Treated Waste Water in Lakes (Die Einleitung Von Gereinigtem Abwasser in Seen),
W76-09216 5B

Persistence of Fecal Coliform Indicator Bacteria on Alfalfa Irrigated with Municipal Sewage Lagoon Effluent,
W76-09217 5C

Options for the Use and Disposal of Bark,
W76-09302 5E

Ocean Dumping--A Rational Approach to an International Problem,
W76-09304 5G

Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic,
W76-09334 5G

New York Alternative Dumpsite Assessment - Reconnaissance Study of Surficial Sediments,
W76-09383 5G

ASTE IMPACT
ationale for a Water Pollution Code Part 1: he Waste System and the Natural System, V76-08839 5G

ASTE STORAGE
reatment and Disposal of Waste Fluids from nshore Drilling Sites, V76-08910 5D

ASTE SUMPS
reatment and Disposal of Waste Fluids from nshore Drilling Sites, V76-08910 5D

ASTE TREATMENT
reatment and Disposal of Waste Fluids from nshore Drilling Sites, V76-08910 5D

he Toxicity of Drilling Fluids, Their Testing nd Disposal, V76-08911 5D

Vaste Water Base Drilling Fluid Disposal, V76-08914 5D

Method and Apparatus for Treating a Continuous Flow of Fluid Waste Products and Other Materials, W76-08993 5D

Sludge Sterilization by Gamma Rays (La Sterilizzazione Dei Fanghi Con Raggi Gamma), W76-09004 5D

Water Plant Waste Treatment: State of the Art, Part II, W76-09045 5D

Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic, W76-09334 5G

ASTE WATER DISPOSAL
Municipal Wastewater Odor Still a Problem, Part 2, W76-09044 5D

Nutrient Mass Balance in Columns Representing Fill Systems for Disposal of Septic Tank Effluents, W76-09164 5E

Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic, W76-09334 5G

ASTE WATER (POLLUTION)
Determination of Ammonia and Kjeldahl Nitrogen by Indophenol Method, W76-09201 5A

An Improved Determination of Chemical Oxygen Demand in Water and Wastes by a Simplified Acid Dichromate Digestion, W76-09203 5A

ASTE WATER TREATMENT
Biological Effects of Primary, Secondary, and Tertiary Sewage Treatment in Lotic Analog Recipients, W76-08792 5C

Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth, W76-08842 5D

The Effects of a Synthetic Chili Waste on Biological Sewage Treatment Plant Operations, W76-08845 5D

Giant Mole to Dig Sanitary District Tunnels, W76-08963 5D

Biological Purification of Waste Waters, W76-08971 5D

Waste Water Purification, W76-08972 5D

Phosphorus Removal from Waste Water, W76-08975 5D

Method and Apparatus for Chemically Purifying Sewage, W76-08976 5D

Waste Water Treatment Plant, W76-08977 5D

Waste Treatment Process, W76-08978 5D

Waste-Water Purification, W76-08979 5D

Aerobic Sewage Treatment System, W76-08982 5D

Up-Flow Separator, W76-08983 5D

Process for Treating Sewage Sludge and Fertilizer Products Thereof, W76-08984 5D

Apparatus for Treatment of Water, Particularly Waste Water, W76-08985 5D

Fluidized Furnace Construction for Burning Partly Dehydrated Sludge, W76-08988 5E

Centrifuge Preventing Air Admission During Sludge Discharge, W76-08990 5D

Sewage Treatment System, W76-08992 5D

Phosphorus Removal from Wastewater, W76-08994 5D

Biological Treatment of Sterilised Aqueous Waste. W76-08995 5D

Removal of Water from Sludges with Filter Presses (Schlammentwaesserung Mit Pressfiltern), W76-08998

An Experimental Investigation of Tertiary Treatment with a Submerged Filter (Sesshoku bakkiho ni yoru gesui sanjishori no jikkenteki kenkyu), W76-08999 5D

Electric Equipment for Mukogawa Sewage Treatment Plant, Hyogo Prefecture (Hyogoken mukogawa shorijo no denki setsubi), W76-09000 5D

Reclamation and Use of Municipal Waste Water (Toshi ni okeru seikatsu haisui no sairiyo), W76-09001 5D

Specific Pollutants in Urban Waste Waters and the Efficiency of their Purification (Spetsificheskie zagryazneniya gorodskikh stochnykh vod i effektivnost' ikh ochistki), W76-09002 5A

Lamella Settling Tanks (Lamella-Absetzbecken), W76-09003 5F

Waste Water Purification Plant Uhwiesen-Dachsen (Abwasserreingungsanlage Uhwiesen-Dachsen), W76-09005 5D

Measurement of the Oxygenation Capacity in Waste Water Treatment Plants using Completely Mixed Activated Sludge (Mesure De La Capacite D'Oxygenation Dans Les Stations De Traitement A Boues Activees En Melange Integral), W76-09006 5D

Current Aeration Techniques--An Overview, W76-09009 5D

Wastewater Recycling Utilizes Pesky Nutrients, W76-09010 5D

Pollution Control Plant is Designed to be an Attractive Neighbor, Too. W76-09011 5D

Portland Adds Secondary Treatment, W76-09013 5D

Coatings for Wastewater Treatment Plants, W76-09014 8G

Methods for Filtering Nitrified Effluents, W76-09015 5D

Costs of Biological Waste Water Purification (Die Kosten Der Biologischen Abwasserreinigung), W76-09016 5D

Treatment of Waste Water Containing Mercurials by Activated Sludge. I. Mechanism of Removal of Mercurials in waste Water (Kassei odei ni yoru suigin ganyu haisui no shori ni kansuru kenkyu. I Kassei odei no suigin jokyo kiko), W76-09017 5D

Treatment of Waste Water Containing Mercurials by Activated Sludge. 2. Mercury Volatilization and the Capacity of Activated Sludge for Waste Water Containing Mercurials (Kasseiodei ni yoru suigin ganyu haisui no shor ni kansuru kenkyu. 2), W76-09018 5D

Canadian Clarifier is Low in Cost, W76-09019 5D

Advanced Waste Treatment Plant Features Nitrification, W76-09020 5D

Modern Filter Press Technology for Sewage Sludge Dewatering, W76-09021 5D

Municipal Waste Water Treatment by Rotating Disc Method (Kaiten enbaho ni yoru hisui shori), W76-09022 5D

Ammonia Nitrogen Removal from Waste Water Effluents by Zeolite Ion Exchange and Electrolysis Combination (Zeoraito ni yoru ionkokan-denkai no kumiawase ni yoru haisui karano ammoniasei chisso jokyo), W76-09023 5D

Municipal Waste Water Treatment by Ozone (Ozon ni yoru toshigesui shori), W76-09025 5D

LIBRARY U. OF A. HUNTSVILLE

Decolorization of Night Soil Treatment Plant Effluent by Ozone (Ozon ni yoru shinyo shorisui no dasshoku),
W76-09026 5D

Double Funnel with Baffle Cascade Aeration Unit,
W76-09027 5D

Gravity Separation of Coarse Solids in Wastewater,
W76-09028 5D

Studies of High-Rate Biological Treatment of Ipswich Sewage on Pilot Filters using Plastics Media,
W76-09029 5D

Basingstoke Sewage Treatment Works, 1961-1975,
W76-09030 5D

Wastewater Research Facility Designed for Comparative Testing,
W76-09031 5D

Municipal Wastewater Odor Still a Problem, Part 2,
W76-09044 5D

Water Plant Waste Treatment: State of the Art, Part II,
W76-09045 5D

Apparatus and Process of Separating Packing House Waste,
W76-09046 5D

Method for Biologically Treating Sewage and an Installation for Carrying out the Method,
W76-09047 5D

Direct Contact Multi-Stage Flash Desalination,
W76-09052 3A

Process for Electrolysis of Brine,
W76-09053 5D

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09054 5D

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09055 5D

Ligand Exchange Process for [illegible] monia,
W76-09056 5D

Split Stream Ultraviolet Purification Device,
W76-09058 5D

Water Purification Process and Apparatus,
W76-09059 5D

Separation by Solvent Extraction,
W76-09061 5D

The Role of New Technologies for Improved Water Management and Related Effects on Water Law Systems,
W76-09065 3E

There is Something New Under the Sun,
W76-09152 5D

Anaerobic Digestion of Solid Waste and Sewage Sludge into Methane,
W76-09153 5D

Processes Make Sewage Come Clean More Cheaply.
W76-09154 5D

Combination of Physical Chemical Processes of Waste Water Purification with Ozone Treatment (Kombination Physi-Kalisch-Chemischer Verfahren Der Abwasserreiningung Mit Ozon-Behandlung),
W76-09156 5D

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards Experimental Studies,
W76-09157 5D

Review of Advanced Treatment Techniques for Waste Water,
W76-09159 5D

Wastewater Plant will Use no Chemicals for Sludge Conditioning,
W76-09161 5D

Alum Sludge from Water Plant Conditions Sewage Sludge,
W76-09163 5F

Reverse Osmosis Separation of Polar Organic Compounds in Aqueous Solution,
W76-09165 5D

Water Supply and Sewage Treatment in Arid Areas,
W76-09166 5D

The Use of Oxygen in the Treatment of Waste Water,
W76-09167 5D

Sewerage Project on Upstream Area of the Yamato River,
W76-09168 5D

Reverse Osmosis Today,
W76-09169 5D

Package Sewage Treatment Process,
W76-09170 5D

Removal of Faecal Coliform from Waste Water by Proper Aerobic Biological Treatment,
W76-09171 5D

Microbiology and Activated Sludge,
W76-09172 5D

Evaluating Rotating Biological Contactor Performance,
W76-09173 5D

[illegible]ect of Flocculants on Postcoagulation Sludge [illegible]ering (Wplyw flokulantow na odwadnialnosc osadow pokoagulacyjnych),
W76-09174 5D

Effects of Activated Carbon Addition to the Activated Sludge Process (Wplyw dodatku wegla aktywnego do procesu osadu Czynnego),
W76-09175 5D

Newmarket's Replacement Sewage Treatment Works,
W76-09176 5D

Combined Utility Provides Water and Wastewater Treatment.
W76-09177 5D

Regina Tertiary Treatment Plant Study and Design, Part I, Case History,
W76-09178 5D

The Performance-Potential of Polyelectrolytes and High Velocity Gradients in the Treatment of Wastewaters,
W76-09179 5D

Ammonia Removal by Use of Clinoptilolite,
W76-09180 5D

Conditioning Improves Sludge Filterability,
W76-09181 5D

Two-Step Phosphate Removal from Solutio Using Aluminum Salts,
W76-09182 5D

Sewage Treatment with Activated Fly-Ash an Regenerated Alum Sludge,
W76-09183 5D

The Tyneside Sewerage Scheme,
W76-09184 5D

The Nature of Activated Sludge Flocs,
W76-09188 5D

Chlorination and Iodination of Poliovirus an F2,
W76-09196 5D

Quality Control in Sewage Treatment Pla (Gesuishorijo no shishutsu seigyo),
W76-09205 5D

Probability Models of Wastewater Treatme Plant Operation,
W76-09210 5D

Design Procedure for a Contact Stabilizatio Activated Sludge Process,
W76-09211 5D

Recent Trends of Process Control for Wat Works and Drainage (Jogesuido purosesu se gyo no doko),
W76-09214 5D

Study on the Balance of Heavy Metals in A tivated Sludge Treatment Process (Gesui sho shisetsu ni okeru jukinzokurui no shushi ni ka suru kenkyu),
W76-09222 5D

Experimental Report for Regeneration of A tivated Carbon and Recalcination of Lim Sludge (Kasseitan, sekkai-oden no saisei jikk hokoku),
W76-09223 5D

Capabilities and Costs of Technology A sociated with the Achievement of the Requir ments and Goals of the FWPCA of 1972 f Pulp and Paper Industry.
W76-09229 5D

New Method for Removing Sodium Sulfi from Sludge,
W76-09278 5D

Continuous Filter for Dewatering Sludg (Filtre continu de deshydratation des boues),
W76-09279 5D

Studies of Flocculation and Sedimentati Treatment of Pulp Mill Effluents: An Approa of a Closed System Using Calcium Alumina Hydrates (In Japanese),
W76-09284 5D

Problems Caused by Industrial Residual Wate Treated in Conjunction with Urban Wate (Problemas planteados por las aguas residual industriales en su tratamiento conjunto con l aguas urbanas),
W76-09285 5D

Filter Media Comparison at Prince George Pu and Paper (Limited),
W76-09286 5D

Suspended Solids Removal from Woodroom Effluent,
W76-09289 5D

Economic Considerations in the Selection of a Biological Treatment System,
W76-09290 5D

Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W76-09292 5D

Practical Application of the Toxicity Emission Rate Concept in a Survey of Maritime Pulp and Paper Mills,
W76-09293 5A

Secondary Effluent Treatment at Northwood Pulp and Timber Limited,
W76-09297 5D

Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon,
W76-09298 5D

Secondary Treatment at Ontario-Minnesota Pulp and Paper Company Limited, Fort Frances, Ontario,
W76-09301 5D

Separation Processes Used for Pollution Control in the Pulp and Paper Industry,
W76-09340 5D

Papeteries De L'AA -- Suspended Solids Reduced by 98%, Organic Materials by 74% (Papeteries de l'Aa -- mes reduites de 98%, et MO de 74%),
W76-09341 5D

Kinetics and Control Tests of Nitrification-Denitrication Process, Part I: Kinetics,
W76-09365 5D

Kinetics and Control Tests of Nitrification-Denitrification Process, Part II: Respiration and Control Tests,
W76-09366 5D

Agronomic and Cattle Studies with Municipal Liquid Digested Sludge,
W76-09367 5E

WATER ALLOCATION (POLICY)

The Role of New Technologies for Improved Water Management and Related Effects on Water Law Systems,
W76-09065 3E

WATER ANALYSIS

Photographic Analysis of Water Quality Changes,
W76-09199 5A

An Improved Determination of Chemical Oxygen Demand in Water and Wastes by a Simplified Acid Dichromate Digestion,
W76-09203 5A

Heavy Metals in the Aquatic Environment.
W76-09272 5B

Need for an Integral Approach to to the Problem of Quantitative Determination of Lignosulfonic Acids in Mill Effluents and Surface Waters (O potrzebie kompleksowego ujmowania problemu ilosciowego oznaczania kwasow ligninosulfonowych w sciekach pocelulozowych i wodach powierzchniowych),
W76-09277 5A

Standardization of Methods for the Determination of Traces of Some Volatile Chlorinated Aliphatic Hydrocarbons in Air and Water by Gas Chromatography,
W76-09287 5A

Colour Measurement of Pulp Mill Effluents,
W76-09296 5A

Flow Injection Analysis. Part IV. Stream Sample Splitting and Its Application to the Continuous Spectrophotometric Determination of Chloride in Brackish Waters,
W76-09339 5A

WATER BASE MUDS

Drilling Fluid Principles and Operations,
W76-08893 8G

WATER-BASED DRILLING FLUIDS

Waste Water Base Drilling Fluid Disposal,
W76-08914 5D

WATER CHEMISTRY

Algal Growth Potential of Six Norwegian Waters Receiving Primary, Secondary and Tertiary Sewage Effluents,
W76-08794 5C

Environmental Aspects of Chemical Use in Well Drilling Operations.
W76-08889 5G

Hydrogeological Conditions of Al-Hamad Area, Iraq,
W76-09068 2F

WATER CONSERVATION

Soil and Water Conservation with Western Iowa Tillage Systems,
W76-08805 4D

Industrial Development Through Water-Resources Planning,
W76-09034 3E

Water Conservation and Irrigated Agriculture,
W76-09236 3F

Studies on Oxygen-Alkali Treatment of Ligneous Materials. Part V. Recycle and Reuse of Waste Liquor in O-PA-P Bleaching Sequence (In Japanese),
W76-09337 3E

Closing the White Water System of Paper Machines -- Effective Protection of the Environment (Fechamento do sistema de agua branca das maquinas de papel -- uma potecao lucrativa do meio ambiente),
W76-09342 3E

WATER DEMAND

Agricultural Water Demands in North Carolina,
W76-08841 3F

Industrial Development Through Water-Resources Planning,
W76-09034 3E

Water Requirements for Energy,
W76-09231 3E

WATER DIVERSION EFFECTS (FISH)

The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W76-08753 5C

WATER LAW

The Role of New Technologies for Improved Water Management and Related Effects on Water Law Systems,
W76-09065 3E

WATER LEVEL FLUCTUATIONS

Resilience of a Rocky Intertidal Fish Community in a Physically Unstable Environment,
W76-09126 5C

WATER LEVELS

Ground-Water Levels and Chemical Quality of Ground Water in Lincoln, Montana,
W76-09132 7C

Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74,
W76-09144 7C

WATER MANAGEMENT (APPLIED)

Impact of Changes in Irrigation water Management in Eastern Idaho,
W76-08925 3F

The Role of New Technologies for Improved Water Management and Related Effects on Water Law Systems,
W76-09065 3E

Hydrologic Concepts of Artificially Recharging the Floridan Aquifer in Eastern Orange County, Florida--A Feasibility Study,
W76-09150 4B

The Role of Ground Water.
W76-09353 2F

WATER POLICY

Water Resources Policy Issues - 1975.
W76-09230 6B

Water Diversion and the Moratorium,
W76-09234 4A

Protection of Free-Flowing Rivers,
W76-09235 6E

WATER POLLUTION

Chemical Applications in Oil and Gas Well-Drilling and Completion Operations,
W76-08903 8G

Mobility of Well-Drilling Additives in the Ground Water System,
W76-08904 5B

Potential Effects of Oil Drilling and Dumping Activities on Marine Biota,
W76-08907 5C

Cycling of Organic Carbon in the Ocean: Use of Naturally-Occurring Radiocarbon as a Long and Short Term Tracer,
W76-08956 5C

Copepod Slick in the Northwest Pacific Ocean,
W76-08959 5C

Canadian Experience with the Reduction of Mercury at Chlor-Alkali Plants,
W76-09273 5G

Intact Manure Pack Halts Seepage,
W76-09344 5G

Countermeasures to Control Oil Spills in Western Canada,
W76-09346 5G

Cathodic Protection Wells and Ground Water Pollution,
W76-09357 5G

Making the World Safe for Ground Water,
W76-09360 5B

LIBRARY U. OF I. URBANA-CHAMPAIGN

WATER POLLUTION

Development of a Water Quality Instrumentation Package for Long-Term Operation from Buoys and Other Unattended Marine Platforms,
W76-09372 5G

WATER POLLUTION CONTROL

Methods of Estimating Residential Land Use for Water Resources Management,
W76-08924 4C

Environment Protective Oil Skimming and Removal Apparatus,
W76-09048 5G

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09054 5D

Water Pollution Monitoring Using Matched Spatial Filters,
W76-09194 5A

Recent Trends of Process Control for Water Works and Drainage (Jogesuido purosesu seigyo no doko),
W76-09214 5G

Surface Effects Skimmer Developments,
W76-09308 5G

Separation Processes Used for Pollution Control in the Pulp and Paper Industry,
W76-09340 5D

WATER POLLUTION CONTROL ACT

Criteria for Selecting a Water Quality Model for 208 Planning,
W76-09212 5G

WATER POLLUTION EFFECTS

Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

Diatom Community Response to Variations in Effluent Concentration,
W76-08835 5C

Effects of a Thermal Discharge into a River on the Movement of Fish Populations, (Incidences D'un Rejet Thermique En Milieu Fluvial Sur Les Mouvements Des Populations Ichtyologiques),
W76-08871 5C

Effects of Temperature, Copper and Chlorine on Fish During Simulated Entrainment in Power-Plant Condenser Cooling Systems,
W76-08878 5C

Physiological Effects of Sublethal Levels of Acid Water on Fish,
W76-08927 5C

Temperature Influence on Chemical Toxicity to Aquatic Organisms,
W76-08934 5C

Study to Define Changes in Pulp Mill Effluent-Contributed Color in Receiving Waters Detectable by Human Observers,
W76-09276 5C

The Benthos of Pictou Harbor and Northumberland Strait, Canada -- A Measure of the Impact of Treated Kraft Pulp Mill Effluent,
W76-09294 5C

Effects of Color and Toxic Constituents of Bleached Kraft Mill Effluent on Algal Growth,
W76-09300 5C

Ecological Effects of Offshore Construction,
W76 09307 6G

Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

Petroleum Residues in the Sargasso Sea and on Bermuda Beaches,
W76-09315 5C

Simulation of Movement of Oil Slicks in the Strait of Georgia using Simple Atmosphere and Ocean Dynamics,
W76-09316 5C

Toxicity and Avoidance Tests with Prudhoe Bay Oil and Pink Salmon Fry,
W76-09317 5C

A Salt Marsh Microcosm: An Experimental Unit for Marine Pollution Studies,
W76-09318 5C

Microbial Ecology of Petroleum Utilization in Chesapeake Bay,
W76-09319 5C

Effects of Seawater Extracts of Crude Oil on Carbon Budgets in Two Species of Mussels,
W76-09320 5C

The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

Biological Effects of Refinery Effluents,
W76-09322 5C

Respiratory Response of Juvenile Chinook Salmon and Striped Bass Exposed to Benzene, A Water-Soluble Component of Crude Oil,
W76-09323 5C

Interagency Investigations of a Persistent Oil Spill on the Washington Coast. Animal Population Studies, Hydrocarbon Uptake by Marine Organisms, and Algae Response Following the Grounding of the Troopship General M.C. Meigs,
W76-09324 5C

Effects of Water Soluble Extracts of Oil on Phytoplankton,
W76-09325 5C

Effect of a Bunker Fuel on the Beach Bacterial Flora,
W76-09326 5C

Microbial Petroleum Degradation: The Role of Cladosporium Resinae,
W76-09327 5C

The Fate of a Bunker Fuel in Beach Sand,
W76-09328 5C

The OCS Forgotten Land: Territorial Sea, Nearshore, and Estuary,
W76-09330 5G

Offshore Petroleum Drilling and Production,
W76-09332 5G

Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II,
W76-09333 5G

Beach-Offshore Dredging: Some Environmental Consequences,
W76-09335 5G

On Spent Semichemical Pulping Liquors. (4) Xylan in Neutral Sulfite Semichemical Spent Liquor (In Japanese),
W76-09338 5C

WATER POLLUTION SOURCE

A Continuous Flow Bioassay Method to Evaluate the Effects of Outboard Motor Exhausts and Selected Aromatic Toxicants on Fish,
W76-08780 5C

WATER POLLUTION SOURCES

Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

Ground-Water Levels and Chemical Quality of Ground Water in Lincoln, Montana,
W76-09132 7C

The Effects of Ground-Water Development on the Water Supply in the Post Headquarters Area, White Sands Missile Range, New Mexico,
W76-09137 5B

The Effect of Road Deicing Salts on Sodium Concentration in an Urban Water Course,
W76-09218 5B

Pollution From Non-Point Sources,
W76-09232 5B

Heavy Metals in the Aquatic Environment.
W76-09272 5B

Wind and Current Effects on Large-Scale Oil Slicks,
W76-09310 5G

Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

An Analysis of Oil Outflows Due to Tanker Accidents,
W76-09313 5B

Occurrence, Cause and Avoidance of the Spilling of Oil by Tankers,
W76-09314 5B

Environmental Studies for Major Offshore Developments,
W76-09336 5G

Countermeasures to Control Oil Spills in Western Canada,
W76-09346 5G

Application of Ground-Water Flow Theory to a Subsurface Oil Spill,
W76-09350 2L

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II.
W76-09371 5G

Offshore Multi-Use Port Islands and Their Environment,
W76-09376 5G

New York Alternative Dumpsite Assessment - Reconnaissance Study of Surficial Sediments,
W76-09383 5G

Influx of Petroleum Hydrocarbons into the Ocean,
W76-09385 5G

Geotechnical Aspects of Rock Borrow for Large Breakwaters,
W76-09386 5G

ATER POLLUTION TREATMENT
Chlorinated Resin Intended for Water Treatment,
W76-09060 5F

Monograph of the Effectiveness and Cost of Water Treatment Processes for Removal of Specific Contaminants. Vol. 1. Technical Manual,
W76-09227 5F

Countermeasures to Control Oil Spills in Western Canada,
W76-09346 5G

ATER PURIFICATION
Direct Contact Multi-Stage Flash Desalination,
W76-09052 3A

Split Stream Ultraviolet Purification Device,
W76-09058 5D

Water Purification Process and Apparatus,
W76-09059 5D

Chlorinated Resin Intended for Water Treatment,
W76-09060 5F

Monograph of the Effectiveness and Cost of Water Treatment Processes for Removal of Specific Contaminants. Vol. 1. Technical Manual,
W76-09227 5F

ATER QUALITY
The Time Stability of Dissolved Mercury in Water Samples-I. Literature Review,
W76-08767 5A

Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

Portland Adds Secondary Treatment,
W76-09013 5D

Changes in the Composition of the Plankton of the Rivers Rhine and Meuse in the Netherlands During the Last Fifty Five Years,
W76-09105 5C

Reclamation of Acidified Lakes - Middle and Lohi, Sudbury, Ontario,
W76-09108 5G

Summary Appraisals of the Nation's Ground-Water Resources--California Region,
W76-09139 4B

Ground-Water Data for Sunflower County, Mississippi,
W76-09140 7C

Ground-Water Data for Carroll County, Mississippi,
W76-09141 7C

Results of Phytoplankton Sampling at National Stream Quality Accounting Network Stations in Montana--1975 Water Year,
W76-09146 5A

Water Resources of Walton County, Florida,
W76-09149 4A

Phase II: Hydrology,
W76-09240 2L

Oversnow Runoff Events Affect Streamflow and Water Quality,
W76-09274 2C

A Salt Marsh Microcosm: An Experimental Unit for Marine Pollution Studies,
W76-09318 5C

Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming,
W76-09349 5A

WATER QUALITY ACT
EPA Standards for Drinking Water become Effective in June, 1977.
W76-09356 5F

WATER QUALITY CONTROL
Separation by Solvent Extraction,
W76-09061 5D

Quality Control in Sewage Treatment Plant (Gesuishorijo no shishutsu seigyo),
W76-09205 5D

Design of Nationwide Water-Quality-Monitoring Networks,
W76-09209 5A

Criteria for Selecting a Water Quality Model for 208 Planning,
W76-09212 5G

Quality Assurance for Groundwater,
W76-09213 5G

Analytical Chemistry in Water Pollution Control,
W76-09221 5A

Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

The OCS Forgotten Land: Territorial Sea, Nearshore, and Estuary,
W76-09330 5G

Offshore Petroleum Drilling and Production,
W76-09332 5G

Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic,
W76-09334 5G

Environmental Studies for Major Offshore Developments,
W76-09336 5G

EPA Standards for Drinking Water become Effective in June, 1977.
W76-09356 5F

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II.
W76-09371 5G

Development of a Water Quality Instrumentation Package for Long-Term Operation from Buoys and Other Unattended Marine Platforms,
W76-09372 5G

On the Risk Assessment of Offshore Structures,
W76-09373 5G

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III.
W76-09374 5G

Offshore Multi-Use Port Islands and Their Environment,
W76-09376 5G

Industry Candidates and General Locations for Artificial Industrial-Port Islands,
W76-09377 5G

Adapting Industrial Processes for Multi-Purpose Industrial Port Islands,
W76-09378 5G

Evaluation of Seismicity and Earthquake Shaking at Offshore Sites,
W76-09379 5G

Geotechnical Aspects of Rock Borrow for Large Breakwaters,
W76-09386 5G

Evaluation of Offshore Breakwater Stability Under Wave Action,
W76-09387 5G

Effect of Offshore Structures on Shoreline Evolution, Atlantic Generating Station,
W76-09388 5G

WATER QUALITY STANDARDS
Indicators of Air and Water Quality are Tackled by CEQ for Consistency,
W76-08838 5A

Development and Application of Criteria for Marine Cooling Waters,
W76-08885 5G

Criteria for Selecting a Water Quality Model for 208 Planning,
W76-09212 5G

Quality Assurance for Groundwater,
W76-09213 5G

Pollution From Non-Point Sources,
W76-09232 5B

Ocean Dumping--A Rational Approach to an International Problem,
W76-09304 5G

EPA Standards for Drinking Water become Effective in June, 1977.
W76-09356 5F

WATER RATES
Private Wells Prove to be a Better Buy,
W76-09343 4B

WATER REQUIREMENTS
Water Regime in Growing Points of Wheat Shoots, (In Russian),
W76-08757 2I

Agricultural Water Demands in North Carolina,
W76-08841 3F

Zinc Nutrition of Rice in Relation to Iron and Manganese Uptake Under Different Water Regimes,
W76-08974 3F

WATER RESOURCES
Ground Water Problems Associated with Well-Drilling Additives,
W76-08902 5B

Industrial Development Through Water-Resources Planning,
W76-09034 3E

LIBRARY U. OF I. URBANA-CHAMPAIGN

WATER RESOURCES

Water-Resources Investigations of the U.S. Geological Survey in Selected Coal-Energy Areas of Utah,
W76-09148 4B

Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

Toxicity and Avoidance Tests with Prudhoe Bay Oil and Pink Salmon Fry,
W76-09317 5C

Effects of Water Soluble Extracts of Oil on Phytoplankton,
W76-09325 5C

Adapting Industrial Processes for Multi-Purpose Industrial Port Islands,
W76-09378 5G

WATER RESOURCES DEVELOPMENT
Water Resources Policy Issues - 1975.
W76-09230 6B

WATER REUSE
Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

Reclamation and Use of Municipal Waste Water (Toshi ni okeru seikatsu haisui no sairiyo),
W76-09001 5D

Treating Sewage as a Resource Revives Interest in Land Disposal.
W76-09151 5E

Utilization of Wastewater Sludge for Agricultural Soil Enrichment,
W76-09219 5D

Studies on Oxygen-Alkali Treatment of Ligneous Materials. Part V. Recycle and Reuse of Waste Liquor in O-PA-P Bleaching Sequence (In Japanese),
W76-09337 3E

Papeteries De L'AA -- Suspended Solids Reduced by 98%, Organic Materials by 74% (Papeteries de l'Aa -- mes reduites de 98%, et MO de 74%),
W76-09341 5D

WATER SAMPLING
Representative Analytical Waste Water Samples. Note I--A New Sampler (Significativa di Campioni Analitici di Acque Reflue. Nota I -- Nuovo Dispositivo di Campionamento),
W76-09186 5A

WATER SOURCES
Water Supply and Sewage Treatment in Arid Areas,
W76-09166 5D

WATER STORAGE
Hydrogeological Conditions of Al-Hamad Area, Iraq,
W76-09068 2F

Surface Residue, Water Application, and Soil Texture Effects on Water Accumulation,
W76-09258 2G

WATER STRESS (PLANTS)
A Comparison of Short-Term Effects of Thermal Addition on Photosynthesis and Plant-Water Stress in Three Ecosystems,
W76-08884 5C

WATER SUPPLY
Methods of Estimating Residential Land Use for Water Resources Management,
W76-08924 4C

The Effects of Ground-Water Development on the Water Supply in the Post Headquarters Area, White Sands Missile Range, New Mexico,
W76-09137 5B

Water Resources of Walton County, Florida,
W76-09149 4A

Water Supply and Sewage Treatment in Arid Areas,
W76-09166 5D

Quality Assurance for Groundwater,
W76-09213 5G

Water and Food Production Demands,
W76-09237 6D

WATER TABLE
Simulation of Deep Seepage to a Water Table,
W76-09245 2F

Determination of the Hydraulic Conductivity - Drainable Porosity Ratio from Water Table Measurements,
W76-09249 2F

WATER TEMPERATURE
Influence of Heat from the Gentilly Nuclear Power Station on Water Temperature and Gastropoda, (Influence De L'Apport Thermique Originaire de la Centrale Nucleaire Gentilly Sur La Temperature De L'eau Et Sur Les Gasteropodes),
W76-08874 5C

Effect of Constant and Varying Temperature on Egg Production of Lymnaea Obrussa Say (Mollusca: Gastropoda),
W76-09120 5C

Resilience of a Rocky Intertidal Fish Community in a Physically Unstable Environment,
W76-09126 5C

WATER TREATMENT
Ozonization of Water in Moscow (Ozonisation De L'Eau a Moscou),
W76-08997 5F

Lamella Settling Tanks (Lamella-Absetzbecken),
W76-09003 5F

Application of Centrifuges. Dewatering of Sludges from Waterworks (Applicazione Di Centrifughe. Disidratazione Di Fanghi Provenienti Da Impianti Di Potabilizzazione),
W76-09008 5F

Modern Filter Press Technology for Sewage Sludge Dewatering,
W76-09021 5D

Instrumentation and Control for Water Works (Suidosetsubi no keisoku to seigyo),
W76-09024 5F

Chlorinated Resin Intended for Water Treatment,
W76-09060 5F

Three-Media Filtration Plant Treats a Problem Water,
W76-09155 5F

Alum Sludge from Water Plant Conditions Sewage Sludge,
W76-09163 5F

Reverse Osmosis Today,
W76-09169 5D

Combined Utility Provides Water and Waste water Treatment.
W76-09177 5D

Microflocculation--Comparative Experiment Between Single and Double Layer Filters wit Iron and Aluminum Sulfate (Microflockung-Vergleichsversuche Zwischen ein-un Zweischicteiltern mit eisen-und Aluminum sulfat),
W76-09206 5

WATER UTILIZATION
Agricultural Water Demands in North Carolin
W76-08841 3

Impact of Changes in Irrigation water Manage ment in Eastern Idaho,
W76-08925 3

WATER WELLS
Environmental Aspects of Chemical Use i Well Drilling Operations.
W76-08889 5

Techniques of Shallow Well Drilling,
W76-08891 8

WATER WORKS
Instrumentation and Control for Water Wor (Suidosetsubi no keisoku to seigyo),
W76-09024 5

Three-Media Filtration Plant Treats a Proble Water,
W76-09155 5

WATER YIELD
Evaluation of a Monthly Water Yield Model,
W76-09246 2

WATERSHEDS (BASINS)
Evaluation of a Monthly Water Yield Model,
W76-09246 2

WAVE ACTION
Evaluation of Offshore Breakwater Stabili Under Wave Action,
W76-09387 5

Effect of Offshore Structures on Shoreli Evolution, Atlantic Generating Station,
W76-09388 5

WEIGHTING MATERIALS
Toxicity Study - Drilling Fluid Chemicals Aquatic Life,
W76-08895 5

WELL CASINGS
Solutions for Some Problems Resulting fr Refreezing of Permafrost Around a Wellbore,
W76-08892 8

Well Completion - Techniques and Methods,
W76-08894 8

WELL COMPLETION METHODS
Well Completion - Techniques and Methods,
W76-08894 8

WELL CUTTINGS
Effects of Drilling Operations on the Mari Environment,
W76-08909 5

L DATA
und-Water Data for Sunflower County, sissippi,
6-09140 7C

und-Water Data for Carroll County, Mississi,
6-09141 7C

L DRILLING OPERATIONS
vironmental Aspects of Chemical Use in ll Drilling Operations.
6-08889 5G

L REGULATIONS
ectives of Well-Drilling Regulations,
6-08917 5G

LS
lling Fluid Principles and Operations,
6-08893 8G

T AFRICAN SAHEL
nfall Trends in the West African Sahel,
6-09269 2B

LANDS
dels for Evaluation of Freshwater Wetds,
6-08921 4A

AT
ter Regime in Growing Points of Wheat oots, (In Russian),
6-08757 2I

fect of Hardening on the State of Water in edlings of Winter Cultures, (In Russian),
6-09095 2I

TE WATER (PAPER MACHINES)
sing the White Water System of Paper achines -- Effective Protection of the Enonment (Fechamento do sistema de agua anca das maquinas de papel -- uma potecao crativa do meio ambiente),
6-09342 3E

D RIVERS
otection of Free-Flowing Rivers,
6-09235 6E

D RIVERS ACT
otection of Free-Flowing Rivers,
6-09235 6E

SON INLET (AUSTRALIA)
ilson Inlet: A Seasonally Closed Western ustralian South Coast Estuary,
6-09390 2L

D-DRIVEN FLOW
ind-Driven Flow of Water Influenced by a anopy,
6-08801 2H

D EROSION
ind Erosion: The Protective Role of Simuted Standing Stubble,
6-09247 4D

DS
ind-Driven Flow of Water Influenced by a anopy,
6-08801 2H

ssible Influence of Atmospheric Transport the Total Mercury Content of Southeastern tlantic Continental Shelf Surface Waters,
6-09224 5B

WINTER
Mountainous Winter Precipitation: A Stochastic Event-Based Approach,
W76-09062 2B

WIRE CABLE
Wire Rope,
W76-09359 8G

WISCONSIN
Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

Phosphorous Flux Through Fishes,
W76-09104 5C

Low-Flow Characteristics and Mean Annual Discharge of North Branch Manitowoc River at Potter, Wisconsin,
W76-09147 7C

The Availability of Ground Water for Irrigation in the Rice Lake-Eau Claire Area, Wisconsin,
W76-09348 4B

WOOD PRESERVATIVES (PESTICIDES)
Wood Preservatives: Their Depletion as Fungicides and Fate in the Environment,
W76-09275 5B

WOOD WASTES
Suspended Solids Removal from Woodroom Effluent,
W76-09289 5D

Options for the Use and Disposal of Bark,
W76-09302 5E

WYOMING
Oversnow Runoff Events Affect Streamflow and Water Quality,
W76-09274 2C

Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming,
W76-09349 5A

XEROPHILIC ANIMALS
Desert Ecosystems: Higher Trophic Levels,
W76-09064 2A

XYLAN
On Spent Semichemical Pulping Liquors. (4) Xylan in Neutral Sulfite Semichemical Spent Liquor (In Japanese),
W76-09338 5C

YAMATO RIVER (JAPAN)
Sewerage Project on Upstream Area of the Yamato River,
W76-09168 5D

YELLOWTAIL LARVAE
On the Histological Structure and Function of Digestive Organs of the Fed and Starved Larvae of the Yellowtail, Seriola Quinqueradiata, (In Japanese),
W76-09088 2I

ZEBRAFISH
Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

ZINC
Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

Zinc Nutrition of Rice in Relation to Iron and Manganese Uptake Under Different Water Regimes,
W76-08974 3F

ZONING
Implications of Zoning as An Urban Water Management Measure,
W76-08755 6F

ZOOPLANKTON
Mercury Concentrations in Spring and Fall Zooplankton of the Estuary of the Arosa River, (In Spanish),
W76-08768 5C

Zooplankton of Western Lake Erie at Put-in-Bay: A Quantitative Study, April 1973-March 1974,
W76-08833 5C

Nutrient Regeneration by Oceanic Zooplankton: A Comparison of Methods,
W76-08950 5C

Sediment Loading, its Effect on a southern Arizona Lake and the Emerging Spring Zooplankton Community,
W76-09073 2J

The Crustacean Plankton of an Acid Reservoir,
W76-09109 5C

A Method for the Rapid Sorting of Plankton into a Number of Size Groups,
W76-09397 7B

LIBRARY U. OF I. URBANA-CHAMPAIGN

AUTHOR INDEX

ESON, M. A.
ctors Affecting the Extraction and Analysis Polynuclear Aromatic Hydrocarbons in ater,
76-09200 5A

MS, M. V.
neral Resource Management of the Outer ntinental Shelf.
76-09306 6G

MSKI, J. M.
clamation of Acidified Lakes - Middle and hi, Sudbury, Ontario,
76-09108 5G

LKARI, M.
wage Treatment with Activated Fly-Ash and generated Alum Sludge,
76-09183 5D

A, B. B.
asonal Feature of Thermal Abatement of oreline Discharges at Nuclear Sites,
76-08862 5G

OURI, A.
aste Water Treatment Plant,
76-08977 5D

LEUV, E. A.
eadow Vegetation and Forage Resources of Ural River Floodplain, (In Russian)
76-09098 4A

JA, L. R.
termining Both Water Characteristics and ydraulic Conductivity of a Soil Core at High ater Contents from a Transient Flow Experi-ent,
76-09271 2G

RA,
the Histological Structure and Function of gestive Organs of the Fed and Starved Lar-e of the Yellowtail, Seriola Quinqueradiata, Japanese),
76-09088 2I

RECHT, E.
uidized Furnace Construction for Burning rtly Dehydrated Sludge,
76-08988 5E

MI, M. H.
termining the Hydraulic Conductivity of Soil res by Centrifugation,
76-09256 2G

XANDRE, D.
sinfection of Urban Sewage Sludge (La sinfection Des Bous Residuaires Urbaines),
76-09007 5D

AN, R. J.
e Formation and Detection of Metal Disper-n Halos in Organic Lake Sediments,
76-09129 2J

ARDI, J.
fects of a Thermal Discharge into a River on Movement of Fish Populations, (Incidences un Rejet Thermique En Milieu Fluvial Sur s Mouvements Des Populations ntyologiques),
76-08871 5C

EN, R. R.
-Till Seeding of Irrigated Sorghum Double opped After Wheat,
76-08756 3F

ALLISON, B. E.
Wind Erosion: The Protective Role of Simulated Standing Stubble,
W76-09247 4D

ALLRED, R. B.
The Handling and Treating of Water-Based Drilling Muds,
W76-08912 5D

ALMEIDA, S. P.
Water Pollution Monitoring Using Matched Spatial Filters,
W76-09194 5A

ALT, C.
Removal of Water from Sludges with Filter Presses (Schlammentwaesserung Mit Pressfiltern),
W76-08998 5D

AMBUHL, H.
Discharge of Treated Waste Water in Lakes (Die Einleitung Von Gereinigtem Abwasser in Seen),
W76-09216 5B

AMOUROUX, J. M.
A Study of the Infralittoral Population of the Coast of Roussillon: III. Spatial and Seasonal Variations, (In French),
W76-08898 2L

AMY, L.
Features of Various Offshore Structures,
W76-09311 8A

ANDERSON, D.
An Investigation of Antibiotic and Drug Residues in Fish,
W76-09124 5C

ANDREI, S.
The Effect of Certain Synthetic Macromolecular Substances on the Physico-Chemical Properties of Soil and on the Fertilizer Utilization Coefficient, (In French),
W76-08981 2G

ANDREYASHKIN, YU. G.
Self-Regulation of the Population and Biomass of Schools of Yearling Carp, (In Russian),
W76-08832 2I

ARIATHURAI, R.
Finite Element Model for Cohesive Sediment Transport,
W76-09264 2L

ASSIF, K.
Quantitative Assessment of Changes in Urban Runoff,
W76-09267 4C

AUDUNSON, T.
Computations of the Temperature Response of Stratified Sill Fjords to Cooling-Water Discharges,
W76-08857 5B

AVOTINS, P.
The Time Stability of Dissolved Mercury in Water Samples-I. Literature Review,
W76-08767 5A

AXTELL, R. J.
Basingstoke Sewage Treatment Works, 1961-1975,
W76-09030 5D

AZAM, F.
Improved Methodology for ATP Determination in Marine Environments,
W76-08958 5C

Silicic Acid Uptake and Incorporation by Natural Marine Phytoplankton Populations,
W76-08941 5C

BAGI, G.
Valyl tRNA's of Anacystis Nidulans,
W76-08827 5C

BAILEY, H. T.
Respiratory Response of Juvenile Chinook Salmon and Striped Bass Exposed to Benzene, A Water-Soluble Component of Crude Oil,
W76-09323 5C

BAILY, P.
Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

BAKER, F. G.
Variability of Hydraulic Conductivity in Two Subsurface Horizons of Two Silt Loam Soils,
W76-09257 2G

BAKER, J. M.
Biological Effects of Refinery Effluents,
W76-09322 5C

BALATOVA-TULACOVA, E.
The Phragmitetea and Molinietalia Associations in the Thaya, March and Danube River Basins of Austria, (In German),
W76-09076 4A

BANERJEE, B.
Sewage Treatment with Activated Fly-Ash and Regenerated Alum Sludge,
W76-09183 5D

BANKS, P. A.
Studies of High-Rate Biological Treatment of Ipswich Sewage on Pilot Filters using Plastics Media,
W76-09029 5D

BANNAI, E.
Recent Trends of Process Control for Water Works and Drainage (Jogesuido purosesu seigyo no doko),
W76-09214 5G

BAPTIST, J. P.
Effects of Temperature, Copper and Chlorine on Fish During Simulated Entrainment in Power-Plant Condenser Cooling Systems,
W76-08878 5C

BARKACS, K.
Ammonia Removal by Use of Clinoptilolite,
W76-09180 5D

BARKLEY, W. A.
The Effects of a Synthetic Chili Waste on Biological Sewage Treatment Plant Operations,
W76-08845 5D

BARLITT, H. R.
How to Get Good Samples by Rotary Drilling,
W76-09363 8G

BARNES, R. S.
The Effects of Waste Water Diversion on Heavy Metal Levels in the Sediments of a Large Urban Lake,
W76-08754 5B

LIBRARY U. OF I. URBANA-CHAMPAIGN

BARTELS, H.
Cooling Tower Experience and the Meteorological Consequences of Thermal Discharges from Nuclear Power Plants in the Federal Republic of Germany,
W76-08855 5G

BATES, C. C.
Influx of Petroleum Hydrocarbons into the Ocean,
W76-09385 5G

BAUER, H.
Energy Saving--An Important Consideration,
W76-09187 5A

BAYLEY, R. W.
Review of Advanced Treatment Techniques for Waste Water,
W76-09159 5D

BECHAC, J. P.
Measurement of the Oxygenation Capacity in Waste Water Treatment Plants using Completely Mixed Activated Sludge (Mesure De La Capacite D'Oxygenation Dans Les Stations De Traitement A Boues Activees En Melange Integral),
W76-09006 5D

BECK, A. D.
Development and Application of Criteria for Marine Cooling Waters,
W76-08885 5G

BECKER, C. D.
Aquatic Physiology of Thermal and Chemical Discharges,
W76-08880 5C

BEER, C.
Kinetics and Control Tests of Nitrification-Denitrification Process, Part II: Respiration and Control Tests,
W76-09366 5D

Waste Treatment Process,
W76-08978 5D

BEERS, J.
The Replication of Biological Events in Enclosed Water Columns,
W76-09226 5C

BEERS, J. R.
Microplankton of the North Pacific Central Gyre. I. Population Structure and Abundance, June 1973,
W76-08949 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-08948 5C

BELL, E. A.
The Availability of Ground Water for Irrigation in the Rice Lake-Eau Claire Area, Wisconsin,
W76-09348 4B

BELL, R. G.
Persistence of Fecal Coliform Indicator Bacteria on Alfalfa Irrigated with Municipal Sewage Lagoon Effluent,
W76-09217 5C

BELMAN, B. W.
Circulatory Adaptations to the Oxygen Minimum Layer in the Bathypelagic Mysid Gnathophausia ingens,
W76-09128 5C

BELSER, R.
Behavioral Impairment Produced by Exposure to Subclinical Amounts of Methylmercury Chloride,
W76-09037 5C

BELTER, W. G.
Management of Waste Heat at Nuclear Power Stations, Its Possible Impact on the Environment, and Possibilities of its Economic Use,
W76-08849 5G

BENEFIELD, L. D.
Design Procedure for a Contact Stabilization Activated Sludge Process,
W76-09211 5D

BENSON-EVANS, K.
Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

BERGENTHAL, J.
Kinetics and Control Tests of Nitrification-Denitrication Process, Part I: Kinetics,
W76-09365 5D

Kinetics and Control Tests of Nitrification-Denitrification Process, Part II: Respiration and Control Tests,
W76-09366 5D

BERGER, D. M.
Coatings for Wastewater Treatment Plants,
W76-09014 8G

BERGER, W. H.
Coccolith Sedimentation by Fecal Pellets: Laboratory Experiments and Field Observations,
W76-08954 5C

BERLINER, P.
Fog Formation and Fog Elimination,
W76-08854 5G

BERMAN, T.
Amino Acid Uptake and Respiration by Marine Heterotrophs,
W76-08955 5C

BERNOT, L.
A Lake Population: The Intha of Lake Inle. (Southern Shan States, Burma), (In French),
W76-09361 2H

BERTRAND, J. E.
Agronomic and Cattle Studies with Municipal Liquid Digested Sludge,
W76-09367 5E

BERZINS, V.
Colour Measurement of Pulp Mill Effluents,
W76-09296 5A

BEYME, B.
Improved Procedure for Ion Exchange Experiments with Soils Using Leaching Tubes, and Handling of Water Repellent Soils, (In German),
W76-08762 2G

BHARGAVA, N.
Combined Dry/Wet-Cooling Towers: Their Environmental Promise and Their Problems,
W76-08852 5B

BHARGAVA, V. P.
Pressure Fluctuations in Submerged Jump,
W76-09265 8B

BHAT, I. S.
Seasonal Feature of Thermal Abatement Shoreline Discharges at Nuclear Sites,
W76-08862

BHUIYAN, A. L.
Limnoplankton of Some Inland Waters Dacca City,
W76-09400

BIDDLE, P.
The Effect of Polyacrylamide on the Settling Thames Mud,
W76-09243

BIGGAR, J. W.
Determining the Hydraulic Conductivity of S Cores by Centrifugation,
W76-09256

BINZ, C. M.
Contents of Eleven Trace Elements in Urei Achondrites,
W76-09041

BLANCARD, A.
Disinfection of Urban Sewage Sludge Desinfection Des Bous Residuaires Urbaines
W76-09007

BLANCHAR, R. W.
Phosphate Determinations in Waters Using Anion Exchange Resin,
W76-09370

BOAST, C.
A Simulation Model of Biophysiochem Transformations of Nitrogen in tile-Drai Corn Belt Soil,
W76-08761

BOBEE, B.
Pre-Impoundment Site Preparation: A Stud the Effects of Topsoil Stripping on Reser Water Quality,
W76-09117

BOCHY, B. M.
Results of Phytoplankton Sampling at Nati Stream Quality Accounting Network Stat in Montana--1975 Water Year,
W76-09146

BOCSOR, J. G.
Environmental Changes in a Portion of L Ontario Following Pollution Abatement,
W76-09119

BOERSMA, L.
Water and Food Production Demands,
W76-09237

BOGH, P.
Combined Dry/Wet-Cooling Towers: Their vironmental Promise and Their Problems,
W76-08852

BONASIA, J.
Evaluation of Multi-Purpose Industrial Islands: Sea Island Structure Engine Research Study,
W76-09375

BOONE, L. V.
Natural (15)N Abundance in Soil, Leaves Grain as Influenced by Long Term Additio Fertilizer N at Several Rates,
W76-08765

BORBELY, G.
Valyl tRNA's of Anacystis Nidulans,
W76-08827

ROVINSKAYA, L. B.
Effect of the Mozhaysk Reservoir on Soil of he Bank Area of the Surrounding Territory, In Russian),
W76-09081 2G

SSHARD, E. J.
Apparatus for Treatment of Water, Particularly Waste Water,
W76-08985 5D

TOSANEANU, L.
Protection of Romanian Underground Water Fauna, (In Romanian),
W76-09085 2I

UMA, J.
Variability of Hydraulic Conductivity in Two Subsurface Horizons of Two Silt Loam Soils,
W76-09257 2G

UTIERE, H.
Hyperhaline Environments of the Complex of Bages-Sigean, the Lagoon of the Doul, (In French),
W76-08784 2L

UTIN, P.
Measurement of the Oxygenation Capacity in Waste Water Treatment Plants using Completely Mixed Activated Sludge (Mesure De La Capacite D'Oxygenation Dans Les Stations De Traitement A Boues Activees En Melange Integral),
W76-09006 5D

VARD, P.
Can the Criteria and Methodology Used for Radioactive Discharges be Applied to Thermal Discharges. (Les Criteres et La Methodologie Retenus Pour les Rejets Radioactifs Sont-Ils Transposables Aux Rejets Thermiques.),
W76-08887 5G

AGG, D. M.
Industry Candidates and General Locations for Artificial Industrial-Port Islands,
W76-09377 5G

AIDECH, T. E.
River Pollution by Anticholinesterase Agents,
W76-08782 5C

AMATI, L.
Regulations and Environmental Investigations Associated with Nuclear Station Thermal Discharges,
W76-08886 5G

ANDON, D. E.
Hydrocarbons in Water and Sediment Samples rom Coal Oil Point Area, Offshore California,
W76-09384 5B

AUNLICH, F. H.
Well Completion - Techniques and Methods,
W76-08894 8G

AZEL, A. J.
A Preliminary Water and Energy Budget Analysis of Montezuma Well, Arizona,
W76-09072 4B

ENNIMAN, G.
A Continuous Flow Bioassay Method to Evaluate the Effects of Outboard Motor Exhausts nd Selected Aromatic Toxicants on Fish,
W76-08780 5C

BRETSCHER, U.
Improved Method for the Phosphate Determination in Waste Water (Verbesserte Methode Zur Phosphatbestimmung im Abwasser),
W76-09190 5A

BRETT, C. W.
Behavioral Impairment Produced by Exposure to Subclinical Amounts of Methylmercury Chloride,
W76-09037 5C

BRETTHAUER, R.
Laboratory Experiments to Determine the Limits of Tolerance of Flagellates to Some Abiotic Factors,
W76-09110 5C

BREWER, R.
Industrial Development Through Water-Resources Planning,
W76-09034 3E

BROCK, T. D.
Predicting the Ecological Consequences of Thermal Pollution from Observations on Geothermal Habitats,
W76-08883 5C

BROCKSEN, R. W.
Respiratory Response of Juvenile Chinook Salmon and Striped Bass Exposed to Benzene, A Water-Soluble Component of Crude Oil,
W76-09323 5C

BROCKWAY, C. E.
Impact of Changes in Irrigation water Management in Eastern Idaho,
W76-08925 3F

BROWN, J. R.
The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

BROWN, W. M. III.
Sediment Transport, Turbidity, Channel Configuration, and Possible Effects of Impoundment of the Mad River, Humboldt County, California,
W76-09136 2J

BRUNEAU, M.
A Lake Population: The Intha of Lake Inle. (Southern Shan States, Burma), (In French),
W76-09361 2H

BRUNGS, W. A.
Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

BRYANT, W. J.
Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic,
W76-09334 5G

BRYCE, J. B.
Thermal Discharge Studies on the Great Lakes-the Canadian Experience,
W76-08869 5G

BUHRER, H.
Discharge of Treated Waste Water in Lakes (Die Einleitung Von Gereinigtem Abwasser in Seen),
W76-09216 5B

BULKLEY, J. W.
Probability Models of Wastewater Treatment Plant Operation,
W76-09210 5D

BULLA, L. A.
A New Stratified Plankton Sampler for Shallow Waters, (In Spanish),
W76-09193 7B

BUNTING, A. H.
Rainfall Trends in the West African Sahel,
W76-09269 2B

BURMAN, R. D.
Intercontinental Comparison of Evaporation Estimates,
W76-08800 2D

BURNS, D. E.
Phosphorus Removal from Wastewater,
W76-08994 5D

BURNS, N. M.
Oxygen Depletion in the Central and Eastern Basins of Lake Erie, 1970,
W76-09263 5C

Temperature, Oxygen, and Nutrient Distribution Patterns in Lake Erie, 1970,
W76-09262 5B

BURRELL JR, V. G.
A New Device For Subsampling Plankton Samples,
W76-09396 7B

BURWOOD, R.
Photooxidation as a Factor in the Environmental Dispersal of Curde Oil,
W76-09389 5B

BUTLER, J. D.
Salt Tolerance and Suitability of Various Grasses for Saline Roadsides,
W76-08764 3C

BUTLER, J. N.
Petroleum Residues in the Sargasso Sea and on Bermuda Beaches,
W76-09315 5C

BYKOWSKI, M. J.
Phosphorus Removal from Waste Water,
W76-08975 5D

CABRERA, G.
A Finite Element Model of Contaminant Movement in Groundwater,
W76-09253 5B

CAILLE, A.
Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

CAIRNS, J. JR.
Research on the Marine Food Chain.
W76-08935 5C

CAIRNS JR, J.
Temperature Influence on Chemical Toxicity to Aquatic Organisms,
W76-08934 5C

CALLAHAN, J. A.
Ground-Water Data for Carroll County, Mississippi,
W76-09141 7C

CAMPBELL, M. D.
Mobility of Well-Drilling Additives in the Ground Water System,
W76-08904 5B

LIBRARY U. OF I. URBANA-CHAMPAIGN

CAMPBELL, P. G.
Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

CAMPER, N. D.
Effects of Selected Herbicides on Bacterial Populations in Nontreated and Treated Water,
W76-09369 5C

CANELLI, E.
An Improved Determination of Chemical Oxygen Demand in Water and Wastes by a Simplified Acid Dichromate Digestion,
W76-09203 5A

CARLUCCI, A. F.
Vitamins in the South Polar Seas, I. Distribution and Significance of Dissolved and Particulate Vitamin B 12, Thiamine, and Biotin in the Southern Indian Ocean,
W76-08952 5C

CARNAHAN, C. L.
Transform Approach to Solution of Groundwater Flow Equations,
W76-08922 2F

CARNEY, L. L.
Thermal Degradation of Drilling Mud Additives,
W76-08901 8G

CARSTENS, T.
Trapping of Heat in Sill Fjords,
W76-08856 5C

CARVAJAL, J. R.
Environmental Conditions and Productivity in the Terminos Lagoon, Campeche, Mexico, (In Spanish),
W76-08900 2L

CARVER, R. D.
Effect of Offshore Structures on Shoreline Evolution, Atlantic Generating Station,
W76-09388 5G

CASE, C. M.
Transform Approach to Solution of Groundwater Flow Equations,
W76-08922 2F

CASPAR, J. W.
Cooling Tower Experience and the Meteorological Consequences of Thermal Discharges from Nuclear Power Plants in the Federal Republic of Germany,
W76-08855 5G

CASSELMAN, J. M.
Selective Fish Mortality Resulting from Low Winter Oxygen,
W76-08788 5C

CATALAN LAFUENTE, J. G.
Problems Caused by Industrial Residual Waters Treated in Conjunction with Urban Waters (Problemas planteados por las aguas residuales industriales en su tratamiento conjunto con las aguas urbanas),
W76-09285 5D

CECH, I.
Quantitative Assessment of Changes in Urban Runoff,
W76-09267 4C

CHANDRAMOULI, S.
Seasonal Feature of Thermal Abatement of Shoreline Discharges at Nuclear Sites,
W76-08862 5G

CHAPMAN, L.
Hepatitis Attributed to Polluted Stream,
W76-09220 5C

CHAPMAN, W. F.
Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09054 5D

Method and Apparatus for Separating Oil from Aqueous Liquids,
W76-09055 5D

CHARREL, J.
Disinfection of Urban Sewage Sludge (La Desinfection Des Bous Residuaires Urbaines),
W76-09007 5D

CHASE, B. L.
Features of Various Offshore Structures,
W76-09311 8A

CHEL'TSOVA, L. P.
Water Regime in Growing Points of Wheat Shoots, (In Russian),
W76-08757 2I

CHEN, L. H.
Agricultural Water Demands in North Carolina,
W76-08841 3F

CHERKINSKII, S. N.
The Significance of Isomery in Hygienic Standardization of Industrial Contaminations of Water Bodies, (In Russian),
W76-08864 5A

CHERNOUSOV, YU. I.
Phenols -- Products of Lignin Degradation -- in Effluents of the Baikal Pulp and Paper Mill (Fenoli -- produkty razrusheniya lignina -- v stochnykh vodakh Baikal'-skogo tsellyuloznogo zavoda),
W76-09281 5A

CHIAN, E. S. K.
Reverse Osmosis Separation of Polar Organic Compounds in Aqueous Solution,
W76-09165 5D

CHIEN, J. C.
Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

CHILDRESS, J. J.
Circulatory Adaptations to the Oxygen Minimum Layer in the Bathypelagic Mysid Gnathophausia ingens,
W76-09128 5C

CHILHOLM, S. W.
Silicic Acid Uptake and Incorporation by Natural Marine Phytoplankton Populations,
W76-08941 5C

CHISHOLM, S. W.
Environmental and Intrinsic Control of Filtering and Feeding Rates in Arctic Daphnia,
W76-08933 5C

CHOW, L. Y.
The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

CHRISTMAS, J. Y.
Phase I: Area Description,
W76-09239 2L

Phase II: Hydrology,
W76-09240 2L

Phase IV: Biology,
W76-09242 2I

CHUNG, C.
A Simulation Model of Biophysiochemica Transformations of Nitrogen in tile-Draine Corn Belt Soil,
W76-08761 5

CLAIBORN, B. A.
Impact of Changes in Irrigation water Manage ment in Eastern Idaho,
W76-08925 3

CLARK, R. C. R.
Interagency Investigations of a Persistent C Spill on the Washington Coast. Animal Popul tion Studies, Hydrocarbon Uptake by Mari Organisms, and Algae Response Following th Grounding of the Troopship General M.C Meigs,
W76-09324 5

CLARKE, A. J.
Plant Collection for Saltland Revegetation an Soil Conservation,
W76-09071

CLOTHIER, W. D.
Pollution From Non-Point Sources,
W76-09232 5

CLOUGH, C. F.
Wastewater Research Facility Designed f Comparative Testing,
W76-09031 5

CLUFF, C. B.
Development of a Mathematical Model of Inf tration which Includes the Effects of Raindr Impact,
W76-08844 2

COBET, A. B.
Effect of a Bunker Fuel on the Beach Bacter Flora,
W76-09326 5

The Fate of a Bunker Fuel in Beach Sand,
W76-09328 5

COFONE, L. JR.
Microbial Petroleum Degradation: The Role Cladosporium Resinae,
W76-09327 5

COLLINS, G. A.
Chemical Applications in Oil and Gas We Drilling and Completion Operations,
W76-08903

COLOMB, P.
Lamella Settling Tanks (Lamella-Abse becken),
W76-09003

COLONELL, J. M.
Field Evaluation of a Predictive Model f Thermal Stratification in Lakes and Reservoi
W76-08920

COLWELL, R. R.
Microbial Ecology of Petroleum Utilization Chesapeake Bay,
W76-09319

COOK JR, E. H.
Process for Electrolysis of Brine,
W76-09053

OOK, R. H.
Practical Application of the Toxicity Emission Rate Concept in a Survey of Maritime Pulp and Paper Mills,
W76-09293 5A

OONEY, J. J.
Microbial Petroleum Degradation: The Role of Cladosporium Resinae,
W76-09327 5C

OOPER, P. F.
Review of Advanced Treatment Techniques for Waste Water,
W76-09159 5D

OPPAGE, D. L.
River Pollution by Anticholinesterase Agents,
W76-08782 5C

ORINO, E. R.
Method for Clarifying Oily Water Mixtures,
W76-09057 5G

ORRAL, J.
Mercury Concentrations in Spring and Fall Zooplankton of the Estuary of the Arosa River, (In Spanish),
W76-08768 5C

ORY, R. L.
Macroscopic Benthic Fauna of Three Tidal Creeks Adjoining the Rhode River, Maryland,
W76-09143 5B

OSTON, L. C.
Effects of Temperature, Copper and Chlorine on Fish During Simulated Entrainment in Power-Plant Condenser Cooling Systems,
W76-08878 5C

OUGHLAN, J.
Environmental Effects of the Heated Discharges From Bradwell Nuclear Power Station, and of the Cooling Systems of Other Stations,
W76-08873 5C

OULON, R.
Can the Criteria and Methodology Used for Radioactive Discharges be Applied to Thermal Discharges. (Les Criteres et La Methodologie Retenus Pour les Rejets Radioactifs Sont-Ils Transposables Aux Rejets Thermiques.),
W76-08887 5G

OUTANT, C. C.
Temperature Selection By Fish--A Factor in Power-Plant Impact Assessments,
W76-08882 5C

OUTURE, R.
Influence of Heat from the Gentilly Nuclear Power Station on Water Temperature and Gastropoda, (Influence De L'Apport Thermique Originaire de la Centrale Nucleaire Gentilly Sur La Temperature De L'eau Et Sur Les Gasteropodes),
W76-08874 5C

OWEN, W. F.
Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

OX, G. V.
Environmental Site Assessment for a Massachusetts Bay Deepwater Oil Terminal,
W76-09380 5G

CRAMER, W. N.
Chlorination and Iodination of Poliovirus and F2,
W76-09196 5A

CROM, J. A.
Portland Adds Secondary Treatment,
W76-09013 5D

CUHEL, R.
Primary Production and the Factors Controlling Phytoplankton Growth in the Antarctic Seas,
W76-08942 5C

CUHEL, R. L.
Vitamins in the South Polar Seas, I. Distribution and Significance of Dissolved and Particulate Vitamin B 12, Thiamine, and Biotin in the Southern Indian Ocean,
W76-08952 5C

CULLIMORE, D. R.
The in Vitro Sensitivity of Some Species of Chlorophyceae to a Selected Range of Herbicides,
W76-08824 5C

CYR, R.
Waste Water Treatment Plant,
W76-08977 5D

CZAPIK, A.
Ciliate Associations (Ciliata) in the Pradnik Stream, Which is Polluted by Residual Waters of a Dairy, (In French),
W76-08777 5C

DANCER, W. S.
Leaching Losses of Ammonium and Nitrate in the Reclamation of Sand Spoils in Cornwall,
W76-08760 3C

DANIELS, B. A.
The Biology of the Leech Myzobdella Lugubris Infesting Blue Crabs and Catfish,
W76-08932 5C

DAS, N. G.
Limnoplankton of Some Inland Waters of Dacca City,
W76-09400 5C

DATTA, R. M.
Effect of Late Sowing on Morphogenetic Development of Panicle in Rice (Oryza Sativa L.),
W76-08758 3F

DAUBERT, A.
Heating of Estuarine and Coastal Waters by Nuclear Power Stations in France, (Echauffement Des Eaux Par Des Centrales Nucleaires En Estuaire Et Bord De Mer En France),
W76-08859 5B

DAVIDSON, D. D.
Effect of Offshore Structures on Shoreline Evolution, Atlantic Generating Station,
W76-09388 5G

DAVIES, P. H.
Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

DAVIS, D.
Mountainous Winter Precipitation: A Stochastic Event-Based Approach,
W76-09062 2B

DAVIS, H. N.
Monograph of the Effectiveness and Cost of Water Treatment Processes for Removal of Specific Contaminants. Vol. 1. Technical Manual,
W76-09227 5F

DAVIS, L. G.
A Technique for Estimating the Time of Travel of Water in Indiana Streams,
W76-09138 4A

DAVIS, L. H.
Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

DAWSON, P.
Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

DAZAI, M.
Treatment of Waste Water Containing Mercurials by Activated Sludge. I. Mechanism of Removal of Mercurials in waste Water (Kassei odei ni yoru suigin ganyu haisui no shori ni kansuru kenkyu. I Kassei odei no suigin jokyo kiko),
W76-09017 5D

Treatment of Waste Water Containing Mercurials by Activated Sludge. 2. Mercury Volatilization and the Capacity of Activated Sludge for Waste Water Containing Mercurials (Kasseiodei ni yoru suigin ganyu haisui no shor ni kansuru kenkyu. 2),
W76-09018 5D

DE BOODT, M.
The Relationship Between Heat Conductance and the Moisture Content of the Soil, (In Dutch),
W76-08769 2G

DE JONCKHEERE, J.
The Effect of Thermal Pollution on the Distribution of Naegleri Fowleri,
W76-08930 5C

DEBO, T. N.
Criteria for Selecting a Water Quality Model for 208 Planning,
W76-09212 5G

DECOSTA, J.
The Crustacean Plankton of an Acid Reservoir,
W76-09109 5C

DEETMAN, A. A.
Standardization of Methods for the Determination of Traces of Some Volatile Chlorinated Aliphatic Hydrocarbons in Air and Water by Gas Chromatography,
W76-09287 5A

DEGRAEVE, G. M.
Feeding Behavior and Temperature and Light Tolerance of Mysis Relicta in the Laboratory,
W76-08931 5C

DELFINE, J. J.
Comparative Effects of Two Modes of Cooling Water Discharge on Mississippi River Biota and Environmental Ecosystems,
W76-08888 5C

DEMALSY, M. J.
Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

DEMALSY, P.
Pre-Impoundment Site Preparation: A Study of the Effects of Topsoil Stripping on Reservoir Water Quality,
W76-09117 4C

DEMEULEMEESTER, P.
Standardization of Methods for the Determination of Traces of Some Volatile Chlorinated Aliphatic Hydrocarbons in Air and Water by Gas Chromatography,
W76-09287 5A

DEMPSEY, B. A.
Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth,
W76-08842 5D

DENG, C. B.
The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

DENIKE, E. E.
Interagency Investigations of a Persistent Oil Spill on the Washington Coast. Animal Population Studies, Hydrocarbon Uptake by Marine Organisms, and Algae Response Following the Grounding of the Troopship General M.C. Meigs,
W76-09324 5C

DENNETT, M. D.
Rainfall Trends in the West African Sahel,
W76-09269 2B

DETORRES, A. G.
Simultaneous Spectrophotometric Determination of Nickel and Cobalt in Mixtures with 3-Hydroxypicolinealdehyde Azine,
W76-09042 5A

DEWEY, G. C.
Apparatus and Method for Making Snow with Uniform Drop Size,
W76-09051 7B

DIETRICH, K. R.
Combination of Physical Chemical Processes of Waste Water Purification with Ozone Treatment (Kombination Physi-Kalisch-Chemischer Verfahren Der Abwasserreiningung Mit Ozon-Behandlung),
W76-09156 5D

DMITRENKO, N.
The Peripheral Flood Zones of Gniewkowo Lowland from 1969 to 1972, (In Polish),
W76-09079 2I

DOBBS, R. A.
Ligand Exchange Process for Removal of Ammonia,
W76-09056 5D

DOBRE, M.
The Effect of Certain Synthetic Macromolecular Substances on the Physico-Chemical Properties of Soil and on the Fertilizer Utilization Coefficient, (In French),
W76-08981 2G

DOBRINSKAYA, L. A.
Self-Regulation of the Population and Biomass of Schools of Yearling Carp, (In Russian),
W76-08832 2I

DOCHERTY, A. E.
Effects of Heat Enrichment on Species Succession and Primary Production in Fresh-Water Plankton,
W76-08879 5C

DOMINGUE, E.
Storm Sewer Pipe Joints Tight After Ten Years,
W76-08966 8G

DORICA, J.
Colour Measurement of Pulp Mill Effluents,
W76-09296 5A

Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon,
W76-09298 5D

DORNEANU, A.
The Effect of Certain Synthetic Macromolecular Substances on the Physico-Chemical Properties of Soil and on the Fertilizer Utilization Coefficient, (In French),
W76-08981 2G

DOUGLAS, E. L.
Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

DRAGO, C. E.
Thermal Structure of Lake Mascardi (Province of Rio Negro, Argentina, (In Spanish),
W76-09358 2H

DRIEDZIC, W.
Glycerophosphatide Content and Composition of Trout (Salvelinus Fontinalis M.) Brain,
W76-08929 5C

DUCKSTEIN, L.
Mountainous Winter Precipitation: A Stochastic Event-Based Approach,
W76-09062 2B

The Role of New Technologies for Improved Water Management and Related Effects on Water Law Systems,
W76-09065 3E

DUFFY, J.
A Simulation Model of Biophysiochemical Transformations of Nitrogen in tile-Drained Corn Belt Soil,
W76-08761 5B

DUSEK, D. A.
No-Till Seeding of Irrigated Sorghum Double Cropped After Wheat,
W76-08756 3F

DYER, T. G. J.
On the Components of Time Series; The Removal of Spatial Dependence,
W76-08803 2B

EADENS, C.
Sewer Cleaner Flushes Out Acids,
W76-09032 8G

EBINUMA, O.
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

ECKENFELD, W. W. JR.
Comparison of Warburg and Marais Methods of Determining Oxygen Uptake Rate Constants,
W76-09189 5A

EDLUND, L.
An Automatic Release Instrument with Underwater Buoy for Marking of Field Equipment,
W76-09268 7B

EFFER, W. R.
Thermal Discharge Studies on the Great Lakes-the Canadian Experience,
W76-08869 5G

EICHENBERGER, E.
Experiments on the Effects of Inorganic Enrichment of Rivers on Periphyton Primary Production,
W76-08787 5C

Flow Velocity as a Rate Determining Factor for Self-Purification in Rivers (Uber Den Einfluss der Stromungsgeschwindigkeit auf die Selbstreinigung in Fliessgewaessern),
W76-09204 5F

EIKENBERRY, S. E.
A Technique for Estimating the Time of Travel of Water in Indiana Streams,
W76-09138 4A

EILER, H. O.
Comparative Effects of Two Modes of Cooling Water Discharge on Mississippi River Biota and Environmental Ecosystems,
W76-08888 5C

EL-GOHARY, F. A.
Conditioning Improves Sludge Filterability,
W76-09181 5D

EL-KIKE, F. E.
Hydrogeological Conditions of Al-Hamad Area, Iraq,
W76-09068 2F

EL-SAYED, S. Z.
Primary Production and the Factors Controlling Phytoplankton Growth in the Antarctic Seas,
W76-08942 5C

EL-SWAIFY, S. A.
Determining Both Water Characteristics and Hydraulic Conductivity of a Soil Core at High Water Contents from a Transient Flow Experiment,
W76-09271 2G

ELEUTERIUS, C. K.
Phase II: Hydrology,
W76-09240 2L

ELEUTERIUS, L. N.
Phase IV: Biology,
W76-09242 2L

ELLENBERG, H.
Vegetational Strata in Perhumid and Perarid Regions of the Tropical Andes, (In German)
W76-09083 2I

ELLNER, S.
Split Stream Ultraviolet Purification Device,
W76-09058 5D

ELOUBAIDY, A. F.
Hydrogeological Conditions of Al-Hamad Area, Iraq,
W76-09068 2F

ELSTON, J.
Rainfall Trends in the West African Sahel,
W76-09269 2B

EMERGY, A. T.
Process for Electrolysis of Brine,
W76-09053 5D

GEL, D. W.
Effects of Temperature, Copper and Chlorine n Fish During Simulated Entrainment in Power-Plant Condenser Cooling Systems, W76-08878 5C

NS, T.
A Thermodynamic Model for Steady State Metabolism of Phytoplankton, Part I. Theory, W76-08944 5C

PLEY, R. W.
Chlorine Reactions with Seawater Constituents nd the Inhibition on Photosynthesis of Natural Marine Phytoplankton, W76-08946 5C

Dynamics of Phosphorus Cycling in the uphotic Waters of the Central North Pacific Ocean, W76-08939 5C

hotosynthetic Measurements in the Central orth Pacific: The Dark Loss of Carbon in 24-Hour Incubations, W76-08940 5C

hysiological Ecology of Gonyaulax Polyedra, Red Water Dinoflagellate Off Southern alifornia, W76-08936 5C

KSSON, C.
Mercury Uptake in Rooted Higher Aquatic lants; Laboratory Studies, W76-09111 5C

O, Y.
ecolorization of Night Soil Treatment Plant ffluent by Ozone (Ozon ni yoru shinyo norisui no dasshoku), W76-09026 5D

J. K-T.
Water Pollution Monitoring Using Matched patial Filters, W76-09194 5A

NS, D.
evelopment of a Mathematical Model of Infiltation which Includes the Effects of Raindrop mpact, W76-08844 2G

NS, G. H.
iatom Community Response to Variations in ffluent Concentration, W76-08835 5C

NS, P. M.
istribution, Morphometry, and Seasonal ology of the Planktonic Copepods, Neolanus Robustior and N. Gracilis, in the cific Ocean, W76-08951 5C

utrient Regeneration by Oceanic Zooplankn: A Comparison of Methods, W76-08950 5C

IAN, L. D.
e Availability of 137-CS to Fishes from Insted Clays, W76-09118 5C

G, H. H. P.
verse Osmosis Separation of Polar Organic mpounds in Aqueous Solution, W76-09165 5D

FANGMEIR, D. D.
Soluble Salts and Nitrate Distribution in Irrigated Lettuce Beds, W76-08763 3C

FARKAS, G. L.
Valyl tRNA's of Anacystis Nidulans, W76-08827 5C

FAST, S. G.
Environment Protective Oil Skimming and Removal Apparatus, W76-09048 5G

FICKE, J. F.
Design of Nationwide Water-Quality-Monitoring Networks, W76-09209 5A

FICKEISEN, D. H.
Aquatic Physiology of Thermal and Chemical Discharges, W76-08880 5C

FIDGEON, S.
An Investigation of Antibiotic and Drug Residues in Fish, W76-09124 5C

FILION, L.
Zonation of Snow Conditions in Forest-Tundra, Hudson Bay, New Quebec, (In French), W76-08759 2C

FINLEY, J. S.
Interagency Investigations of a Persistent Oil Spill on the Washington Coast. Animal Population Studies, Hydrocarbon Uptake by Marine Organisms, and Algae Response Following the Grounding of the Troopship General M.C. Meigs, W76-09324 5C

FISCHER, J. A.
Evaluation of Offshore Breakwater Stability Under Wave Action, W76-09387 5G

Geotechnical Aspects of Rock Borrow for Large Breakwaters, W76-09386 5G

FLAHERTY, T. K.
Three-Media Filtration Plant Treats a Problem Water, W76-09155 5F

FLEMING, B.
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74, W76-09144 7C

FLETCHER, R. H.
Separation Processes Used for Pollution Control in the Pulp and Paper Industry, W76-09340 5D

FLEWELLING, F. J.
Canadian Experience with the Reduction of Mercury at Chlor-Alkali Plants, W76-09273 5G

FLORES, C.
Notes on the Importance of Dissolved and Particulate Organic Matter in Marine Food Chains, (In Spanish), W76-08916 5C

FLOROV, R. I.
Hydrothermic Regime and Productivity of Forests of Natural Origin, (In Russian), W76-09080 2I

FLORQUIST, B. A.
Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming, W76-09349 5A

FLOYD, C. F.
Implications of Zoning as An Urban Water Management Measure, W76-08755 6F

FLYNN, C. J.
Pressure and Flow Regulation Device, W76-09049 3F

FOGEL, M.
Mountainous Winter Precipitation: A Stochastic Event-Based Approach, W76-09062 2B

FORSTER, C. F.
The Nature of Activated Sludge Flocs, W76-09188 5D

FRANCESCHIMI, G. A.
Primary Production and the Factors Controlling Phytoplankton Growth in the Antarctic Seas, W76-08942 5C

FRANCISCO, D. E.
Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth, W76-08842 5D

FRANKLIN, M.
A Simulation Model of Biophysiochemical Transformations of Nitrogen in tile-Drained Corn Belt Soil, W76-08761 5B

FREDERICK, V. R.
Changes in the Algal Flora of East Harbor, Ottawa County, Ohio, Since 1900, W76-08834 5C

FREELAND, G. L.
New York Alternative Dumpsite Assessment - Reconnaissance Study of Surficial Sediments, W76-09383 5G

FRIEDL, W. A.
Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics, W76-09112 5C

FRIZ, T. O.
A Guide to State Programs for the Reclamation of Surface Mined Areas, W76-09142 5G

FRYBERGER, J. S.
Subsurface Brine Disposal - Be Reasonable, W76-09261 5B

FUKUZUKA, T.
Municipal Waste Water Treatment by Ozone (Ozon ni yoru toshigesui shori), W76-09025 5D

FULTON, G. P.
Water Plant Waste Treatment: State of the Art, Part II, W76-09045 5D

GABBARD, J. L.
The Effects of a Synthetic Chili Waste on Biological Sewage Treatment Plant Operations, W76-08845 5D

LIBRARY U. OF L. Urbana-Champaign

GALIEV, N. A.
Effect of Hardening on the State of Water in Seedlings of Winter Cultures, (In Russian),
W76-09095 2I

GANDIKOTA, M.
Titration of Antimony (III) with Cerium (IV) Sulphate and Diphenylamine and its Derivatives as Reversible Indicators,
W76-09040 5A

GANGWAR, M. S.
Zinc Nutrition of Rice in Relation to Iron and Manganese Uptake Under Different Water Regimes,
W76-08974 3F

GANIN, G. I.
Mechanism of Conversion of Lignin and its Derivatives in Natural Waters (Mekhanizm prevrashcheniya lignina i ego proizvodnykh v prirodnoj vode),
W76-09280 5B

GARCIA, M.
Standardization of Methods for the Determination of Traces of Some Volatile Chlorinated Aliphatic Hydrocarbons in Air and Water by Gas Chromatography,
W76-09287 5A

GARTEN, C. T. JR.
Thermal Ecology of Dragonflies in Habitats Receiving Reactor Effluent,
W76-08881 5C

GASPARINI, R.
Regulations and Environmental Investigations Associated with Nuclear Station Thermal Discharges,
W76-08886 5G

GASS, T. E.
Fundamental Geologic Principles,
W76-09362 7C

GAST, M.
Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

GATES, C. D.
A Critical Study of Flood Protection Planning in the Susquehanna River Basin: 1936-1972,
W76-08846 6F

GECKLER, J. R.
Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

GENTRY, J. B.
Thermal Ecology of Dragonflies in Habitats Receiving Reactor Effluent,
W76-08881 5C

GEORGE, R. Y.
Potential Effects of Oil Drilling and Dumping Activities on Marine Biota,
W76-08907 5C

GERKING, S. D.
Laboratory and Field Tests of Temperature Tolerance on Gambusia A. Affinis, the Western Mosquitofish,
W76-08798 5C

GEVAUDAN, P.
Disinfection of Urban Sewage Sludge (La Desinfection Des Bous Residuaires Urbaines),
W76-09007 5D

GIANI, N.
The Sediments of High Mountain Lake: Structure: Nature and Populations, (In French),
W76-09347 2J

GIBBONS, J. W.
Ecology of Artificially Heated Streams, Swamps and Reservoirs on the Savannah River Plant, the Thermal Studies Program of the Savannah River Ecology Laboratory,
W76-08870 5C

GILFILLAN, E. S.
Effects of Seawater Extracts of Crude Oil on Carbon Budgets in Two Species of Mussels,
W76-09320 5C

GILHOUSEN, D. B.
Prediction of Meteorological Factors Related to Beach Erosion at New Jersey and Long Island, N.Y.,
W76-09270 2L

GILLHAM, R. W.
Hydraulic Properties of a Porous Medium: Measurement and Empirical Representation,
W76-09255 2G

GITCHEL, W. B.
Waste Water Purification,
W76-08972 5D

GLOOSCHENKO, W. A.
Nutrient-Primary Production Relationships in Central Lake Erie: A Simple Correlation Approach,
W76-08836 5C

GOCHNAUER, M. B.
Isolation and Characterization of Actinopolyspora Halophila, Gen. ET SP. Nov., An Extremely Halophilic Actinomycete,
W76-08837 5C

GOETTL JR, J. P.
Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

GOLAY, M. W.
A Model for Salt Drift Deposition from Spray Ponds,
W76-08866 5B

GOLDBURN, J. R.
Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic,
W76-09334 5G

GOLDMAN, J. C.
Identification of Nitrogen as a Growth-Limiting Nutrient in Wastewaters and Coastal Marine Waters Through Continuous Culture Algal Assays,
W76-09195 5A

GOODRICH, R. R.
Method for Clarifying Oily Water Mixtures,
W76-09057 5G

GORDON, R. W.
Chemical Characteristics, Acute Toxicity and Detoxification of Foam in Two Aerated Lagoons,
W76-09295 5C

GOZDZICKA-JOZEFIAK, A.
Valyl tRNA's of Anacystis Nidulans,
W76-08827 5C

GRABER, K. L.
Ammonia Removal by Use of Clinoptilolite,
W76-09180 5

GRANT, B. F.
Endrin Toxicity and Distribution in Fresh water: A Review,
W76-09122 5

GRANTHAM, C. K.
Toxicity Study - Drilling Fluid Chemicals o Aquatic Life,
W76-08895 5

GRAY, G. R.
Mobility of Well-Drilling Additives in t Ground Water System,
W76-08904 5

GREEN, L. P.
Ecological and Physiological Implications Greenbelt Irrigation,
W76-08840 5

GREGG, D. O.
Movement of Chemical Contaminants Ground Water,
W76-08905 5

GRIFFITHS, M.
The Toxicity of Crude Oil and Its Componer to Freshwater Algae,
W76-09321 5

GROSSMAN, A.
The Effect of Flocculants on Postcoagulati Sludge Dewatering (Wplyw flokulantow na o wadnialnosc osadow pokoagulacyjnych),
W76-09174 5

GUARD, H. E.
Effect of a Bunker Fuel on the Beach Bacter Flora,
W76-09326 5

The Fate of a Bunker Fuel in Beach Sand,
W76-09328 5

GUNN, A. S.
Modern Filter Press Technology for Sewa Sludge Dewatering,
W76-09021 5

GUNNEBERG, F.
The Total Heat-Exchange Coefficient of Su face Waters,
W76-08867

GUPTA, S. K.
Sewage Treatment with Activated Fly-Ash a Regenerated Alum Sludge,
W76-09183

GURG, R. P.
Seasonal Feature of Thermal Abatement Shoreline Discharges at Nuclear Sites,
W76-08862

GUTIERREZ, M.
Periodicity in the Biometric Variations of Lo echinus Albus Molina, (In Spanish),
W76-09089

GUYER, E. C.
A Model for Salt Drift Deposition from Spr Ponds,
W76-08866

GWINN, W. R.
Stepped Baffled Trash Rack for Drop Inlets,
W76-09250

AAN, C. T.
Evaluation of a Monthly Water Yield Model,
W76-09246 2A

AKANSON, D. E.
Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo Boreas),
W76-09115 5C

AKANSON, L.
An Automatic Release Instrument with Underwater Buoy for Marking of Field Equipment,
W76-09268 7B

ALL, P. L.
Countermeasures to Control Oil Spills in Western Canada,
W76-09346 5G

ANDRA, M.
The Effect of Certain Synthetic Macromolecular Substances on the Physico-Chemical Properties of Soil and on the Fertilizer Utilization Coefficient, (In French),
W76-08981 2G

ANKS, R. S.
Sediment Loading, its Effect on a southern Arizona Lake and the Emerging Spring Zooplankton Community,
W76-09073 2J

Toxicity of Some Chemical Therapeutics to the Commercial Shrimp, Penaeus Californiensis,
W76-08796 5C

ANNA, S. B.
Kinetics and Mechanisms of the Oxidative Degradation of Nitrilotriacetic Acid (NTA) in Aqueous Solutions,
W76-08843 5B

ARRIS, A. R.
Sewage Effluent Infiltrates Frozen Forest Soil,
W76-09288 5B

ARRIS, L.
Thermal Degradation of Drilling Mud Additives,
W76-08901 8G

ARRIS, M. D.
Effects of Initial Flooding on Forest Vegetation at Two Oklahoma Lakes,
W76-08831 4A

ARRISON, R. M.
Factors Affecting the Extraction and Analysis of Polynuclear Aromatic Hydrocarbons in Water,
W76-09200 5A

ARRISON, W. G.
Assay of Nitrate Reductase from Plasmolyzed Marine Phytoplankton,
W76-08943 5C

Physiological Ecology of Gonyaulax Polyedra, a Red Water Dinoflagellate Off Southern California,
W76-08936 5C

ARTMAN, W. J.
Municipal Wastewater Odor Still a Problem, Part 2,
W76-09044 5D

ARTMANN, R.
The Relationship Between Heat Conductance and the Moisture Content of the Soil, (In Dutch),
W76-08769 2G

HARTUNG, R.
A Continuous Flow Bioassay Method to Evaluate the Effects of Outboard Motor Exhausts and Selected Aromatic Toxicants on Fish,
W76-08780 5C

HARTWIG, E. O.
Nutrient Cycling Between the Water Column and a Marine Sediment. I. Organic Carbon,
W76-08957 5C

HARVEY, H. H.
Fish Populations in a Large Group of Acid-Stressed Lakes,
W76-08790 5C

Selective Fish Mortality Resulting from Low Winter Oxygen,
W76-08788 5C

HASSAN, H. A.
Hydrogeological Conditions of Al-Hamad Area, Iraq,
W76-09068 2F

HATADA, H.
Electric Equipment for Mukogawa Sewage Treatment Plant, Hyogo Prefecture (Hyogoken mukogawa shorijo no denki setsubi),
W76-09000 5D

HAUCK, G.
Standardization of Methods for the Determination of Traces of Some Volatile Chlorinated Aliphatic Hydrocarbons in Air and Water by Gas Chromatography,
W76-09287 5A

HAWES, F. B.
Environmental Effects of the Heated Discharges From Bradwell Nuclear Power Station, and of the Cooling Systems of Other Stations,
W76-08873 5C

HEALY, T. V.
The Effect of Polyacrylamide on the Settling of Thames Mud,
W76-09243 2J

HEARNE, G. A.
The Effects of Ground-Water Development on the Water Supply in the Post Headquarters Area, White Sands Missile Range, New Mexico,
W76-09137 5B

HEATH, A. G.
Research on the Marine Food Chain.
W76-08935 5C

Temperature Influence on Chemical Toxicity to Aquatic Organisms,
W76-08934 5C

HEATH, R. D.
Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms,
W76-08752 5B

HECKARD, J. M.
Environmental Studies for Major Offshore Developments,
W76-09336 5G

HEERMANN, D. F.
Hydraulic Properties of a Porous Medium: Measurement and Empirical Representation,
W76-09255 2G

HEIDER, F. M.
Monograph of the Effectiveness and Cost of Water Treatment Processes for Removal of Specific Contaminants. Vol. 1. Technical Manual,
W76-09227 5F

HEINEMANN, H. G.
Soil and Water Conservation with Western Iowa Tillage Systems,
W76-08805 4D

HELLEBUST, J.
The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

HESLINGA, G. A.
Effects of Copper on the Coral Reef Echinoid Echinometra Mathaei,
W76-09113 5C

HETRICK, C. C.
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

HIASA, T.
Ammonia Nitrogen Removal from Waste Water Effluents by Zeolite Ion Exchange and Electrolysis Combination (Zeoraito ni yoru ion-kokan-denkai no kumiawase ni yoru haisui karano ammoniasei chisso jokyo),
W76-09023 5D

HICKEL, B.
The Application of the Scanning Electron Microscope to Freshwater Phytoplankton Taxonomy and Morphology,
W76-09225 5A

HICKMAN, R. R.
Offshore Petroleum Drilling and Production,
W76-09332 5G

HILBELINK, P. A.
Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming,
W76-09349 5A

HINDALL, S. M.
The Availability of Ground Water for Irrigation in the Rice Lake-Eau Claire Area, Wisconsin,
W76-09348 4B

HIROI, K.
Instrumentation and Control for Water Works (Suidosetsubi no keisoku to seigyo),
W76-09024 5F

HIROSE, F.
Experimental Report for Regeneration of Activated Carbon and Recalcination of Lime Sludge (Kasseitan, sekkai-oden no saisei jikken hokoku),
W76-09223 5D

HITCHCOCK, K. W.
Studies of High-Rate Biological Treatment of Ipswich Sewage on Pilot Filters using Plastics Media,
W76-09029 5D

HITTE, S. J.
Anaerobic Digestion of Solid Waste and Sewage Sludge into Methane,
W76-09153 5D

HODSON, R. E.
Improved Methodology for ATP Determination in Marine Environments,
W76-08958 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

HOLLIES, J. I.
Standardization of Methods for the Determination of Traces of Some Volatile Chlorinated Aliphatic Hydrocarbons in Air and Water by Gas Chromatography,
W76-09287 5A

HOLLINGSWORTH, J. W.
Fish Toxicity of Dispersed Clay Drilling Mud Deflocculants,
W76-08896 5C

HOLM-HANSEN, O.
Amino Acid Uptake and Respiration by Marine Heterotrophs,
W76-08955 5C

Effects of Copper on Natural Marine Phytoplankton Communities,
W76-08947 5C

Improved Methodology for ATP Determination in Marine Environments,
W76-08958 5C

Primary Production and the Factors Controlling Phytoplankton Growth in the Antarctic Seas,
W76-08942 5C

HOLMSTROM, B. K.
Low-Flow Characteristics and Mean Annual Discharge of North Branch Manitowoc River at Potter, Wisconsin,
W76-09147 7C

HOLT, C. H. JR.
Separation by Solvent Extraction,
W76-09061 5D

HOLZER, T. L.
Application of Ground-Water Flow Theory to a Subsurface Oil Spill,
W76-09350 2L

HONARVAR, S.
Effect of Drilling Fluid Components Mixtures on Plants and Soils,
W76-08897 5C

HORIKOSHI, T.
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

HORNING, D. P.
Chlorinated Resin Intended for Water Treatment,
W76-09060 5F

HOSS, D. E.
Effects of Temperature, Copper and Chlorine on Fish During Simulated Entrainment in Power-Plant Condenser Cooling Systems,
W76-08878 5C

HOWE, R. H. L.
Removal of Faecal Coliform from Waste Water by Proper Aerobic Biological Treatment,
W76-09171 5D

HOWELL, F. G.
Ecology of Artificially Heated Streams, Swamps and Reservoirs on the Savannah River Plant, the Thermal Studies Program of the Savannah River Ecology Laboratory,
W76-08870 5C

Thermal Ecology of Dragonflies in Habitats Receiving Reactor Effluent,
W76-08881 5C

HOWES, B. L.
Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

HRUDEY, S. E.
Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic,
W76-09334 5G

HSU, D. Y.
Alum Sludge from Water Plant Conditions Sewage Sludge,
W76-09163 5F

HSU, P. H.
Two-Step Phosphate Removal from Solution Using Aluminum Salts,
W76-09182 5D

HUEBL, E.
The Phragmitetea and Molinietalia Associations in the Thaya, March and Danube River Basins of Austria, (In German),
W76-09076 4A

HUGHES, R.
Behavioral Impairment Produced by Exposure to Subclinical Amounts of Methylmercury Chloride,
W76-09037 5C

HUGHES, T. D.
Salt Tolerance and Suitability of Various Grasses for Saline Roadsides,
W76-08764 3C

HULL, J. E.
Summary of Hydrologic Data Collected During 1974 in Dade County Florida,
W76-09135 7C

HUMMADI, K. B.
Soluble Salts and Nitrate Distribution in Irrigated Lettuce Beds,
W76-08763 3C

HUMMEL, S. G.
A New Device For Subsampling Plankton Samples,
W76-09396 7B

HUNDAL, S.S.
Drainage System Effects on Physical Properties of a Lakebed Clay Soil,
W76-09259 2G

HUNG, Y. T.
Comparison of Warburg and Marais Methods of Determining Oxygen Uptake Rate Constants,
W76-09189 5A

HUTCHINSON, T. C.
The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

HYDE, H. C.
Utilization of Wastewater Sludge for Agricultural Soil Enrichment,
W76-09219 5D

ICHIMURA, T.
Observations of Colonial Multiplication in a Rapidly Growing Alga, Gonium Multicoccum Pocock (Volvocaceae),
W76-08826 5C

IKEHATA, A.
Reclamation and Use of Municipal Waste Water (Toshi ni okeru seikatsu haisui no sairiyo),
W76-09001 5D

IKRAMUDDIN, M.
Contents of Eleven Trace Elements in Ureilite Achondrites,
W76-09041 5A

IMHOFF, E. A.
A Guide to State Programs for the Reclamation of Surface Mined Areas,
W76-09142 5G

INADA, O.
On Spent Semichemical Pulping Liquors. (4) Xylan in Neutral Sulfite Semichemical Spent Liquor (In Japanese),
W76-09338 5C

INES,
Periodicity in the Biometric Variations of Loxechinus Albus Molina, (In Spanish),
W76-09089 2I

INOUE, S.
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

IRWIN, D. C.
Apparatus and Process of Separating Packing House Waste,
W76-09046 5D

ISHIGURO, M.
An Experimental Investigation of Tertiary Treatment with a Submerged Filter (Sesshoku bakkiho ni yoru gesui sanjishori no jikkenteki kenkyu),
W76-08999 5D

ISHIMARU, H.
Ammonia Nitrogen Removal from Waste Water Effluents by Zeolite Ion Exchange and Electrolysis Combination (Zeoraito ni yoru ion-kokan-denkai no kumiawase ni yoru haisui karano ammoniasei chisso jokyo),
W76-09023 5D

ISHMUKHAMETOVA, N. N.
Effect of Hardening on the State of Water in Seedlings of Winter Cultures, (In Russian),
W76-09095 2I

ITO, J.
Treatment of Waste Water Containing Mercurials by Activated Sludge. I. Mechanism of Removal of Mercurials in waste Water (Kassei odei ni yoru suigin ganyu haisui no shori ni kansuru kenkyu. I Kassei odei no suigin jokyo kiko),
W76-09017 5D

Treatment of Waste Water Containing Mercurials by Activated Sludge. 2. Mercury Volatilization and the Capacity of Activated Sludge for Waste Water Containing Mercurials (Kasseiodei ni yoru suigin ganyu haisui no shor ni kansuru kenkyu. 2),
W76-09018 5D

JENKINS, C. R.
Physiological Effects of Sublethal Levels of Acid Water on Fish,
W76-08927 5C

ENNE, E. A.
The Time Stability of Dissolved Mercury in Water SamplesI. Literature Review,
W76-08767 5A

ERIS, J. S.
Waste Treatment Process,
W76-08978 5D

OHANSSON, C.
Closing the White Water System of Paper Machines -- Effective Protection of the Environment (Fechamento do sistema de agua branca das maquinas de papel -- uma potecao lucrativa do meio ambiente),
W76-09342 3E

OHN, C. B.
Mineral Resource Management of the Outer Continental Shelf.
W76-09306 6G

OHNSON, R. W.
Water Diversion and the Moratorium,
W76-09234 4A

OLLIFFE, I. P.
Beach-Offshore Dredging: Some Environmental Consequences,
W76-09335 5G

ONASSON, L. R.
Some Comments on Interferences by CU(II) Ions and AG(I) Ions on the Wet Reduction-Flameless Atomic Absorption Determination of Mercury,
W76-09039 5A

ONES, G. L.
Microbiology and Activated Sludge,
W76-09172 5D

ONES, J. I.
The OCS Forgotten Land: Territorial Sea, Nearshore, and Estuary,
W76-09330 5G

ORDAN, E.
Comparison of Two Methods for Determination of Primary Productivity on Coastal Waters of the Gulf of Mexico, (In Spanish),
W76-09391 5A

ORGENSEN, S. E.
Ammonia Removal by Use of Clinoptilolite,
W76-09180 5D

OSTI, J.
Wastewater Plant will Use no Chemicals for Sludge Conditioning,
W76-09161 5D

UAN,
Periodicity in the Biometric Variations of Loxechinus Albus Molina, (In Spanish),
W76-09089 2I

UDD, J. H.
Environmental Changes in a Portion of Lake Ontario Following Pollution Abatement,
W76-09119 5C

URKIEWICZ, S.
Need for an Integral Approach to to the Problem of Quantitative Determination of Lignosulfonic Acids in Mill Effluents and Surface Waters (O potrzebie kompleksowego ujmowania problemu ilosciowego oznaczania kwasow ligninosulfonowych w sciekach pocelulozowych i wodach powierzchniowych),
W76-09277 5A

KAKA, G. F.
Comparative Evaluation of Climatic Factors and Conditions at Fudhaliya Agro-Meteorological Station and Baghdad Airport Meteorological Station,
W76-09067 2B

Comparative Evaluation of Yearly Climatic Factors with the Five Years Averages for Fudhaliya Agro-Meteorological Station,
W76-09066 2B

KALLQVIST, T.
Algal Growth Potential of Six Norwegian Waters Receiving Primary, Secondary and Tertiary Sewage Effluents,
W76-08794 5C

Thermal Effects on Marine Biota in Experimental Systems,
W76-08877 5C

KAMATH, P. R.
Seasonal Feature of Thermal Abatement of Shoreline Discharges at Nuclear Sites,
W76-08862 5G

KAPLIN, V. T.
Mechanism of Conversion of Lignin and its Derivatives in Natural Waters (Mekhanizm prevrashcheniya lignina i ego proizvodnykh v prirodnoj vode),
W76-09280 5B

KARIMIAN-TEHERANI, D.
Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

KATAOKA, T.
Experimental Report for Regeneration of Activated Carbon and Recalcination of Lime Sludge (Kasseitan, sekkai-oden no saisei jikken hokoku),
W76-09223 5D

KATES, M.
Isolation and Characterization of Actinopolyspora Halophila, Gen. ET SP. Nov., An Extremely Halophilic Actinomycete,
W76-08837 5C

KATO, T.
Experimental Report for Regeneration of Activated Carbon and Recalcination of Lime Sludge (Kasseitan, sekkai-oden no saisei jikken hokoku),
W76-09223 5D

KAUSS, P.
The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

KAWABE, K.
Instrumentation and Control for Water Works (Suidosetsubi no keisoku to seigyo),
W76-09024 5F

KAWATA, K.
Chlorination and Iodination of Poliovirus and F2,
W76-09196 5A

KEELEY, J. W.
Ground Water Problems Associated with Well-Drilling Additives,
W76-08902 5B

KEENEY, D. R.
Nutrient Mass Balance in Columns Representing Fill Systems for Disposal of Septic Tank Effluents,
W76-09164 5E

KEITH, V. F.
An Analysis of Oil Outflows Due to Tanker Accidents,
W76-09313 5B

KELL, V.
Investigations on the Phytoplankton and Some Environmental Parameters of the Shattal-Arab (Iraq), (In German)
W76-09084 2L

KELLY, R. F.
Mineral Resource Management of the Outer Continental Shelf.
W76-09306 6G

KELLY, T. E.
The Effects of Ground-Water Development on the Water Supply in the Post Headquarters Area, White Sands Missile Range, New Mexico,
W76-09137 5B

KENNEDY, K. G.
Movement of Chemical Contaminants in Ground Water,
W76-08905 5B

KEPCZYNSKI, K.
Plant Associations of Lake Mieliwo and the Adjacent Peat Bogs in the Brodnica District, (In Polish),
W76-09099 2H

KETTANEH, M. S.
Comparative Evaluation of Yearly Climatic Factors with the Five Years Averages for Fudhaliya Agro-Meteorological Station,
W76-09066 2B

KHALANSKI, M.
Studies Carried out in France on the Ecological Consequences of Open-Circuit Cooling in Thermal Power Stations, (Etudes Realisees en France sur Les Consequences Ecologiques de la Refrigeration des Centrales Thermiques en Circuit Ouvert),
W76-08875 5C

KHANDEKAR, M. L.
Simulation of Movement of Oil Slicks in the Strait of Georgia using Simple Atmosphere and Ocean Dynamics,
W76-09316 5C

KHISAMUTDINOVA, V. I.
Effect of Hardening on the State of Water in Seedlings of Winter Cultures, (In Russian),
W76-09095 2I

KIEFER, D. A.
A Thermodynamic Model for Steady State Metabolism of Phytoplankton, Part I. Theory,
W76-08944 5C

A Thermodynamic Model for Steady State Metabolism of Phytoplankton, Part II. Light and Carbon Limited Growth,
W76-08945 5C

Two Blooms of Gymnodinium Splendens (Lebour). A Large Naked Dinoflagellate,
W76-08937 5C

KILBERTUS, G.
Microbiological and Algological Survey of A Primary Stage of Eutrophication in a Stream, (In French),
W76-09399 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

KILROE-SMITH, T. A.
Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

KINCANNON, D. F.
Evaluating Rotating Biological Contactor Performance,
W76-09173 5D

KING, T. G.
Simulation of Deep Seepage to a Water Table,
W76-09245 2F

KIRKERUD, L. A.
A Method for the Rapid Sorting of Plankton into a Number of Size Groups,
W76-09397 7B

KITANOSONO, H.
Interception of Rainfall at Different Growth Stages by the Canopy of Tobacco Plants, (In Japanese).
W76-08986 3F

KITAO, T.
Ammonia Nitrogen Removal from Waste Water Effluents by Zeolite Ion Exchange and Electrolysis Combination (Zeoraito ni yoru ion-kokan-denkai no kumiawase ni yoru haisui karano ammoniasei chisso jokyo),
W76-09023 5D

KITCHELL, J. F.
Phosphorous Flux Through Fishes,
W76-09104 5C

KITCHINGS, J. T.
The Availability of 137-CS to Fishes from Ingested Clays,
W76-09118 5C

KLEINER, C. F.
Growth and Survival of Young-of-the-Year Emerald Shiners (Notropis Atherinoides) at Different Temperatures,
W76-08779 5C

KLEMMER, H. W.
Mercury Content of Biota in Coastal Waters in Hawaii,
W76-08776 5C

KLUTE, A.
Hydraulic Properties of a Porous Medium: Measurement and Empirical Representation,
W76-09255 2G

KNAPTON, J. R.
Results of Phytoplankton Sampling at National Stream Quality Accounting Network Stations in Montana--1975 Water Year,
W76-09146 5A

KNOCHENMUS, D. D.
Hydrologic Concepts of Artificially Recharging the Floridan Aquifer in Eastern Orange County, Florida--A Feasibility Study,
W76-09150 4B

KNOPP, P. V.
Waste Water Purification,
W76-08972 5D

KNOTT, R. K.
Discharge Data at Water-Quality Monitoring Stations in Arkansas,
W76-09145 7C

KOBAYASHI, T.
Decolorization of Night Soil Treatment Plant Effluent by Ozone (Ozon ni yoru shinyo shorisui no dasshoku),
W76-09026 5D

KOBORI, K.
Study on the Balance of Heavy Metals in Activated Sludge Treatment Process (Gesui shori shisetsu ni okeru jukinzokurui no shushi ni kansuru kenkyu),
W76-09222 5A

KOELLER, P.
The Replication of Biological Events in Enclosed Water Columns,
W76-08948 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-09226 5C

KOENIGS, F. F. R.
Conditions for Using a Tensionplate as a Lysimeter, (In German),
W76-09082 2G

KOHL, A. L.
Direct Contact Multi-Stage Flash Desalination,
W76-09052 3A

KOIDE, K.
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

KOJO, M.
Economics and Energy: Reducing Mill Energy Consumption and Effluent Volume,
W76-09299 5G

KOLEHMAINEN, S. E.
Thermal Studies on Tropical Marine Ecosystems in Puerto Rico,
W76-08872 5C

KOLLAR, K. L.
Industrial Development Through Water-Resources Planning,
W76-09034 3E

KOMARATAT, P.
Isolation and Characterization of Actinopolyspora Halophila, Gen. ET SP. Nov., An Extremely Halophilic Actinomycete,
W76-08837 5C

KOMISSAROVA, L. V.
Effect of the Mozhaysk Reservoir on Soil of the Bank Area of the Surrounding Territory, (In Russian),
W76-09081 2G

KONDO, T.
On Spent Semichemical Pulping Liquors. (4) Xylan in Neutral Sulfite Semichemical Spent Liquor (In Japanese),
W76-09338 5C

Studies on Oxygen-Alkali Treatment of Ligneous Materials. Part V. Recycle and Reuse of Waste Liquor in O-PA-P Bleaching Sequence (In Japanese),
W76-09337 3E

KOONCE, J. F.
Phosphorous Flux Through Fishes,
W76-09104 5C

KOONS, C. B.
Hydrocarbons in Water and Sediment Samples from Coal Oil Point Area, Offshore California,
W76-09384 5B

KORENEVSKAYA, V. E.
Effect of the Mozhaysk Reservoir on Soil of the Bank Area of the Surrounding Territory, (In Russian),
W76-09081 2G

KOSCIELNIAK, H.
The Effect of Flocculants on Postcoagulation Sludge Dewatering (Wplyw flokulantow na odwadnialnosc osadow pokoagulacyjnych),
W76-09174 5D

KOSTOVETSKIY, YA. I.
Specific Pollutants in Urban Waste Waters and the Efficiency of their Purification (Spetsificheskie zagryazneniya gorodskikh stochnykh vod i effektivnost' ikh ochistki),
W76-09002 5A

KRAKATITSA, T. F.
Interrelation Between Weight and Linear Indices in Black Sea Oysters, (In Russian),
W76-09087 2I

KRIUL'KOV, V. A.
Mechanism of Conversion of Lignin and its Derivatives in Natural Waters (Mekhanizm prevrashcheniya lignina i ego proizvodnykh v prirodnoj vode),
W76-09280 5B

KRIVAN, V.
Multi-Reaction Proton Activation Analysis for Traces of Molybdenum,
W76-09036 5A

KRONE, R. B.
Finite Element Model for Cohesive Sediment Transport,
W76-09264 2L

KRUSE, C. W.
Chlorination and Iodination of Poliovirus and F2,
W76-09196 5A

KURTZ, L. T.
Natural (15)N Abundance in Soil, Leaves, and Grain as Influenced by Long Term Additions of Fertilizer N at Several Rates,
W76-08765 3F

KUSZNIK, W.
The Effect of Flocculants on Postcoagulation Sludge Dewatering (Wplyw flokulantow na odwadnialnosc osadow pokoagulacyjnych),
W76-09174 5D

KUWAYAMA, K.
Recent Trends of Process Control for Water Works and Drainage (Jogesuido purosesu seigyo no doko),
W76-09214 5G

LA POINTE, A. E.
Mineral Resource Management of the Outer Continental Shelf.
W76-09306 6G

LABUDA, D.
Valyl tRNA's of Anacystis Nidulans,
W76-08827 5C

LACATUSU, R.
The Effect of Certain Synthetic Macromolecular Substances on the Physico-Chemical Pro-

perties of Soil and on the Fertilizer Utilization Coefficient, (In French),
W76-08981 2G

LACOURLY, G.
Can the Criteria and Methodology Used for Radioactive Discharges be Applied to Thermal Discharges. (Les Criteres et La Methodologie Retenus Pour les Rejets Radioactifs Sont-Ils Transposables Aux Rejets Thermiques.),
W76-08887 5G

LAFEVERS, J. R.
A Guide to State Programs for the Reclamation of Surface Mined Areas,
W76-09142 5G

LAMARRA, V. A. JR.
Digestive Activities of Carp as a Major Contributor to the Nutrient Loading of Lakes,
W76-09103 5C

LAMBERT, J. R.
Simulation of Deep Seepage to a Water Table,
W76-09245 2F

LAND, J.
Computations of the Temperature Response of Stratified Sill Fjords to Cooling-Water Discharges,
W76-08857 5B

LANDLESS, P. J.
Acclimation of Rainbow Trout to Sea Water,
W76-09125 2L

LANGLEY, W. W.
Phase IV: Biology,
W76-09242 2L

LASKER, R.
Two Blooms of Gymnodinium Splendens (Lebour). A Large Naked Dinoflagellate,
W76-08937 5C

LASKINA, V. P.
The Significance of Isomery in Hygienic Standardization of Industrial Contaminations of Water Bodies, (In Russian),
W76-08864 5A

LE HOUEROU, H.
The Nature and Causes of Desertization,
W76-09069 4C

LEACH, J. M.
Acute Toxicity to Juvenile Rainbow Trout (Salmo Gairdneri) of Naturally Occurring Insect Juvenile Hormone Analogues,
W76-09282 5C

LEE, G. F.
Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

LEE, R. F.
Copepod Slick in the Northwest Pacific Ocean,
W76-08959 5C

LEHNER, C. E.
Resilience of a Rocky Intertidal Fish Community in a Physically Unstable Environment,
W76-09126 5C

LEHR, J. H.
Objectives of Well-Drilling Regulations,
W76-08917 5G

LEHRER, G. M.
The Effect of Lead on Mouse Brain Development,
W76-09038 5C

LEIDNER, H. A.
Flow Velocity as a Rate Determining Factor for Self-Purification in Rivers (Uber Den Einfluss der Stromungsgeschwindigkeit auf die Selbstreinigung in Fliessgewaessern),
W76-09204 5F

LEMAY, Y.
Suspended Solids Removal from Woodroom Effluent,
W76-09289 5D

LENANTON, R. C. J.
Wilson Inlet: A Seasonally Closed Western Australian South Coast Estuary,
W76-09390 2L

LEPPARD, G. G.
Isolation and Characterization of Actinopolyspora Halophila, Gen. ET SP. Nov., An Extremely Halophilic Actinomycete,
W76-08837 5C

LETOUZEY, R.
First Observations on the Forest of Cameroon on Sandy Coastal Cordons, (In French)
W76-09100 2I

LEU, J. E.
Advanced Waste Treatment Plant Features Nitrification,
W76-09020 5D

LEVEQUE, K.
Mollusks of the Ceratophyllum Carpets of Lake Chad: Biomasses and Seasonal Variations of the Density, (In French).
W76-09094 2H

LEWIN, R. A.
Leucothrix: Absence of Demonstrable Fixation of N2,
W76-08953 5C

LEWIS, C. H.
Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

LEWIS, D. H.
Regina Tertiary Treatment Plant Study and Design, Part I, Case History,
W76-09178 5D

LEYNAUD, G.
Effects of a Thermal Discharge into a River on the Movement of Fish Populations, (Incidences D'un Rejet Thermique En Milieu Fluvial Sur Les Mouvements Des Populations Ichtyologiques),
W76-08871 5C

LIBOR, O.
Ammonia Removal by Use of Clinoptilolite,
W76-09180 5D

LIEBERMAN, C. J.
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

LIND, O. T.
Effects of Thermal Circulation on Phytoplankton Photosynthesis,
W76-08785 5C

LINDMAN, W. E.
Water Purification Process and Apparatus,
W76-09059 5D

LINICK, T. W.
Cycling of Organic Carbon in the Ocean: Use of Naturally-Occurring Radiocarbon as a Long and Short Term Tracer,
W76-08956 5C

LIPSCHUTZ, M. E.
Contents of Eleven Trace Elements in Ureilite Achondrites,
W76-09041 5A

LO, C. P.
Photographic Analysis of Water Quality Changes,
W76-09199 5A

LOCKHART, R. A.
Fish Toxicity of Dispersed Clay Drilling Mud Deflocculants,
W76-08896 5C

LODHOLZ, J. C.
Gravity Separation of Coarse Solids in Wastewater,
W76-09028 5D

LONG, D. A.
Municipal Wastewater Odor Still a Problem, Part 2,
W76-09044 5D

LOPES-POLO, C.
Environmental Aspects of the Cooling Systems of Thermal Power Stations: Report on the Seminar Held at Zurich, May Conclusions and Recommendations, (Les Aspects D'Environment Des Systems De Refroidissement Des Centralles Thermiques),
W76-08850 6G

LOPEZ, B.
Measurement of the Oxygenation Capacity in Waste Water Treatment Plants using Completely Mixed Activated Sludge (Mesure De La Capacite D'Oxygenation Dans Les Stations De Traitement A Boues Activees En Melange Integral),
W76-09006 5D

LORILLARD, M.
Vegetation and Landslides, (In French),
W76-09101 4C

LOS', S. I.
Biochemical Characteristics of Spirulina Platensis (GOM.) Geitl.: I. Water-Soluble Group B Vitamins, (In Ukranian),
W76-09091 2I

LOSHAKOV, A. S.
Formation of Fish Fauna of the Berdyansk Reservoir in the First Twelve Years of its Existence, (In Russian),
W76-09392 2H

LOUDEN, L. R.
Waste Water Base Drilling Fluid Disposal,
W76-08914 5D

LOY, S. E. III.
Techniques of Deep Well Drilling,
W76-08890 8B

LU, B. T. D.
Evaluation of Offshore Breakwater Stability Under Wave Action,
W76-09387 5G

LUCAS, C.
The Sediments of High Mountain Lake: Structure: Nature and Populations, (In French),
W76-09347 2J

LIBRARY U. OF I. URBANA-CHAMPAIGN

LUDWIG, D. F.
Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

LUMB, A. M.
Criteria for Selecting a Water Quality Model for 208 Planning,
W76-09212 5G

LUND, L. J.
Nitrogen and Phosphorus Levels in Soils Beneath Sewage Disposal Ponds,
W76-09197 5A

LUTRICK, M. C.
Agronomic and Cattle Studies with Municipal Liquid Digested Sludge,
W76-09367 5E

LYLES, L.
Wind Erosion: The Protective Role of Simulated Standing Stubble,
W76-09247 4D

MACHIDA, M.
Computer Control of Sewage and Rain Water Pumps at Sewage Treatment Plant (Gesuishorijo no osui, amamizu ponpu no keisanki seigyo),
W76-09215 8C

Electric Equipment for Mukogawa Sewage Treatment Plant, Hyogo Prefecture (Hyogoken mukogawa shorijo no denki setsubi),
W76-09000 5D

MADDING, R. P.
A Comparison of Aerial Infra-Red and In-Situ Thermal Plume Measurement Techniques,
W76-08860 5A

MAGDOFF, F. R.
Nutrient Mass Balance in Columns Representing Fill Systems for Disposal of Septic Tank Effluents,
W76-09164 5E

MAGUE, T. H.
Leucothrix: Absence of Demonstrable Fixation of N2,
W76-08953 5C

MAHOOD, H. W.
Chemical Characteristics, Acute Toxicity and Detoxification of Foam in Two Aerated Lagoons,
W76-09295 5C

MAKER, H. S.
The Effect of Lead on Mouse Brain Development,
W76-09038 5C

MALCOLM, C. V.
Plant Collection for Saltland Revegetation and Soil Conservation,
W76-09071 2I

MALLET, M. N.
Disinfection of Urban Sewage Sludge (La Desinfection Des Bous Residuaires Urbaines),
W76-09007 5D

MANCY, K. H.
Analytical Chemistry in Water Pollution Control,
W76-09221 5A

MANN, J. S.
Zinc Nutrition of Rice in Relation to Iron and Manganese Uptake Under Different Water Regimes,
W76-08974 3F

MANVILLE, J. F.
Acute Toxicity to Juvenile Rainbow Trout (Salmo Gairdneri) of Naturally Occurring Insect Juvenile Hormone Analogues,
W76-09282 5C

MARCAN, E.
Diatom Community Response to Variations in Effluent Concentration,
W76-08835 5C

MARCIAK, Z.
Influence of Mineral Fertilization of Lakes on Fish Growth,
W76-08799 5C

MARIC, K.
Papeteries De L'AA -- Suspended Solids Reduced by 98%, Organic Materials by 74% (Papeteries de l'Aa -- mes reduites de 98%, et MO de 74%),
W76-09341 5D

MARINO, M. A.
A Finite Element Model of Contaminant Movement in Groundwater,
W76-09253 5B

MARKHAM, D.
Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

MARMER, G. J.
A Comparison of Aerial Infra-Red and In-Situ Thermal Plume Measurement Techniques,
W76-08860 5A

MARSALEK, J.
Urban Runoff Modelling,
W76-09033 4A

MARTIN, F. D.
Thermal Studies on Tropical Marine Ecosystems in Puerto Rico,
W76-08872 5C

MARTIN, M. J.
Package Sewage Treatment Process,
W76-09170 5D

MASSO, C.
Mercury Concentrations in Spring and Fall Zooplankton of the Estuary of the Arosa River, (In Spanish),
W76-08768 5C

MASUDA, S.
An Experimental Investigation of Tertiary Treatment with a Submerged Filter (Sesshoku bakkiho ni yoru gesui sanjishori no jikkenteki kenkyu),
W76-08999 5D

MATALAS, N. C.
Statistics of Data Transfer,
W76-09133 4A

MATHESON, J. C. III.
Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth,
W76-08842 5D

MATSUMURA, T.
Municipal Waste Water Treatment by Ozone (Ozon ni yoru toshigesui shori),
W76-09025 5D

MATSUOKA, T.
Recent Trends of Process Control for Water Works and Drainage (Jogesuido purosesu seigyo no doko),
W76-09214 5G

MATTICE, J. S.
Effect of Constant and Varying Temperature on Egg Production of Lymnaea Obrussa Say (Mollusca: Gastropoda),
W76-09120 5C

A Method for Estimating the Toxicity of Chlorinated Discharges,
W76-08928 5C

MAZHILIS, A. A.
Infection of Broad-Clawed Crayfish with Branchiobdella and Control Measures Against them, (In Russian),
W76-09086 2H

MCCOLL, R. H. S.
Self-Purification of Small Freshwater Streams: Phosphate, Nitrate, and Ammonia Removal,
W76-09398 5C

MCCORMICK, J. H.
Growth and Survival of Young-of-the-Year Emerald Shiners (Notropis Atherinoides) at Different Temperatures,
W76-08779 5C

MCCRACKEN, A.
An Investigation of Antibiotic and Drug Residues in Fish,
W76-09124 5C

MCDANNALD, R. B.
Wire Rope,
W76-09359 8C

MCDONALD, J.
Filter Media Comparison at Prince George Pulp and Paper (Limited),
W76-09286 5D

MCGLOTHLIN, R. E.
Waste Water Base Drilling Fluid Disposal,
W76-08914 5D

MCGUIRE, W. J.
Disposal of Drilling Fluids and Drilled-up Solids in Offshore Drilling Operations,
W76-08915 5D

MCKAY, H. A. C.
The Effect of Polyacrylamide on the Settling of Thames Mud,
W76-09243 2J

MCKENNA, E. J.
Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms,
W76-08752 5B

MCKEOWN, J. J.
Study to Define Changes in Pulp Mill Effluent Contributed Color in Receiving Waters Detectable by Human Observers,
W76-09276 5C

MCKOWN, M. M.
Environmental Implications of Sediment Bulk Analysis Techniques for Trace Metals in Offshore Well-Drilling Operations,
W76-08908 5A

MCLAREN, D. A.
The Nature of Activated Sludge Flocs,
W76-09188 5D

MCLEAN, R. O.
Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

MCMAHON, J. W.
Effects of Heat Enrichment on Species Succession and Primary Production in Fresh-Water Plankton,
W76-08879 5C

MCMORDIE, W. C.
Handling and Treatment of Oil-Base Drilling Muds,
W76-08913 8G

MCMURRAY, G.
Summer Phytoplankton Photosynthesis in a Northeastern Ohio Glacial Lake,
W76-08828 5C

MCWHORTER, D. B.
Vertical Flow of Air and Water with a Flux Boundary Condition,
W76-09251 2G

MEAD, J. T.
Late Pleistocene and Modern Plant Communities of Shinumo Creek and Peach Springs Wash, Lower Grand Canyon, Arizona,
W76-09074 2I

MEHTA, Y. M.
Suspended Solids Removal from Woodroom Effluent,
W76-09289 5D

MEINTS, V. W.
Natural (15)N Abundance in Soil, Leaves, and Grain as Influenced by Long Term Additions of Fertilizer N at Several Rates,
W76-08765 3F

MELVASALO, T. L.
Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

MENIER, G.
Suspended Solids Removal from Woodroom Effluent,
W76-09289 5D

MERLUZZI, D.
Regulations and Environmental Investigations Associated with Nuclear Station Thermal Discharges,
W76-08886 5G

MESAROVIC, M. M.
Waste-Heat Disposal from Steam Electric Plants with Reference to the Stochastic Nature of Some Environmental Conditions and to Thermal Pollution Control Regulations,
W76-08865 5G

MEURER, R. W.
Mineral Resource Management of the Outer Continental Shelf.
W76-09306 6G

MICHALSKI, M. F. P.
Reclamation of Acidified Lakes - Middle and Lohi, Sudbury, Ontario,
W76-09108 5G

MIKKOLA, I.
Heat Discharges into the Sea at the Olkiluoto Site: Laboratory Model Test Results and Reasons for Selected Arrangements,
W76-08858 5B

MILFORD, J. R.
Rainfall Trends in the West African Sahel,
W76-09269 2B

MILLER, D. C.
Development and Application of Criteria for Marine Cooling Waters,
W76-08885 5G

MILLER, P. C.
A Comparison of Short-Term Effects of Thermal Addition on Photosynthesis and Plant-Water Stress in Three Ecosystems,
W76-08884 5C

MILLER, R. W.
Effect of Drilling Fluid Components Mixtures on Plants and Soils,
W76-08897 5C

MILLS, A.
Fish Habitat in Forest Lands,
W76-09233 8I

MINAS, M.
Distribution, Circulation and Evolution of Nutrients, Particularly Inorganic Phosphorus in Lake Etang DeBerre: Influence of River Durance Waters, (In French),
W76-09393 5B

MITCHELL, D. G.
An Improved Determination of Chemical Oxygen Demand in Water and Wastes by a Simplified Acid Dichromate Digestion,
W76-09203 5A

MIYAMOTO, S.
Potentially Beneficial Uses of Sulfuric Acid in Southwestern Agriculture,
W76-08766 3F

MOLDAU, K. A.
Effect of Air Humidity on Stomatal and Mesophyll Conductivity of Bean Leaves at Two Soil Moisture Levels, (In Russian)
W76-09097 2I

MONDAL, N.
Effect of Late Sowing on Morphogenetic Development of Panicle in Rice (Oryza Sativa L.),
W76-08758 3F

MONTALVO, J. G.
Environmental Implications of Sediment Bulk Analysis Techniques for Trace Metals in Offshore Well-Drilling Operations,
W76-08908 5A

MOORE, B.
Acute Toxicity of Well-Drilling to Rainbow Trout,
W76-08899 5A

MORAVCOVA, V.
Axenic Cultures of Tetrahymena Pyriformis as Toxicological Tools,
W76-09121 5A

MORI, T.
Studies on Phosphorylation Coupled with Denitrification and Aerobic Respiration in Pseudomonas Denitrificans,
W76-08823 5C

MORRIS, B. F.
Petroleum Residues in the Sargasso Sea and on Bermuda Beaches,
W76-09315 5C

MORTIMER, D. C.
Mercury Uptake in Rooted Higher Aquatic Plants; Laboratory Studies,
W76-09111 5C

MOSHER, S. C.
Secondary Treatment at Ontario-Minnesota Pulp and Paper Company Limited; Fort Frances, Ontario,
W76-09301 5D

MOWAT, A.
Measurement of Metal Toxicity by Biochemical Oxygen Demand,
W76-09127 5A

MUELLER, J. A.
Waste Treatment Process,
W76-08978 5D

MUELLER, J. C.
Effects of Color and Toxic Constituents of Bleached Kraft Mill Effluent on Algal Growth,
W76-09300 5C

MUGA, B. J.
The Role of Engineering in Minimizing Offshore Impacts,
W76-09331 5G

MULLIN, M. M.
Coccolith Sedimentation by Fecal Pellets: Laboratory Experiments and Field Observations,
W76-08954 5C

Distribution, Morphometry, and Seasonal Biology of the Planktonic Copepods, Neocalanus Robustior and N. Gracilis, in the Pacific Ocean,
W76-08951 5C

Nutrient Regeneration by Oceanic Zooplankton: A Comparison of Methods,
W76-08950 5C

MUNAWAR, M.
Biomass Parameters and Primary Production at a Nearshore and a Midlake Station of Lake Ontario During IFYGL,
W76-08825 5C

MURPHY, D. S.
Double Funnel with Baffle Cascade Aeration Unit,
W76-09027 5D

MURRAY, D. A.
A Light Weight Corer for Sampling Soft Subaqueous Deposits,
W76-09266 2J

MURRAY, S. P.
Wind and Current Effects on Large-Scale Oil Slicks,
W76-09310 5G

MURTY, T. S.
Simulation of Movement of Oil Slicks in the Strait of Georgia using Simple Atmosphere and Ocean Dynamics,
W76-09316 5C

MUSHA, S.
Chemical Interference Effects in the Atomic Absorption Spectrometric Determination of Lead with Premixed Inert Gas (Entrained Air)-Hydrogen Flames.
W76-09043 5A

LIBRARY U. OF I. URBANA-CHAMPAIGN

MUSICK, J. T.
No-Till Seeding of Irrigated Sorghum Double Cropped After Wheat,
W76-08756 3F

NABIVANETS, B. I.
Chemiluminescent Method of Determining Manganese in Natural Waters, (In Russian),
W76-09077 2K

Experimental Study of the Effect of Temperature and Degree of Oxygen Saturation on the Destruction rate of Soluble Proteins in Natural Waters, (In Russian),
W76-09078 5C

NADEAU, R. J.
A Salt Marsh Microcosm: An Experimental Unit for Marine Pollution Studies,
W76-09318 5C

NAFTEL, W. L.
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74,
W76-09144 7C

NAGATA, Y.
Quality Control in Sewage Treatment Plant (Gesuishorijo no shishutsu seigyo),
W76-09205 5D

NAKAHARA, T.
Chemical Interference Effects in the Atomic Absorption Spectrometric Determination of Lead with Premixed Inert Gas (Entrained Air)-Hydrogen Flames.
W76-09043 5A

NAKAMURA, K.
Treatment of Waste Water Containing Mercurials by Activated Sludge. I. Mechanism of Removal of Mercurials in waste Water (Kassei odei ni yoru suigin ganyu haisui no shori ni kansuru kenkyu. I Kassei odei no suigin jokyo kiko),
W76-09017 5D

Treatment of Waste Water Containing Mercurials by Activated Sludge. 2. Mercury Volatilization and the Capacity of Activated Sludge for Waste Water Containing Mercurials (Kasseiodei ni yoru suigin ganyu haisui no shor ni kansuru kenkyu. 2),
W76-09018 5D

NAKAYAMA, K.
Municipal Waste Water Treatment by Rotating Disc Method (Kaiten enbaho ni yoru hisui shori),
W76-09022 5D

NARASIMHAN, S.
Pressure Fluctuations in Submerged Jump,
W76-09265 8B

NEGAARD, J.
Costs of Biological Waste Water Purification (Die Kosten Der Biologischen Abwasserreinigung),
W76-09016 5D

NEGORO, Y.
Computer Control of Sewage and Rain Water Pumps at Sewage Treatment Plant (Gesuishorijo no osui, amamizu ponpu no keisanki seigyo),
W76-09215 8C

NEILL, R. D.
Options for the Use and Disposal of Bark,
W76-09302 5E

NELSON, C. O.
Nitrogen and Phosphorus Levels in Soils Beneath Sewage Disposal Ponds,
W76-09197 5A

NELSON, K.
Centrifuge Preventing Air Admission During Sludge Discharge,
W76-08990 5D

NELSON, S. B.
Ocean Dumping--A Rational Approach to an International Problem,
W76-09304 5G

NELSON, S. O.
Power Factors and Electrical Demands of Center-Pivot Irrigation Machines,
W76-08770 3F

NG, F. W.
Solutions for Some Problems Resulting from Refreezing of Permafrost Around a Wellbore,
W76-08892 8G

NG, K. S.
Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W76-09292 5D

NIELSEN, D. R.
Determining the Hydraulic Conductivity of Soil Cores by Centrifugation,
W76-09256 2G

NIEMINEN, G. A.
Economic Considerations in the Selection of a Biological Treatment System,
W76-09290 5D

NIKITIN, V. M.
Phenols -- Products of Lignin Degradation -- in Effluents of the Baikal Pulp and Paper Mill (Fenoli -- produkty razrusheniya lignina -- v stochnykh vodakh Baikal'-skogo tsellyuloznogo zavoda),
W76-09281 5A

NILSEN, G.
Thermal Effects on Marine Biota in Experimental Systems,
W76-08877 5C

NISHIDA, T.
Studies on Oxygen-Alkali Treatment of Ligneous Materials. Part V. Recycle and Reuse of Waste Liquor in O-PA-P Bleaching Sequence (In Japanese),
W76-09337 3E

NOBBS, P. A.
Environmental and Intrinsic Control of Filtering and Feeding Rates in Arctic Daphnia,
W76-08933 5C

NORGROVE, W. B.
The Tyneside Sewerage Scheme,
W76-09184 5D

NOVITSKY, T.
Isolation and Characterization of Actinopolyspora Halophila, Gen. ET SP. Nov., An Extremely Halophilic Actinomycete,
W76-08837 5C

NOY-MEIR, I.
Desert Ecosystems: Higher Trophic Levels,
W76-09064 2A

NOZ, F. J.
Hydraulic Calculation of Sludge Pipelines in Waste Water Treatment Plants (De hydraulische berekening van slibwaterleidingen op rioolwaterzuiveringstallaties),
W76-09208 8C

NUZZI, R.
Effects of Water Soluble Extracts of Oil on Phytoplankton,
W76-09325 5C

NYLUND, J. E.
Secondary Effluent Treatment at Northwood Pulp and Timber Limited,
W76-09297 5D

O'BRIEN, J. J.
An Investigation of Antibiotic and Drug Residues in Fish,
W76-09124 5C

O'DONNELL, J. M.
Process for Treating Sewage Sludge and Fertilizer Products Thereof,
W76-08984 5D

O'LEARY, J. W.
Growth, Water Consumption, and Salt Uptake of Tomato Plants in High Humidity- High Carbon Dioxide Greenhouse Environments,
W76-09075 3C

OCHI, S.
Study on the Balance of Heavy Metals in Activated Sludge Treatment Process (Gesui shori shisetsu ni okeru jukinzokurui no shushi ni kansuru kenkyu),
W76-09222 5A

OCHIAI,
On the Histological Structure and Function of Digestive Organs of the Fed and Starved Larvae of the Yellowtail, Seriola Quinqueradiata (In Japanese),
W76-09088 2

OERTEL, F. G.
Report on the Hydrologic and Sedimentologic Study of the Offshore Spoil Disposal Area Savannah, Georgia,
W76-09309 5E

OGEDENGBE, O.
The Performance-Potential of Polyelectrolyte and High Velocity Gradients in the Treatment of Wastewaters,
W76-09179 5E

OKUBO, W. I.
Mercury Content of Biota in Coastal Waters of Hawaii,
W76-08776 5C

OLEINIK, G. N.
Experimental Study of the Effect of Temperature and Degree of Oxygen Saturation on the Destruction rate of Soluble Proteins in Natural Waters, (In Russian),
W76-09078 5C

OLIVE, J. H.
Summer Phytoplankton Photosynthesis in Northeastern Ohio Glacial Lake,
W76-08828 5C

OMATA, I.
Instrumentation and Control for Water Work (Suidosetsubi no keisoku to seigyo),
W76-09024 5

OSCHWALD, W. R.
Erosion for Corn Tillage Systems,
W76-09248 3

TSTAVNOV, A. A.
Dimensioning of Underground Sewer Pipelines Made of Plastic Tubes (Raschet podzemnykh kanalizatsionnykh truboprovodov iz polimernykh trub),
W76-08962 8B

TSU, V.
Periodicity in the Biometric Variations of Loxechinus Albus Molina, (In Spanish),
W76-09089 2I

TTO, R. G.
Laboratory and Field Tests of Temperature Tolerance on Gambusia A. Affinis, the Western Mosquitofish,
W76-08798 5C

TVOS, E. G.
Phase III: Sedimentology,
W76-09241 2L

UZILLEAU, J.
Zonation of Snow Conditions in Forest-Tundra, Hudson Bay, New Quebec, (In French),
W76-08759 2C

WEN, P. J.
Insecticide Residues in Two Turtle Species Following Treatment with DDT,
W76-08778 5C

AFLAI, A. G.
Interrelation Between Weight and Linear Indices in Black Sea Oysters, (In Russian),
W76-09087 2I

AGE, A. L.
Nitrogen and Phosphorus Levels in Soils Beneath Sewage Disposal Ponds,
W76-09197 5A

AGE, R. A.
Evaluation of Seismicity and Earthquake Shaking at Offshore Sites,
W76-09379 5G

ARKER, B. C.
Research on the Marine Food Chain.
W76-08935 5C

Temperature Influence on Chemical Toxicity to Aquatic Organisms,
W76-08934 5C

ASCALE, C. A.
Water Resources of Walton County, Florida,
W76-09149 4A

ATTEN, B. C.
A Reservoir Cove Ecosystem Model,
W76-08830 5C

ATTEN, B. G.
Interagency Investigations of a Persistent Oil Spill on the Washington Coast. Animal Population Studies, Hydrocarbon Uptake by Marine Organisms, and Algae Response Following the Grounding of the Troopship General M.C. Meigs,
W76-09324 5C

AUL, A. K.
Effect of Late Sowing on Morphogenetic Development of Panicle in Rice (Oryza Sativa L.),
W76-08758 3F

AUSE, R. W.
An Improved Determination of Chemical Oxygen Demand in Water and Wastes by a Simplified Acid Dichromate Digestion,
W76-09203 5A

PAWLITA, W.
The Effect of Flocculants on Postcoagulation Sludge Dewatering (Wplyw flokulantow na odwadnialnosc osadow pokoagulacyjnych),
W76-09174 5D

PAYETTE, S.
Zonation of Snow Conditions in Forest-Tundra, Hudson Bay, New Quebec, (In French),
W76-08759 2C

PAYNE, J. F.
Field Evaluation of Benzopyrene Hydroxylase Induction as a Monitor for Marine Petroleum Pollution,
W76-09116 5A

PEARL, R. H.
Hydrological Problems Associated with Developing Geothermal Energy Systems,
W76-09260 4B

PEARSON, E.
Influx of Petroleum Hydrocarbons into the Ocean,
W76-09385 5G

PECHEN-FINENKO, G. A.
Effect of Food Concentration on Efficiency of its Assimilation by Planktonic Crustaceans with Different Feeding Mechanisms, (In Russian),
W76-09092 2I

PECK, M. K.
Transform Approach to Solution of Groundwater Flow Equations,
W76-08922 2F

PEELEN, R.
Changes in the Composition of the Plankton of the Rivers Rhine and Meuse in the Netherlands During the Last Fifty Five Years,
W76-09105 5C

PEGG, W. J.
Physiological Effects of Sublethal Levels of Acid Water on Fish,
W76-08927 5C

PELL, J.
The Chalk Point Cooling Tower Project,
W76-08861 5B

PENRIDGE, L.
Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

PENTZ, H.
Gravity Separation of Coarse Solids in Wastewater,
W76-09028 5D

PERAINO, J.
Features of Various Offshore Structures,
W76-09311 8A

PERCY, J. A.
Responses of Arctic Marine Crustaceans to Crude Oil and Oil-Tainted Food,
W76-09123 5C

PERKINS, T. K.
Solutions for Some Problems Resulting from Refreezing of Permafrost Around a Wellbore,
W76-08892 8G

PERRY, H. M.
Phase IV: Biology,
W76-09242 2L

PERRY, M. J.
Dynamics of Phosphorus Cycling in the Euphotic Waters of the Central North Pacific Ocean,
W76-08939 5C

Nutrient Regeneration by Oceanic Zooplankton: A Comparison of Methods,
W76-08950 5C

Phosphate Utilization by an Oceanic Diatom in Phosphorus-Limited Chemostat Culture and in the Oligotrophic Waters of the Central North Pacific,
W76-08938 5C

PERRY, P. A.
Methods of Estimating Residential Land Use for Water Resources Management,
W76-08924 4C

PERRY, R.
Factors Affecting the Extraction and Analysis of Polynuclear Aromatic Hydrocarbons in Water,
W76-09200 5A

PESONEN, R.
Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

PESSAH, E.
Practical Application of the Toxicity Emission Rate Concept in a Survey of Maritime Pulp and Paper Mills,
W76-09293 5A

PETERS, R. R.
Techniques of Shallow Well Drilling,
W76-08891 8B

PFISTER, R. E.
Protection of Free-Flowing Rivers,
W76-09235 6E

PHOENIX, D. A.
Summary Appraisals of the Nation's Ground-Water Resources--California Region,
W76-09139 4B

PICKERING, R. J.
Design of Nationwide Water-Quality-Monitoring Networks,
W76-09209 5A

PICKWELL, G. V.
Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

PIERRE, J. F.
Microbiological and Algological Survey of A Primary Stage of Eutrophication in a Stream, (In French),
W76-09399 5C

PIEST, R. F.
Soil and Water Conservation with Western Iowa Tillage Systems,
W76-08805 4D

PINO, F.
Simultaneous Spectrophotometric Determination of Nickel and Cobalt in Mixtures with 3-Hydroxypicolinealdehyde Azine,
W76-09042 5A

PIYALKIN, V. N.
Phenols -- Products of Lignin Degradation in Effluents of the Baikal Pulp and Paper Mill (Fenoli -- produkty razrusheniya lignina -- v

LIBRARY U. OF J. UNDRAU CENTRE

PIYALKIN, V. N.

stochnykh vodakh Baikal'-skogo tsellyuloznogo zavoda),
W76-09281 5A

PLODOWSKI, T.
Features of Various Offshore Structures,
W76-09311 8A

PODGAEVSKAYA, L. V.
Experimental Study of the Effect of Temperature and Degree of Oxygen Saturation on the Destruction rate of Soluble Proteins in Natural Waters, (In Russian),
W76-09078 5C

POON, C. P. C.
Kinetics and Control Tests of Nitrification-Denitrication Process, Part I: Kinetics,
W76-09365 5D

PORRICELLI, J. D.
An Analysis of Oil Outflows Due to Tanker Accidents,
W76-09313 5B

PORTER, K. R.
Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo Boreas),
W76-09115 5C

PRAHACS, S.
Colour Measurement of Pulp Mill Effluents,
W76-09296 5A

Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon,
W76-09298 5D

PRANCE, N.
Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

PRANGE, C. J.
Mobile Sewer Cleaning Machine,
W76-08973 8C

PRESTON, E. H.
A Critical Study of Flood Protection Planning in the Susquehanna River Basin: 1936-1972,
W76-08846 6F

PRICE, N. B.
Areal and Seasonal Variations in the Chemistry of Suspended Particulate Matter in a Deep Water Fjord,
W76-08829 2L

PUSZ, I.
Effects of Activated Carbon Addition to the Activated Sludge Process (Wplyw dodatku wegla aktywnego do procesu osadu Czynnego),
W76-09175 5D

QUAM, H.
Countermeasures to Control Oil Spills in Western Canada,
W76-09346 5G

RADES, D. L.
The Benthos of Pictou Harbor and Northumberland Strait, Canada -- A Measure of the Impact of Treated Kraft Pulp Mill Effluent,
W76-09294 5C

RAKHOV, G. M.
Specific Pollutants in Urban Waste Waters and the Efficiency of their Purification (Spetsificheskie zagryazneniya gorodskikh stochnykh vod i effektivnost' ikh ochistki),
W76-09002 5A

RAMUSINO, M. C.
The Po River at the Island of Serafini, (In Italian),
W76-09305 2E

RANDALL, C. W.
Design Procedure for a Contact Stabilization Activated Sludge Process,
W76-09211 5D

RANISH, D. R.
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

RAO, G.
Titration of Antimony (III) with Cerium (IV) Sulphate and Diphenylamine and its Derivatives as Reversible Indicators,
W76-09040 5A

RASHID, M. A.
Degradation of Bunker C Oil under Different Coastal Environments of Chedabucto Bay, Nova Scotia,
W76-09394 5B

RAT'KOVA, T. N.
Phytoplankton Distribution in the Vicinity of the Peru Current Near 8 Degrees S. Latitude, (In Russian),
W76-09283 5B

RATCLIFF, T.
Laboratory and Field Tests of Temperature Tolerance on Gambusia A. Affinis, the Western Mosquitofish,
W76-08798 5C

REDDING, J. M.
Macroscopic Benthic Fauna of Three Tidal Creeks Adjoining the Rhode River, Maryland,
W76-09143 5B

REEVES, J. R.
Monitoring Dissolved-Oxygen Content to Assure Clean Wastewater,
W76-09202 5A

REHWOLDT, R.
Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

REID, F. M. H.
Microplankton of the North Pacific Central Gyre. I. Population Structure and Abundance, June 1973,
W76-08949 5C

REID, R. O.
Wind-Driven Flow of Water Influenced by a Canopy,
W76-08801 2H

RENGER, E. H.
Chlorine Reactions with Seawater Constituents and the Inhibition on Photosynthesis of Natural Marine Phytoplankton,
W76-08946 5C

Nutrient Regeneration by Oceanic Zooplankton: A Comparison of Methods,
W76-08950 5C

REUTTER, J. M.
Zooplankton of Western Lake Erie at Put-in-Bay: A Quantitative Study, April 1973-March 1974,
W76-08833 5C

REUTTER, V. M.
Zooplankton of Western Lake Erie at Put-i
Bay: A Quantitative Study, April 1973-Mar
1974,
W76-08833 5

REYNOLDS, J. B.
Feeding Behavior and Temperature and Lig
Tolerance of Mysis Relicta in the Laboratory,
W76-08931 5

REYNOLDS, M. A.
Advanced Waste Treatment Plant Featur
Nitrification,
W76-09020 5

RICE, S. D.
Toxicity and Avoidance Tests with Prudh
Bay Oil and Pink Salmon Fry,
W76-09317 5

RICH, L. G.
How to Design Aerated Lagoon Systems
Meet 1977 Effluent Standards Experimen
Studies,
W76-09157 5

RIEGO, D.
Phosphate Determinations in Waters Using
Anion Exchange Resin,
W76-09370 5

RINGUELET, R. A.
A New Stratified Plankton Sampler for Shall
Waters, (In Spanish),
W76-09193

RITCHIE, E. A.
Cathodic Protection Wells and Ground Wa
Pollution,
W76-09357 5

ROBERSON, J. A.
A Theory of Flow Resistance for Vegetat
Channels,
W76-09252 4

ROBERTSON, R. E.
Chlorinated Resin Intended for Water Tre
ment,
W76-09060 5

ROGERS, I. H.
Chemical Characteristics, Acute Toxicity a
Detoxification of Foam in Two Aerat
Lagoons,
W76-09295 5

ROHLING, J. P.
Development of a Water Quality Instrumen
tion Package for Long-Term Operation fr
Buoys and Other Unattended Marine Pl
forms,
W76-09372 5

ROOTS, B. I.
Glycerophosphatide Content and Composit
of Trout (Salvelinus Fontinalis M.) Brain,
W76-08929 5

ROSSARO, B.
The Po River at the Island of Serafini, (
Italian),
W76-09305 2

ROTH, P. H.
Coccolith Sedimentation by Fecal Pellet
Laboratory Experiments and Field Observ
tions,
W76-08954 5

)UNSEFELL, G. A.
Ecological Effects of Offshore Construction,
W76-09307 6G

)USH, T. H.
A Salt Marsh Microcosm: An Experimental Unit for Marine Pollution Studies,
W76-09318 5C

)WAN, M. J.
mplications of Zoning as An Urban Water Management Measure,
W76-08755 6F

ZICKA, J.
Flow Injection Analysis. Part IV. Stream Sample Splitting and Its Application to the Continuous Spectrophotometric Determination of Chloride in Brackish Waters,
W76-09339 5A

ABOV, A. K.
Experimental Study of the Effect of Temperature and Degree of Oxygen Saturation on the Destruction rate of Soluble Proteins in Natural Waters, (In Russian),
W76-09078 5C

AN, J.
Potentially Beneficial Uses of Sulfuric Acid in Southwestern Agriculture,
W76-08766 3F

E, H.
Computations of the Temperature Response of Stratified Sill Fjords to Cooling-Water Discharges,
W76-08857 5B

AD, A. H.
nvestigations on the Phytoplankton and Some nvironmental Parameters of the Shattal-Arab raq), (In German)
W76-09084 2L

TO, K.
tudy on the Balance of Heavy Metals in Activated Sludge Treatment Process (Gesui shori isetsu ni okeru jukinzokurui no shushi ni kanru kenkyu),
W76-09222 5A

TO, S.
bservations of Colonial Multiplication in a apidly Growing Alga, Gonium Multicoccum ocock (Volvocaceae),
W76-08826 5C

AI, K.
udies on Oxygen-Alkali Treatment of Lignes Materials. Part V. Recycle and Reuse of aste Liquor in O-PA-P Bleaching Sequence n Japanese),
W76-09337 3E

EH, M.
onditioning Improves Sludge Filterability,
W76-09181 5D

IESHIMA, K.
n Spent Semichemical Pulping Liquors. (4) ylan in Neutral Sulfite Semichemical Spent quor (In Japanese),
W76-09338 5C

IPAYO, F. F.
ethods for Filtering Nitrified Effluents,
W76-09015 5D

KS, G. D.
lt Tolerance and Suitability of Various asses for Saline Roadsides,
W76-08764 3C

SANO, H.
The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

SASO, Y.
Effects of Lime, Phosphate and Soil Conditioner on Growth and Fruit Quality of Netted Melon, (In Japanese),
W76-08989 3C

SAWYER, R. T.
The Biology of the Leech Myzobdella Lugubris Infesting Blue Crabs and Catfish,
W76-08932 5C

SCHALENKAMP, M.
Microflocculation--Comparative Experiments Between Single and Double Layer Filters with Iron and Aluminum Sulfate (Microflockung--Vergleichsversuche Zwischen ein-und Zweischicteiltern mit eisen-und Aluminumsulfat),
W76-09206 5F

SCHEINER, D.
Determination of Ammonia and Kjeldahl Nitrogen by Indophenol Method,
W76-09201 5A

SCHERB, K.
Energy Saving--An Important Consideration,
W76-09187 5A

SCHETZ, J. A.
Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

SCHLEICHER, J.
Is Your Pump a Candidate for Inefficiency.,
W76-09352 3F

SCHMIDT, B. G.
Industry Candidates and General Locations for Artificial Industrial-Port Islands,
W76-09377 5G

SCHMISSEUR, W. E.
Water Conservation and Irrigated Agriculture,
W76-09236 3F

SCHMITZ, W.
Expedient Technique of Permanent Observations -- An Indispensable Tool on Studying the Limnology of Rivers,
W76-09106 7B

SCHNEIDER, M. J.
Aquatic Physiology of Thermal and Chemical Discharges,
W76-08880 5C

SCHOEPFLE, B. O.
Process for Electrolysis of Brine,
W76-09053 5D

SCHRECKER, G. O.
Atmospheric Dispersion of Cooling-Tower Blowdown,
W76-08853 5B

SCHREIBER, A.
Method for Biologically Treating Sewage and an Installation for Carrying out the Method,
W76-09047 5D

SCHREIBER, B.
Method for Biologically Treating Sewage and an Installation for Carrying out the Method,
W76-09047 5D

SCHROEDER, P. B.
Thermal Studies on Tropical Marine Ecosystems in Puerto Rico,
W76-08872 5C

SCHUELLER, G. I.
On the Risk Assessment of Offshore Structures,
W76-09373 5G

SCHULZE-RETTMER, R.
Instrumentation for Analyzing TOD (Instrumentelle TSB-Analytik),
W76-09185 5A

SCHWAB, G. O.
Drainage System Effects on Physical Properties of a Lakebed Clay Soil,
W76-09259 2G

SCHWARTZ, M.
Separation Processes Used for Pollution Control in the Pulp and Paper Industry,
W76-09340 5D

SCORSA, M.
Application of Centrifuges. Dewatering of Sludges from Waterworks (Applicazione Di Centrifughe. Disidratazione Di Fanghi Provenienti Da Impianti Di Potabilizzazione),
W76-09008 5F

SCOTT, W. S.
The Effect of Road Deicing Salts on Sodium Concentration in an Urban Water Course,
W76-09218 5B

SCRIVEN, R. A.
United Kingdom Experience of the Physical Behaviour of Heated Effluents in the Atmosphere and in Various Types of Aquatic Systems,
W76-08863 5B

SEIBERT, D. L. R.
Effects of Copper on Natural Marine Phytoplankton Communities,
W76-08947 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-08948 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-09226 5C

SEIYAMA, T.
Ammonia Nitrogen Removal from Waste Water Effluents by Zeolite Ion Exchange and Electrolysis Combination (Zeoraito ni yoru ionkokan-denkai no kumiawase ni yoru haisui karano ammoniasei chisso jokyo),
W76-09023 5D

SERVIZI, J. A.
Chemical Characteristics, Acute Toxicity and Detoxification of Foam in Two Aerated Lagoons,
W76-09295 5C

SHABMAN, L. A.
User Charges for Inland Waterways: A Review of Issues in Policy and Economic Impact,
W76-08847 4A

SHARITZ, R. R.
Ecology of Artificially Heated Streams, Swamps and Reservoirs on the Savannah River Plant, the Thermal Studies Program of the Savannah River Ecology Laboratory,
W76-08870 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

SHARP, J. H.
Photosynthetic Measurements in the Central North Pacific: The Dark Loss of Carbon in 24-Hour Incubations,
W76-08940 5C

SHARP, J. M.
The Offshore Ecology Investigation,
W76-09382 5G

SHAW, D. R.
The Toxicity of Drilling Fluids, Their Testing and Disposal,
W76-08911 5D

SHCHERBINA, M. A.
Physiological Evaluation of the Nutritional Value of Artificial Fish Feeds, (In Russian),
W76-09090 2I

SHELL, G. L.
Phosphorus Removal from Wastewater,
W76-08994 5D

SHEVCHENKO, A. K.
Problem of Blood-Sucking Flies in the Zones Affected by Big Water Reservoirs in the Ukrainian SSR, (In Russian),
W76-08991 5G

SHEW, C. D.
Ground Water Problems Associated with Well-Drilling Additives,
W76-08902 5B

SHEW, R. L.
Recreation Use Patterns and User Attitudes on the Snake River,
W76-08751 6B

SHIMAZAKI, T. T.
Direct Contact Multi-Stage Flash Desalination,
W76-09052 3A

SHINNAI, K.
Computer Control of Sewage and Rain Water Pumps at Sewage Treatment Plant (Gesuishorijo no osui, amamizu ponpu no keisanki seigyo),
W76-09215 8C

SHIRAKI, Y.
Electric Equipment for Mukogawa Sewage Treatment Plant, Hyogo Prefecture (Hyogoken mukogawa shorijo no denki setsubi),
W76-09000 5D

SHIVELY, J. M.
Effects of Selected Herbicides on Bacterial Populations in Nontreated and Treated Water,
W76-09369 5C

SHOFNER, F. M.
Atmospheric Dispersion of Cooling-Tower Blowdown,
W76-08853 5B

SHTEYNBERG, E. I.
Specific Pollutants in Urban Waste Waters and the Efficiency of their Purification (Spetsificheskie zagryazneniya gorodskikh stochnykh vod i effektivnost' ikh ochistki),
W76-09002 5A

SHUKHTINA, G. G.
Effect of the Water Regime on the Heat-Resistance of Leaf Cells of Heat-Hardened Tradescantia Fluminensis Vell. Plants, (In Russian),
W76-09107 2I

SHUMAS, F. J.
Diffuser Design,
W76-09291 8A

SHUPE, O. K.
Structural Performance of Buried Plastic Drain Tubing,
W76-08771 8G

SIEMENS, J. C.
Erosion for Corn Tillage Systems,
W76-09248 3F

SIKES, J. E. G.
Economic Considerations in the Selection of a Biological Treatment System,
W76-09290 5D

SILIDES, D. J.
The Effect of Lead on Mouse Brain Development,
W76-09038 5C

SILL, B. L.
Penetration and Mixing of Heated Discharges into Waterways,
W76-08926 5B

SIMPSON, J. P.
Drilling Fluid Principles and Operations,
W76-08893 8G

SINGH, K. P.
Unit Hydrographs - A Comparative Study,
W76-09254 2E

SINGH, R. R.
Effect of Soil-Moisture Regimes and N and P Fertilization on Berseem Grown for Fodder,
W76-08987 3F

SINGH, S. P.
Effect of Soil-Moisture Regimes and N and P Fertilization on Berseem Grown for Fodder,
W76-08987 3F

SINGH, V. P.
A Rapid Method of Estimating Mean Areal Rainfall,
W76-09368 2B

SINLEY, J. R.
Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

SKAGGS, R. W.
Determination of the Hydraulic Conductivity - Drainable Porosity Ratio from Water Table Measurements,
W76-09249 2F

SKEI, J. M.
Areal and Seasonal Variations in the Chemistry of Suspended Particulate Matter in a Deep Water Fjord,
W76-08829 2L

SKULBERG, O. M.
Observation and Monitoring of Water Quality by use of Experimental Biological Methods,
W76-08793 5A

SLACK, L. J.
Hydrologic Environmental Effects of Sprayed Sewage Effluent, Tallahassee, Florida,
W76-09134 5B

SLADKOV, A. V.
Dimensioning of Underground Sewer Pipelines Made of Plastic Tubes (Raschet podzemnykh kanalizatsionnykh truboprovodov iz polin nykh trub),
W76-08962

SLOAN, J. P.
Toxicity Study - Drilling Fluid Chemicals Aquatic Life,
W76-08895

SMIKUN, T. Y.
Experimental Study of the Effect of Temp ture and Degree of Oxygen Saturation on Destruction rate of Soluble Proteins in Nat Waters, (In Russian),
W76-09078

SMITH, J. E.
Regulation of Onshore and Offshore Oil E Waste Disposal,
W76-08919

SMITH, J. W.
Occurrence, Cause and Avoidance of Spilling of Oil by Tankers,
W76-09314

SMITH, M. H.
Ecology of Artificially Heated Strea Swamps and Reservoirs on the Savannah R Plant, the Thermal Studies Program of Savannah River Ecology Laboratory,
W76-08870

Thermal Ecology of Dragonflies in Hab Receiving Reactor Effluent,
W76-08881

SMITH, N. F.
Acute and Chronic Toxicity of Lead to R bow Trout Salmo Gairdneri, in Hard and Water,
W76-08781

SNEED, R. E.
Agricultural Water Demands in North Caro
W76-08841

SOLANAS, D. W.
Responsibilities of Offshore Drilling Rep tions,
W76-08918

SONIASSY, R. N.
Effects of Color and Toxic Constituent Bleached Kraft Mill Effluent on Algal Grow
W76-09300

SONU, C. J.
Mass Transport and Dispersion Off a T Inlet,
W76-09381

SOTA, C.
The Toxicity of Crude Oil and Its Compon to Freshwater Algae,
W76-09321

SOWELL, R. S.
Agricultural Water Demands in North Caro
W76-08841

SPANO, S. J.
Monograph of the Effectiveness and Cos Water Treatment Processes for Remova Specific Contaminants. Vol. 1. Techn Manual,
W76-09227

SPECKEN, G. A.
Treatment and Disposal of Waste Fluids f Onshore Drilling Sites,
W76-08910

RS, G. C.
otooxidation as a Factor in the Environmen-
Dispersal of Curde Oil,
6-09389 5B

CER, J. F.
vironmental Effects of the Heated
charges From Bradwell Nuclear Power Sta-
, and of the Cooling Systems of Other Sta-
s,
6-08873 5C

ARELLI, S. A.
avioural Responses of Lake Michigan
nes to a Nuclear Power Plant Discharge,
6-08876 5C

IER, R. G.
and Water Conservation with Western
a Tillage Systems,
6-08805 4D

R, G.
ted Kingdom Experience of the Physical
aviour of Heated Effluents in the At-
sphere and in Various Types of Aquatic
tems,
6-08863 5B

IDAKIS, D. E.
Effects of Waste Water Diversion on
vy Metal Levels in the Sediments of a
ge Urban Lake,
6-08754 5B

ELMAN, P.
mass Parameters and Primary Production at
earshore and a Midlake Station of Lake On-
o During IFYGL,
6-08825 5C

LEY, A. B.
ing the World Safe for Ground Water,
6-09360 5B

LES, K. D.
Tyneside Sewerage Scheme,
6-09184 5D

LEY, C. E.
er Media Comparison at Prince George Pulp
Paper (Limited),
6-09286 5D

LYUK, M. V.
blem of Blood-Sucking Flies in the Zones
ected by Big Water Reservoirs in the
ainian SSR, (In Russian),
6-08991 5G

ANI, D. F.
ragency Investigations of a Persistent Oil
l on the Washington Coast. Animal Popula-
Studies, Hydrocarbon Uptake by Marine
anisms, and Algae Response Following the
unding of the Troopship General M.C.
gs,
6-09324 5C

ER, A. E.
Nature of Activated Sludge Flocs,
6-09188 5D

SON, L. E.
er Factors and Electrical Demands of
ter-Pivot Irrigation Machines,
6-08770 3F

ART, E.
Thermodynamic Model for Steady State
abolism of Phytoplankton, Part I. Theory,
6-08944 5C

STEWART, G. L.
Microplankton of the North Pacific Central Gyre. I. Population Structure and Abundance, June 1973,
W76-08949 5C

STEWART, J. W. B.
Flow Injection Analysis. Part IV. Stream Sample Splitting and Its Application to the Continuous Spectrophotometric Determination of Chloride in Brackish Waters,
W76-09339 5A

STEWART, M. J.
Regina Tertiary Treatment Plant Study and Design, Part I, Case History,
W76-09178 5D

STOVER, E. L.
Evaluating Rotating Biological Contactor Performance,
W76-09173 5D

STRANKS, D. W.
Wood Preservatives: Their Depletion as Fungicides and Fate in the Environment,
W76-09275 5B

STRATEN, G.
Recommendation for the Evaluation of the Biological Degradability of Effluents of Varying Origin (Vorschlag zur Beurteilung der Biologischen Abbaubarkeit von Abwaessern Unterschiedlicher Herkunft),
W76-09198 5A

STROEHLEIN, J. L.
Potentially Beneficial Uses of Sulfuric Acid in Southwestern Agriculture,
W76-08766 3F

STRONG, A. E.
An Evaluation of ERTS Data for Oceanographic uses Through Great Lake Studies,
W76-09244 2H

STROSS, R. G.
Environmental and Intrinsic Control of Filtering and Feeding Rates in Arctic Daphnia,
W76-08933 5C

STUBBLEFIELD, T. M.
Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

STUMPF, M. G.
An Evaluation of ERTS Data for Oceanographic uses Through Great Lake Studies,
W76-09244 2H

STURGES, D. L.
Oversnow Runoff Events Affect Streamflow and Water Quality,
W76-09274 2C

SUMI, T.
Recent Trends of Process Control for Water Works and Drainage (Jogesuido purosesu seigyo no doko),
W76-09214 5G

SUMMER, W.
Destructive Air Deodorisation at a Dublin Sewage Works,
W76-09158 5D

SURATT, W. B.
Direct Contact Multi-Stage Flash Desalination,
W76-09052 3A

SUSCHKA, J.
Effects of Activated Carbon Addition to the Activated Sludge Process (Wplyw dodatku wegla aktywnego do procesu osadu Czynnego),
W76-09175 5D

SUSUMU,
On the Histological Structure and Function of Digestive Organs of the Fed and Starved Larvae of the Yellowtail, Seriola Quinqueradiata, (In Japanese),
W76-09088 2I

SWALLS, A. A.
Growth, Water Consumption, and Salt Uptake of Tomato Plants in High Humidity- High Carbon Dioxide Greenhouse Environments,
W76-09075 3C

SWEERS, H. E.
Two Methods of Measuring the Heat Dissipation of Discharged Cooling Water: A Phenomenological Approach,
W76-08868 5B

SWIFT, D. J. P.
New York Alternative Dumpsite Assessment - Reconnaissance Study of Surficial Sediments,
W76-09383 5G

SWOPE, D. A.
Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

SYBER, A. Y.
Effect of Air Humidity on Stomatal and Mesophyll Conductivity of Bean Leaves at Two Soil Moisture Levels, (In Russian)
W76-09097 2I

TACHIKAWA, H.
Decolorization of Night Soil Treatment Plant Effluent by Ozone (Ozon ni yoru shinyo shorisui no dasshoku),
W76-09026 5D

TAKAHASHI, M.
Effects of Copper on Natural Marine Phytoplankton Communities,
W76-08947 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-08948 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-09226 5C

TAKAHASHI, S.
Electric Equipment for Mukogawa Sewage Treatment Plant, Hyogo Prefecture (Hyogoken mukogawa shorijo no denki setsubi),
W76-09000 5D

TAKANO, T.
Effects of Lime, Phosphate and Soil Conditioner on Growth and Fruit Quality of Netted Melon, (In Japanese),
W76-08989 3C

TAKASE, I.
Quality Control in Sewage Treatment Plant (Gesuishorijo no shishutsu seigyo),
W76-09205 5D

TAKUSAGAWA, A.
Municipal Waste Water Treatment by Ozone (Ozon ni yoru toshigesui shori),
W76-09025 5D

LIBRARY U. OF I. URBANA-CHAMPAIGN

TAYLOR, F. J.
Chemical Analyses of Campbell Island Fresh Water,
W76-09395 2K

TAYLOR, G. S.
Drainage System Effects on Physical Properties of a Lakebed Clay Soil,
W76-09259 2G

TAYLOR, R.
The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W76-08753 5C

TAYLOR, R. E.
Possible Influence of Atmospheric Transport on the Total Mercury Content of Southeastern Atlantic Continental Shelf Surface Waters,
W76-09224 5B

TEAL, J. M.
The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

TEMOIN, P.
Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W76-09292 5D

TENN, T.
Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon,
W76-09298 5D

TENNIS, P. S.
Phosphorous Flux Through Fishes,
W76-09104 5C

TERAI, H.
Studies on Phosphorylation Coupled with Denitrification and Aerobic Respiration in Pseudomonas Denitrificans,
W76-08823 5C

TETREAULT, A.
Sewage Pipe Fitting,
W76-08996 8G

THAKORE, A. N.
Acute Toxicity to Juvenile Rainbow Trout (Salmo Gairdneri) of Naturally Occurring Insect Juvenile Hormone Analogues,
W76-09282 5C

THATCHER, T. O.
Aquatic Physiology of Thermal and Chemical Discharges,
W76-08880 5C

THOMAS, H. E.
Summary Appraisals of the Nation's Ground-Water Resources--California Region,
W76-09139 4B

THOMAS, W. H.
Effects of Copper on Natural Marine Phytoplankton Communities,
W76-08947 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-08948 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-09226 5C

THOMPSON, G. T.
A Theory of Flow Resistance for Vegetated Channels,
W76-09252 4A

THOMSON, D. A.
Resilience of a Rocky Intertidal Fish Community in a Physically Unstable Environment,
W76-09126 5C

TIMPERLEY, M. H.
The Formation and Detection of Metal Dispersion Halos in Organic Lake Sediments,
W76-09129 2J

TIPPER, R. C.
Ocean Dumping--A Rational Approach to an International Problem,
W76-09304 5G

TKACHENKO, V. S.
Modern State of the Vegetation in the Donbas Small River Basins and its Antierosive and Water-Protective Role, (In Ukranian)
W76-09096 4C

TODINI, E.
Statistics of Data Transfer,
W76-09133 4A

TOFAUTE, K.
Method and Apparatus for Chemically Purifying Sewage,
W76-08976 5D

TOKAR, J. V.
A Comparison of Aerial Infra-Red and In-Situ Thermal Plume Measurement Techniques,
W76-08860 5A

TOKUTSU, S.
Interaction Between Surfactant and Dye IV. Application of the Acridine Orange Method to the Survey of Pollution of Alkylbenzene Sulfonate in Rivers and the Survey of Water Pollution in Kinokawa,
W76-09364 5A

TOMITA, T.
Quality Control in Sewage Treatment Plant (Gesuishorijo no shishutsu seigyo),
W76-09205 5D

TRAAEN, T. S.
Biological Effects of Primary, Secondary, and Tertiary Sewage Treatment in Lotic Analog Recipients,
W76-08792 5C

TRENTACOSTE, N. P.
Surface Effects Skimmer Developments,
W76-09308 5G

TREPP, J. P.
A Two-Dimensional Hydrodynamic Model for Cooling-Tower Plumes,
W76-08851 5B

TRUBA, N. A.
Chemiluminescent Method of Determining Manganese in Natural Waters, (In Russian),
W76-09077 2K

TSUIISAWA, H.
Interaction Between Surfactant and Dye IV. Application of the Acridine Orange Method to the Survey of Pollution of Alkylbenzene Sulfonate in Rivers and the Survey of Water Pollution in Kinokawa,
W76-09364 5A

TUCKER, T. C.
Soluble Salts and Nitrate Distribution in Irrigated Lettuce Beds,
W76-08763 3C

TUPYK, N. D.
Biochemical Characteristics of Spirulina Platensis (GOM.) Geitl.: I. Water-Soluble Group B Vitamins, (In Ukranian),
W76-09091 2I

TVERSKOI, I.
Ozonization of Water in Moscow (Ozonisation De L'Eau a Moscou),
W76-08997 5F

TYSON, J. W.
The Offshore Ecology Investigation,
W76-09382 5C

UDEN, R. H.
Activated Sludge Plant,
W76-08980 5D

UENO, Y.
New Method for Removing Sodium Sulfide from Sludge,
W76-09278 5D

UHRBERG, R.
An Automatic Release Instrument with Underwater Buoy for Marking of Field Equipment,
W76-09268 7B

UMEDA,
On the Histological Structure and Function of Digestive Organs of the Fed and Starved Larvae of the Yellowtail, Seriola Quinqueradiata (In Japanese),
W76-09088 2

UNGER, P. W.
Surface Residue, Water Application, and Soil Texture Effects on Water Accumulation,
W76-09258 2G

Water Retention by Core and Sieved Soil Samples,
W76-08802 2G

UNNINAYER, C. S.
Mercury Content of Biota in Coastal Waters of Hawaii,
W76-08776 5A

URLICH, C. M.
Geotechnical Aspects of Rock Borrow for Large Breakwaters,
W76-09386 5G

VACHON, A.
Measurement of the Oxygenation Capacity in Waste Water Treatment Plants using Completely Mixed Activated Sludge (Mesure De La Capacite D'Oxygenation Dans Les Stations De Traitement A Boues Activees En Melange Integral),
W76-09006 5D

VAILLANCOURT, G.
Influence of Heat from the Gentilly Nuclear Power Station on Water Temperature and Gastropoda, (Influence De L'Apport Thermique Originaire de la Centrale Nucleaire Gentilly Sur La Temperature De L'eau Et Sur Les Gasteropodes),
W76-08874 5C

VALCARCEL, M.
Simultaneous Spectrophotometric Determination of Nickel and Cobalt in Mixtures with 3-Hydroxypicolinealdehyde Azine,
W76-09042 5A

LIELA, I.
he Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
/76-08774 5C

N DE VOORDE, H.
he Effect of Thermal Pollution on the Distribution of Naegleri Fowleri,
/76-08930 5C

N DEVENDER, T. R.
ate Pleistocene and Modern Plant Communies of Shinumo Creek and Peach Springs Vash, Lower Grand Canyon, Arizona,
/76-09074 2I

N DIJICK, P.
he Effect of Thermal Pollution on the Distribution of Naegleri Fowleri,
/76-08930 5C

N ENGEL, W. A.
New Device For Subsampling Plankton Samles,
/76-09396 7B

N RAALTE, C. D.
he Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
/76-08774 5C

NDEWOESTYNE, M.
apeteries De L'AA -- Suspended Solids educed by 98%, Organic Materials by 74% Papeteries de l'Aa -- mes reduites de 98%, et IO de 74%),
/76-09341 5D

RANI, F. T.
Iethod and Apparatus for Treating a Continuus Flow of Fluid Waste Products and Other Iaterials,
/76-08993 5D

RMO,
shore Effect of Pollution on the Biota of the altic, Southern Finland,
/76-08791 5C

SIL'EVA, I. M.
ffect of Hardening on the State of Water in eedlings of Winter Cultures, (In Russian),
/76-09095 2I

UGHT, K.
ecords of Wells, Drillers' Logs, Water-Level leasurements, and Chemical Analyses of round Water in Chambers, Liberty, and ontgomery Counties, Texas, 1966-74,
/76-09144 7C

RPLANCKE, H.
he Relationship Between Heat Conductance nd the Moisture Content of the Soil, (In utch),
/76-08769 2G

RSINO, C.
epresentative Analytical Waste Water Samles. Note I--A New Sampler (Significativa di ampioni Analitici di Acque Reflue. Nota I -- uovo Dispositivo di Campionamento),
/76-09186 5A

WANATH, S. G.
itration of Antimony (III) with Cerium (IV) ulphate and Diphenylamine and its Derivaves as Reversible Indicators,
/76-09040 5A

VODOP'YAN, N. S.
Study of Algoflora of Contaminated Water Bodies, (In Ukranian),
W76-09093 5C

VULJAMAA, H.
Inshore Effect of Pollution on the Biota of the Baltic, Southern Finland,
W76-08791 5C

WADDELL, K. M.
Water-Resources Investigations of the U.S. Geological Survey in Selected Coal-Energy Areas of Utah,
W76-09148 4B

WAFF, W. B.
Development of a Water Quality Instrumentation Package for Long-Term Operation from Buoys and Other Unattended Marine Platforms,
W76-09372 5G

WAITERS, E. M.
Possible Influence of Atmospheric Transport on the Total Mercury Content of Southeastern Atlantic Continental Shelf Surface Waters,
W76-09224 5B

WALDEN, C. C.
Effects of Color and Toxic Constituents of Bleached Kraft Mill Effluent on Algal Growth,
W76-09300 5C

WALKER, J. D.
Microbial Ecology of Petroleum Utilization in Chesapeake Bay,
W76-09319 5C

Microbial Petroleum Degradation: The Role of Cladosporium Resinae,
W76-09327 5C

WALLER, R. S.
Phase IV: Biology,
W76-09242 2L

WALLIS, I. G.
Rationale for a Water Pollution Code Part 1: The Waste System and the Natural System,
W76-08839 5G

WALLIS, J. R.
Statistics of Data Transfer,
W76-09133 4A

WANG, L. K.
Kinetics and Control Tests of Nitrification-Denitrication Process, Part I: Kinetics,
W76-09365 5D

Kinetics and Control Tests of Nitrification-Denitrification Process, Part II: Respiration and Control Tests,
W76-09366 5D

WANG, M. H.
Kinetics and Control Tests of Nitrification-Denitrication Process, Part I: Kinetics,
W76-09365 5D

WARD, D. V.
Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

WASSERMAN, S. E.
Prediction of Meteorological Factors Related to Beach Erosion at New Jersey and Long Island, N.Y.,
W76-09270 2L

WASSON, B. E.
Ground-Water Data for Sunflower County, Mississippi,
W76-09140 7C

WATANABE, Y.
An Experimental Investigation of Tertiary Treatment with a Submerged Filter (Sesshoku bakkiho ni yoru gesui sanjishori no jikkenteki kenkyu),
W76-08999 5D

WATKINS, R. K.
Structural Performance of Buried Plastic Drain Tubing,
W76-08771 8G

WATLING, L.
Offshore Multi-Use Port Islands and Their Environment,
W76-09376 5G

WATSON, I.
Geotechnical Aspects of Rock Borrow for Large Breakwaters,
W76-09386 5G

WATSON, I. C.
Monograph of the Effectiveness and Cost of Water Treatment Processes for Removal of Specific Contaminants. Vol. 1. Technical Manual,
W76-09227 5F

WEATHERLEY, A. H.
Assessment and Eradication of Heavy Metal Pollution in a Planned Urban Environment,
W76-08795 5C

WEBER, W. J. JR.
A Continuous Flow Bioassay Method to Evaluate the Effects of Outboard Motor Exhausts and Selected Aromatic Toxicants on Fish,
W76-08780 5C

WEIR, R. H.
Acute Toxicity of Well-Drilling to Rainbow Trout,
W76-08899 5A

WELLINGS, R. A.
Factors Affecting the Extraction and Analysis of Polynuclear Aromatic Hydrocarbons in Water,
W76-09200 5A

WELLS, M. R.
Insecticide Residues in Two Turtle Species Following Treatment with DDT,
W76-08778 5C

WERENSKIOLD, B.
Historic Heat curve of Recovery Operations,
W76-09303 5E

WERNER, M. P.
Recreation Use Patterns and User Attitudes on the Snake River,
W76-08751 6B

WESTFALL, T. R.
Up-Flow Separator,
W76-08983 5D

WHALIN, R. W.
Effect of Offshore Structures on Shoreline Evolution, Atlantic Generating Station,
W76-09388 5G

WHITAKER, R. E.
Wind-Driven Flow of Water Influenced by a Canopy,
W76-08801 2H

LIBRARY U. OF I. URBANA-CHAMPAIGN

WHITE, D. A.
Ecology of an Annual Saprolegnia Sp. (Phycomycete) Outbreak in Wild Brown Trout,
W76-08786 5C

WHITE, R. J.
Trout Population Responses to Streamflow Fluctuation and Habitat Management in Big Roche-A-Cri Creek, Wisconsin,
W76-08789 4A

WHITE, S. C.
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards Experimental Studies,
W76-09157 5D

WHITEHORN, N. C.
Industry Candidates and General Locations for Artificial Industrial-Port Islands,
W76-09377 5G

WHITTEMORE, R. C.
Study to Define Changes in Pulp Mill Effluent-Contributed Color in Receiving Waters Detectable by Human Observers,
W76-09276 5C

WILKE, D. A.
There is Something New Under the Sun,
W76-09152 5D

WILKE, K. R.
Ground-Water Levels and Chemical Quality of Ground Water in Lincoln, Montana,
W76-09132 7C

WILKINSON, L. E.
Water Requirements for Energy,
W76-09231 3E

WILKON-MICHALSKA, J.
The Peripheral Flood Zones of Gniewkowo Lowland from 1969 to 1972, (In Polish),
W76-09079 2I

WILLARDSON, L. S.
Structural Performance of Buried Plastic Drain Tubing,
W76-08771 8G

WILLIAMS, P. F.
Algal Communities in Polluted Rivers of South Wales,
W76-09107 5C

WILLIAMS, P. J. LEB.
Amino Acid Uptake and Respiration by Marine Heterotrophs,
W76-08955 5C

WILLIAMS, P. M.
Chlorine Reactions with Seawater Constituents and the Inhibition on Photosynthesis of Natural Marine Phytoplankton,
W76-08946 5C

Copepod Slick in the Northwest Pacific Ocean,
W76-08959 5C

Cycling of Organic Carbon in the Ocean: Use of Naturally-Occurring Radiocarbon as a Long and Short Term Tracer,
W76-08956 5C

WILLIAMS, S. L.
Atmospheric Dispersion of Cooling-Tower Blowdown,
W76-08853 5B

WILLIAMS, T. E.
Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

WILSON, G. E.
Sewage Treatment System,
W76-08992 5D

WILSON, R. C. H.
Practical Application of the Toxicity Emission Rate Concept in a Survey of Maritime Pulp and Paper Mills,
W76-09293 5A

WINDOM, H. L.
Possible Influence of Atmospheric Transport on the Total Mercury Content of Southeastern Atlantic Continental Shelf Surface Waters,
W76-09224 5B

WITTE, H.
Recommendation for the Evaluation of the Biological Degradability of Effluents of Varying Origin (Vorschlag zur Beurteilung der Biologischen Abbaubarkeit von Abwaessern Unterschiedlicher Herkunft),
W76-09198 5A

WOLF, E. G.
Aquatic Physiology of Thermal and Chemical Discharges,
W76-08880 5C

WOLFGRAM, P. A.
Development of a Water Quality Instrumentation Package for Long-Term Operation from Buoys and Other Unattended Marine Platforms,
W76-09372 5G

WONG, A.
Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon,
W76-09298 5D

WOOD, K. G.
Trace Element Pollution in Streams of Northwestern U.S.A.,
W76-08797 5A

WOODFORD, D. L.
Environmental Studies for Major Offshore Developments,
W76-09336 5G

WOOK, F. O.
No-Till Seeding of Irrigated Sorghum Double Cropped After Wheat,
W76-08756 3F

WOOLEY, G. R.
Solutions for Some Problems Resulting from Refreezing of Permafrost Around a Wellbore,
W76-08892 8G

WRIGHT, D. G.
Studies of High-Rate Biological Treatment of Ipswich Sewage on Pilot Filters using Plastics Media,
W76-09029 5D

WRIGHT, L. D.
Mass Transport and Dispersion Off a Tidal Inlet,
W76-09381 5G

WRIGHT, N. G.
Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

WUEST, D.
Flow Velocity as a Rate Determining Factor for Self-Purification in Rivers (Uber Den Einfluss der Stromungsgeschwindigkeit auf die Selbstreinigung in Fliessgewaessern),
W76-09204 5F

WUHRMANN, K.
Experiments on the Effects of Inorganic Enrichment of Rivers on Periphyton Primary Production,
W76-08787 5C

Flow Velocity as a Rate Determining Factor for Self-Purification in Rivers (Uber Den Einfluss der Stromungsgeschwindigkeit auf die Selbstreinigung in Fliessgewaessern),
W76-09204 5F

YAGIHASHI, I.
Study on the Balance of Heavy Metals in Activated Sludge Treatment Process (Gesui shori shisetsu ni okeru jukinzokurui no shushi ni kansuru kenkyu),
W76-09222 5A

YAMADA, M.
Sewerage Project on Upstream Area of the Yamato River,
W76-09168 5D

YANO, M.
Method and Device for Attaching Shut-Off Control Valve to Distributing Water Pipe Such as Service Pipe Without Stopping Passage of Water Therethrough,
W76-09050 3F

YAZAR, O.
Effects of Selected Herbicides on Bacterial Populations in Nontreated and Treated Water,
W76-09369 5C

YEICH, B.
Adapting Industrial Processes for Multi-Purpose Industrial Port Islands,
W76-09378 5G

YOKOMICHI, K.
Electric Equipment for Mukogawa Sewage Treatment Plant, Hyogo Prefecture (Hyogoken mukogawa shorijo no denki setsubi),
W76-09000 5D

YOKOYAMA, T.
Interaction Between Surfactant and Dye IV Application of the Acridine Orange Method to the Survey of Pollution of Alkylbenzene Sulfonate in Rivers and the Survey of Water Pollution in Kinokawa,
W76-09364 5A

YOSHIDA, S.
Quality Control in Sewage Treatment Plant (Gesuishorijo no shishutsu seigyo),
W76-09205 5D

YOST, K. J.
Aerobic Sewage Treatment System,
W76-08982 5D

YOUNG, G. K.
Decision Perspectives on Urban Storm Water Pollution,
W76-09207 5C

YOUNGNER, V. B.
Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

AGATTO, E. A.
Flow Injection Analysis. Part IV. Stream Sample Splitting and Its Application to the Continuous Spectrophotometric Determination of Chloride in Brackish Waters,
W76-09339 5A

AVADSKAYA, I. G.
Effect of the Water Regime on the Heat-Resistance of Leaf Cells of Heat-Hardened Tradescantia Fluminensis Vell. Plants, (In Russian),
W76-09102 2I

BELSKI, A.
Plant Associations of Lake Mieliwo and the Adjacent Peat Bogs in the Brodnica District, (In Polish),
W76-09099 2H

ENGULA, R. P.
Effects of Drilling Operations on the Marine Environment,
W76-08909 5G

ITKO, V.
Toxicity and Environmental Properties of Chemicals used in Well-Drilling Operations,
W76-08906 5C

LIBRARY U. OF I. URBANA-CHAMP.

ORGANIZATIONAL INDEX

ADEMIA DE STIINTE AGRICOLE SI VICE, BUCHAREST (RUMANIA).
The Effect of Certain Synthetic Macromolecular Substances on the Physico-Chemical Properties of Soil and on the Fertilizer Utilization Coefficient, (In French),
W76-08981 2G

ADEMIA R. S. R., CLUJ. INSTITUTUL DE ELOLOGIE.
Protection of Romanian Underground Water Fauna, (In Romanian),
W76-09085 2I

RIAN CONSTRUCTION CO., DAYTON, IO. (ASSIGNEE).
Method and Apparatus for Treating a Continuous Flow of Fluid Waste Products and Other Materials,
W76-08993 5D

RICULTURAL RESEARCH CENTER, JAY, A.
Agronomic and Cattle Studies with Municipal Liquid Digested Sludge,
W76-09367 5E

RICULTURAL RESEARCH SERVICE, SHLAND, TEX.
Water Retention by Core and Sieved Soil Samples,
W76-08802 2G

RICULTURAL RESEARCH SERVICE, SHLAND, TEX.; AND SOUTHWESTERN EAT PLAINS RESEARCH CENTER, SHLAND, TEX.
Surface Residue, Water Application, and Soil Texture Effects on Water Accumulation,
W76-09258 2G

RICULTURAL RESEARCH SERVICE, OUNCIL BLUFFS, IOWA. NORTH CENTRAL ATERSHED RESEARCH CENTER.
Soil and Water Conservation with Western Iowa Tillage Systems,
W76-08805 4D

RICULTURAL RESEARCH SERVICE, NCOLN, NEBR. NORTH CENTRAL REGION.
Power Factors and Electrical Demands of Center-Pivot Irrigation Machines,
W76-08770 3F

RICULTURAL RESEARCH SERVICE, ANHATTAN, KANS. NORTH CENTRAL GION.
Wind Erosion: The Protective Role of Simulated Standing Stubble,
W76-09247 4D

RICULTURAL RESEARCH SERVICE, ILLWATER, OKLA. WATER NSERVATION STRUCTURES LAB.
Stepped Baffled Trash Rack for Drop Inlets,
W76-09250 8B

RICULTURAL UNIV., WAGENINGEN ETHERLANDS). LAB. OF AGRICULTURAL EMISTRY.
Conditions for Using a Tensionplate as a Lysimeter, (In German),
W76-09082 2G

ADEMIYA NAUK ESTONSKOI SSR, TARTU. STITUT FIZIKI I ASTRONOMII.
Effect of Air Humidity on Stomatal and Mesophyll Conductivity of Bean Leaves at Two Soil Moisture Levels, (In Russian)
W76-09097 2I

AKADEMIYA NAUK LITOVSKOI SSR, VILNIUS. INSTITUT ZOOLOGII I PARAZITOLOGII.
Infection of Broad-Clawed Crayfish with Branchiobdella and Control Measures Against them, (In Russian),
W76-09086 2H

AKADEMIYA NAUK SSSR, LENINGRAD. BOTANICHESKII INSTITUT.
Effect of the Water Regime on the Heat-Resistance of Leaf Cells of Heat-Hardened Tradescantia Fluminensis Vell. Plants, (In Russian),
W76-09102 2I

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT OKEANOLOGII.
Phytoplankton Distribution in the Vicinity of the Peru Current Near 8 Degrees S. Latitude, (In Russian),
W76-09283 5B

AKADEMIYA NAUK SSSR, MOSCOW. POCHVENNYI INSTITUT.
Water Regime in Growing Points of Wheat Shoots, (In Russian),
W76-08757 2I

AKADEMIYA NAUK SSSR, SVERDLOVSK. INST. OF PLANT AND ANIMAL ECOLOGY.
Self-Regulation of the Population and Biomass of Schools of Yearling Carp, (In Russian),
W76-08832 2I

AKADEMIYA NAUK URSR, KIEV. INSTYTUT BOTANIKI.
Biochemical Characteristics of Spirulina Platensis (GOM.) Geitl.: I. Water-Soluble Group B Vitamins, (In Ukranian),
W76-09091 2I

Study of Algoflora of Contaminated Water Bodies, (In Ukranian),
W76-09093 5C

Modern State of the Vegetation in the Donbas Small River Basins and its Antierosive and Water-Protective Role, (In Ukranian)
W76-09096 4C

AKADEMIYA NAUK URSR, KIEV. INSTYTUT HIDROBIOLOGII.
Chemiluminescent Method of Determining Manganese in Natural Waters, (In Russian),
W76-09077 2K

Experimental Study of the Effect of Temperature and Degree of Oxygen Saturation on the Destruction rate of Soluble Proteins in Natural Waters, (In Russian),
W76-09078 5C

AKRON UNIV., OHIO. DEPT OF BIOLOGY.
Summer Phytoplankton Photosynthesis in a Northeastern Ohio Glacial Lake,
W76-08828 5C

ALBERTA ENERGY RESOURCES CONSERVATION BOARD, EDMONTON.
The Toxicity of Drilling Fluids, Their Testing and Disposal,
W76-08911 5D

AMERICAN PETROLEUM INST., WASHINGTON, D. C.
Proceedings of Joint Conference on Prevention and Control of Oil Spills, March 13-15, 1973, Washington, D.C.,
W76-09312 5B

ANDHRA UNIV., WALTAIR (INDIA). DEPT. OF CHEMISTRY.
Titration of Antimony (III) with Cerium (IV) Sulphate and Diphenylamine and its Derivatives as Reversible Indicators,
W76-09040 5A

ARAGO LAB., BANYULS-SUR-MER (FRANCE).
Hyperhaline Environments of the Complex of Bages-Sigean, the Lagoon of the Doul, (In French),
W76-08784 2L

A Study of the Infralittoral Population of the Coast of Roussillon: III. Spatial and Seasonal Variations, (In French),
W76-08898 2L

ARGONNE NATIONAL LAB., ILL.
Behavioural Responses of Lake Michigan Fishes to a Nuclear Power Plant Discharge,
W76-08876 5C

ARIZONA STATE UNIV., TEMPE.
A Preliminary Water and Energy Budget Analysis of Montezuma Well, Arizona,
W76-09072 4B

ARIZONA UNIV., TUCSON.
Cost of Producing Crops in the Irrigated Southwest, Part V: Utah,
W76-09063 3F

Sediment Loading, its Effect on a southern Arizona Lake and the Emerging Spring Zooplankton Community,
W76-09073 2J

Growth, Water Consumption, and Salt Uptake of Tomato Plants in High Humidity- High Carbon Dioxide Greenhouse Environments,
W76-09075 3C

ARIZONA UNIV., TUCSON. DEPT. OF ECOLOGY AND EVOLUTIONARY BIOLOGY.
Resilience of a Rocky Intertidal Fish Community in a Physically Unstable Environment,
W76-09126 5C

ARIZONA UNIV., TUCSON. DEPT. OF GEOSCIENCES.
Late Pleistocene and Modern Plant Communities of Shinumo Creek and Peach Springs Wash, Lower Grand Canyon, Arizona,
W76-09074 2I

ARIZONA UNIV., TUCSON. DEPT. OF SOILS, WATER AND ENGINEERING.
Soluble Salts and Nitrate Distribution in Irrigated Lettuce Beds,
W76-08763 3C

Potentially Beneficial Uses of Sulfuric Acid in Southwestern Agriculture,
W76-08766 3F

ARIZONA UNIV., TUCSON. DEPT. OF SYSTEMS AND INDUSTRIAL ENGINEERING; AND ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Mountainous Winter Precipitation: A Stochastic Event-Based Approach,
W76-09062 2B

The Role of New Technologies for Improved Water Management and Related Effects on Water Law Systems,
W76-09065 3E

LIBRARY U. OF I. URBANA-CHAMPAIGN

ARIZONA UNIV., TUCSON, ENVIRONMENTAL RESEARCH LAB.
Toxicity of Some Chemical Therapeutics to the Commercial Shrimp, Penaeus Californiensis,
W76-08796 5C

ARIZONA WATER RESOURCES RESEARCH CENTER, TUCSON.
Development of a Mathematical Model of Infiltration which Includes the Effects of Raindrop Impact,
W76-08844 2G

ARMY ENGINEER DISTRICT, KANSAS CITY, KANS.
Flood Plain Information: Sappa Creek, Oberlin, Kansas.
W76-08821 4A

ARMY ENGINEER DISTRICT, LOS ANGELES, CALIF.
Flood Plain Information: Maricopa County, Arizona, Volume I, Indian Bend Wash Report.
W76-08806 4A

Flood Plain Information: Maricopa County, Arizona, Volume II, Cave Creek Report,
W76-08807 4A

Flood Plain Information: Maricopa County, Arizona, Volume IV, Wickenburg Report.
W76-08808 4A

Flood Plain Information: Maricopa County Arizona, Volume V, New River Report.
W76-08809 4A

ARMY ENGINEER DISTRICT, SACRAMENTO, CALIF.
Flood Plain Information: Northeast Stream Group, Stockton, California.
W76-08810 4A

Flood Plain Information: Kings River, Sanger, California.
W76-08813 4A

Flood Plain Information: Dry Creek and Tributaries, Roseville, California.
W76-08814 4A

Flood Plain Information: Cow Creek, Palo Cedro, California.
W76-08817 4A

ARMY ENGINEER DISTRICT, SAN FRANCISCO, CALIF.
Flood Plain Information: Guadalupe River, Santa Clara County, California.
W76-08815 4A

ARMY ENGINEER DISTRICT, ST. LOUIS, MO.
Flood Plain Information: Dardenne and Belleau Creeks, St. Charles County, Missouri.
W76-08818 4A

ARMY ENGINEER DISTRICT, TULSA, OKLAHOMA.
Flood Plain Information: Arkansas River, Derby-Mulvane, Kansas.
W76-08822 4A

ARMY ENGINEER DISTRICT, WALLA WALLA, WASH.
Special Flood Hazard Information: Mill Creek-Gekeler Slough, La Grande, Oregon.
W76-08811 4A

Flood Plain Information: Umatilla River Tributaries, Mckay, Tutuilla and Wildhorse Creeks, Pendleton, Oregon and Vicinity.
W76-08816 4A

ARMY ENGINEERS WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Effect of Offshore Structures on Shoreline Evolution, Atlantic Generating Station,
W76-09388 5G

ATARA CORP., MONTREAL (QUEBEC). (ASSIGNEE).
Double Funnel with Baffle Cascade Aeration Unit,
W76-09027 5D

ATLANTIC RICHFIELD CO., PLANO, TEX. PRODUCTION RESEARCH CENTER.
Solutions for Some Problems Resulting from Refreezing of Permafrost Around a Wellbore,
W76-08892 8G

ATOMIC ENERGY COMMISSION, WASHINGTON, D. C.
Management of Waste Heat at Nuclear Power Stations, Its Possible Impact on the Environment, and Possibilities of its Economic Use,
W76-08849 5G

ATOMIC ENERGY OF CANADA LTD., CHALK RIVER (ONTARIO). CHALK RIVER NUCLEAR LABS; AND ATOMIC ENERGY OF CANADA LTD., CHALK RIVER (ONTARIO). BIOLOGY AND HEALTH PHYSICS DIV.
Effects of Heat Enrichment on Species Succession and Primary Production in Fresh-Water Plankton,
W76-08879 5C

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL (ENGLAND).
The Effect of Polyacrylamide on the Settling of Thames Mud,
W76-09243 2J

AUCKLAND UNIV. (NEW ZEALAND). MARINE RESEARCH LAB.
Chemical Analyses of Campbell Island Fresh Water,
W76-09395 2K

B. C. RESEARCH LTD., VANCOUVER.
Acute Toxicity to Juvenile Rainbow Trout (Salmo Gairdneri) of Naturally Occurring Insect Juvenile Hormone Analogues,
W76-09282 5C

Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W76-09292 5D

Effects of Color and Toxic Constituents of Bleached Kraft Mill Effluent on Algal Growth,
W76-09300 5C

BARTLESVILLE ENERGY RESEARCH CENTER, OKLA.
Chemical Applications in Oil and Gas Well-Drilling and Completion Operations,
W76-08903 8G

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Aquatic Physiology of Thermal and Chemical Discharges,
W76-08880 5C

BEDFORD INST. OF OCEANOGRAPHY, DARTMOUTH (NOVA SCOTIA)
Degradation of Bunker C Oil under Different Coastal Environments of Chedabucto Bay, Nova Scotia,
W76-09394 5B

BERMUDA BIOLOGICAL STATION FOR RESEARCH, ST. GEORGE'S WEST.
Petroleum Residues in the Sargasso Sea and o
Bermuda Beaches,
W76-09315 5

BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA). ENVIRONMENTAL STUDIES SECTION.
Seasonal Feature of Thermal Abatement
Shoreline Discharges at Nuclear Sites,
W76-08862 5

BRITISH COLUMBIA UNIV., VANCOUVER. INST. OF OCEANOGRAPHY.
The Replication of Biological Events in E
closed Water Columns,
W76-09226 5

BRITISH PETROLEUM CO. LTD., SUNBURY-ON-THAMES (ENGLAND). EXPLORATION AND PRODUCTION RESEARCH DIV.
Photooxidation as a Factor in the Environme
tal Dispersal of Curde Oil,
W76-09389 5

BUNDESANSTALT FUER GEWASSERKUNDE, COBLENZ (WEST GERMANY).
The Total Heat-Exchange Coefficient of Su
face Waters,
W76-08867 5

BUREAU INTERNATIONAL TECHNIQUE DES SOLVANTS CHLORES, BRUSSELS (BELGIUM).
Standardization of Methods for the Determin
tion of Traces of Some Volatile Chlorinate
Aliphatic Hydrocarbons in Air and Water b
Gas Chromatography,
W76-09287 5

BUREAU OF SPORT FISHERIES AND WILDLIFE, MARION, ALA. SOUTHEASTERN FISH CULTURAL LAB.
Endrin Toxicity and Distribution in Fres
water: A Review,
W76-09122 5

CALCUTTA UNIV. (INDIA). DEPT. OF AGRICULTURE.
Effect of Late Sowing on Morphogeneti
Development of Panicle in Rice (Oryza Sativ
L.),
W76-08758 3

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Cathodic Protection Wells and Ground Wate
Pollution,
W76-09357 5

CALIFORNIA UNIV., BERKELEY. SCHOOL O PUBLIC HEALTH.
Effect of a Bunker Fuel on the Beach Bacteri
Flora,
W76-09326 5

The Fate of a Bunker Fuel in Beach Sand,
W76-09328 5

CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
Finite Element Model for Cohesive Sedimen
Transport,
W76-09264 2

CALIFORNIA UNIV., DAVIS. DEPT. OF LAND, AIR AND WATER RESOURCES.
Determining the Hydraulic Conductivity of So
Cores by Centrifugation,
W76-09256 2

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF PLANT SCIENCES.
Ecological and Physiological Implications of Greenbelt Irrigation,
W76-08840 5D

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
Nitrogen and Phosphorus Levels in Soils Beneath Sewage Disposal Ponds,
W76-09197 5A

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA. INST. OF MARINE RESOURCES.
Research on the Marine Food Chain.
W76-08935 5C

Physiological Ecology of Gonyaulax Polyedra, a Red Water Dinoflagellate Off Southern California,
W76-08936 5C

Two Blooms of Gymnodinium Splendens (Lebour). A Large Naked Dinoflagellate,
W76-08937 5C

Phosphate Utilization by an Oceanic Diatom in Phosphorus-Limited Chemostat Culture and in the Oligotrophic Waters of the Central North Pacific,
W76-08938 5C

Dynamics of Phosphorus Cycling in the Euphotic Waters of the Central North Pacific Ocean,
W76-08939 5C

Photosynthetic Measurements in the Central North Pacific: The Dark Loss of Carbon in 24-Hour Incubations,
W76-08940 5C

Silicic Acid Uptake and Incorporation by Natural Marine Phytoplankton Populations,
W76-08941 5C

Primary Production and the Factors Controlling Phytoplankton Growth in the Antarctic Seas,
W76-08942 5C

Assay of Nitrate Reductase from Plasmolyzed Marine Phytoplankton,
W76-08943 5C

A Thermodynamic Model for Steady State Metabolism of Phytoplankton, Part I. Theory,
W76-08944 5C

A Thermodynamic Model for Steady State Metabolism of Phytoplankton, Part II. Light and Carbon Limited Growth,
W76-08945 5C

Chlorine Reactions with Seawater Constituents and the Inhibition on Photosynthesis of Natural Marine Phytoplankton,
W76-08946 5C

Effects of Copper on Natural Marine Phytoplankton Communities,
W76-08947 5C

The Replication of Biological Events in Enclosed Water Columns,
W76-08948 5C

Microplankton of the North Pacific Central Gyre. I. Population Structure and Abundance, June 1973,
W76-08949 5C

Nutrient Regeneration by Oceanic Zooplankton: A Comparison of Methods,
W76-08950 5C

Distribution, Morphometry, and Seasonal Biology of the Planktonic Copepods, Neocalanus Robustior and N. Gracilis, in the Pacific Ocean,
W76-08951 5C

Vitamins in the South Polar Seas, I. Distribution and Significance of Dissolved and Particulate Vitamin B 12, Thiamine, and Biotin in the Southern Indian Ocean,
W76-08952 5C

Leucothrix: Absence of Demonstrable Fixation of N2,
W76-08953 5C

Coccolith Sedimentation by Fecal Pellets: Laboratory Experiments and Field Observations,
W76-08954 5C

Amino Acid Uptake and Respiration by Marine Heterotrophs,
W76-08955 5C

Cycling of Organic Carbon in the Ocean: Use of Naturally-Occurring Radiocarbon as a Long and Short Term Tracer,
W76-08956 5C

Nutrient Cycling Between the Water Column and a Marine Sediment. I. Organic Carbon,
W76-08957 5C

Improved Methodology for ATP Determination in Marine Environments,
W76-08958 5C

Copepod Slick in the Northwest Pacific Ocean,
W76-08959 5C

Cruise Summary, A. Southern California Bight Studies (SCBS).
W76-08960 5C

Cruise Summary, B. Gulf of California Photobiology Cruise,
W76-08961 5C

CALIFORNIA UNIV., SANTA BARBARA.
Public Opinion and the Environment: Ecology, the Coastal Zone, and Public Policy,
W76-09035 6G

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF BIOLOGICAL SCIENCES.
Circulatory Adaptations to the Oxygen Minimum Layer in the Bathypelagic Mysid Gnathophausia ingens,
W76-09128 5C

CAMP, DRESSER AND MCKEE, INC., BOSTON, MASS.
Advanced Waste Treatment Plant Features Nitrification,
W76-09020 5D

Wastewater Plant will Use no Chemicals for Sludge Conditioning,
W76-09161 5D

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Temperature, Oxygen, and Nutrient Distribution Patterns in Lake Erie, 1970,
W76-09262 5B

Oxygen Depletion in the Central and Eastern Basins of Lake Erie, 1970,
W76-09263 5C

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO); AND NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ANN ARBOR, MICH. GREAT LAKES ENVIRONMENTAL RESEARCH LAB.
Biomass Parameters and Primary Production at a Nearshore and a Midlake Station of Lake Ontario During IFYGL,
W76-08825 5C

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO). HYDRAULICS DIV.
Urban Runoff Modelling,
W76-09033 4A

CANADA CENTRE FOR INLAND WATERS, BURLINTON (ONTARIO).
Nutrient-Primary Production Relationships in Central Lake Erie: A Simple Correlation Approach,
W76-08836 5C

CANADIAN FOREST SERVICE, OTTAWA (ONTARIO). EASTERN FOREST PRODUCTS LAB.
Wood Preservatives: Their Depletion as Fungicides and Fate in the Environment,
W76-09275 5B

CANADIAN INDUSTRIES LTD., MONTREAL (QUEBEC).
Canadian Experience with the Reduction of Mercury at Chlor-Alkali Plants,
W76-09273 5G

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO. DEPT. OF BIOLOGY.
Fishes in Oxygen-Minimum Zones: Blood Oxygenation Characteristics,
W76-09112 5C

CEA CENTRE D'ETUDES NUCLEAIRES DE FONTENAY-AUX ROSES (FRANCE). DEPARTEMENT DE PROTECTION.
Can the Criteria and Methodology Used for Radioactive Discharges be Applied to Thermal Discharges. (Les Criteres et La Methodologie Retenus Pour les Rejets Radioactifs Sont-Ils Transposables Aux Rejets Thermiques.),
W76-08887 5G

CENTRAL ELECTRICITY GENERATING BOARD, LONDON (ENGLAND).
United Kingdom Experience of the Physical Behaviour of Heated Effluents in the Atmosphere and in Various Types of Aquatic Systems,
W76-08863 5B

CENTRAL ELECTRICITY GENERATING BOARD, LONDON (ENGLAND). PLANNING DEPT.
Environmental Effects of the Heated Discharges From Bradwell Nuclear Power Station, and of the Cooling Systems of Other Stations,
W76-08873 5C

CENTRE TECHNIQUE DU GENIE RURAL DES EAUX ET DES FORETS, PARIS (FRANCE). LABORATOIRE DES MICROPOLLUANTS.
Effects of a Thermal Discharge into a River on the Movement of Fish Populations, (Incidences D'un Rejet Thermique En Milieu Fluvial Sur Les Mouvements Des Populations Ichtyologiques),
W76-08871 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

CENTRE UNIVERSITAIRE DE LUMINY, MARSEILLE (FRANCE). LABORATOIRE D'OCEANOGRAPHIE.
Distribution, Circulation and Evolution of Nutrients, Particularly Inorganic Phosphorus in Lake Etang DeBerre: Influence of River Durance Waters, (In French),
W76-09393 5B

CENTRO DE ENERGIA NUCLEAR NA AGRICULTURA, SAO PAULO (BRAZIL).
Flow Injection Analysis. Part IV. Stream Sample Splitting and Its Application to the Continuous Spectrophotometric Determination of Chloride in Brackish Waters,
W76-09339 5A

CHARLESTON COLL., S. C. DEPT. OF BIOLOGY; AND CHARLESTON COLL., S. C. GRICE MARINE BIOLOGICAL LAB.
The Biology of the Leech Myzobdella Lugubris Infesting Blue Crabs and Catfish,
W76-08932 5C

CHILE UNIV., SANTIAGO, CENTRO DE RECURSOS HIDRAULICOS.
A Finite Element Model of Contaminant Movement in Groundwater,
W76-09253 5B

CLEMSON UNIV., S. C. DEPT. OF BIOCHEMISTRY; AND CLEMSON UNIV., S. C. DEPT. OF BOTANY.
Effects of Selected Herbicides on Bacterial Populations in Nontreated and Treated Water,
W76-09369 5C

COAST GUARD, WASHINGTON, D. C.
An Analysis of Oil Outflows Due to Tanker Accidents,
W76-09313 5B

Influx of Petroleum Hydrocarbons into the Ocean,
W76-09385 5G

COASTAL PLAINS CENTER FOR MARINE DEVELOPMENT SERVICES, WILMINGTON, N.C.
Report of the Conference on Marine Resources of the Coastal Plains States, December 11-12, 1975, Savannah, Georgia.
W76-09329 5G

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF AGRICULTURAL ENGINEERING.
Vertical Flow of Air and Water with a Flux Boundary Condition,
W76-09251 2G

COLORADO STATE UNIV., FORT COLLINS. TURFGRASS EXTENSION.
Salt Tolerance and Suitability of Various Grasses for Saline Roadsides,
W76-08764 3C

CONNELL/METCALF AND EDDY, CORAL GABLES, FLA.
Simulation of Deep Seepage to a Water Table,
W76-09245 2F

CONSOLIDATED-BATHURST LTD., MONTREAL (QUEBEC).
Suspended Solids Removal from Woodroom Effluent,
W76-09289 5D

CORNELL UNIV., ITHACA, N. Y.
A Critical Study of Flood Protection Planning in the Susquehanna River Basin: 1936-1972,
W76-08846 6F

DACCA UNIV. (BANGLADESH). DEPT. OF ZOOLOGY.
Limnoplankton of Some Inland Waters of Dacca City,
W76-09400 5C

DAMES AND MOORE, NEW YORK.
Environmental Studies for Major Offshore Developments,
W76-09336 5G

Geotechnical Aspects of Rock Borrow for Large Breakwaters,
W76-09386 5G

Evaluation of Offshore Breakwater Stability Under Wave Action,
W76-09387 5G

DAMES AND MOORE, PARK RIDGE, ILL.
Movement of Chemical Contaminants in Ground Water,
W76-08905 5B

DAYTON UNIV., OHIO. DEPT. OF BIOLOGY.
Microbial Petroleum Degradation: The Role of Cladosporium Resinae,
W76-09327 5C

DE LAVAL SEPARATOR CO., POUGHKEEPSIE, N. Y. (ASSIGNEE).
Centrifuge Preventing Air Admission During Sludge Discharge,
W76-08990 5D

DELAWARE UNIV., NEWARK.
Offshore Multi-Use Port Islands and Their Environment,
W76-09376 5G

DENVER UNIV., COLO. DEPT. OF BIOLOGICAL SCIENCES.
Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo Boreas),
W76-09115 5C

DEPARTMENT OF AGRICULTURE, LETHBRIDGE (ALBERTA). RESEARCH STATION.
Persistence of Fecal Coliform Indicator Bacteria on Alfalfa Irrigated with Municipal Sewage Lagoon Effluent,
W76-09217 5C

DEPARTMENT OF COMMERCE, WASHINGTON, D. C.
Industrial Development Through Water-Resources Planning,
W76-09034 3E

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, TAUPO (NEW ZEALAND). ECOLOGY DIV.; AND DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, TAUPO (NEW ZEALAND). FRESHWATER SECTION.
Self-Purification of Small Freshwater Streams: Phosphate, Nitrate, and Ammonia Removal,
W76-09398 5G

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). MARINE SCIENCES DIRECTORATE.
Simulation of Movement of Oil Slicks in the Strait of Georgia using Simple Atmosphere and Ocean Dynamics,
W76-09316 5C

DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C. OFFICE OF THE SECRETARY.
Direct Contact Multi-Stage Flash Desalination,
W76-09052 3A

DEUTSCHER WETTERDIENST, OFFENBACH AM MAIN (WEST GERMANY).
Cooling Tower Experience and the Meteorological Consequences of Thermal Discharges from Nuclear Power Plants in the Federal Republic of Germany,
W76-08855 5G

DOMINGUE, SZABO AND ASSOCIATES, INC., LAFAYETTE, LA.
Storm Sewer Pipe Joints Tight After Ten Years,
W76-08966 8G

DOWELL DIV., TULSA, OKLA.
Well Completion - Techniques and Methods,
W76-08894 8G

DRESSER INDUSTRIES, INC., HOUSTON, TEX. OIL FIELD PRODUCTS DIV.
Toxicity Study - Drilling Fluid Chemicals on Aquatic Life,
W76-08895 5C

Fish Toxicity of Dispersed Clay Drilling Mud Deflocculants,
W76-08896 5C

DRESSER INDUSTRIES, INC., HOUSTON, TEX. OILFIELD PRODUCTS DIV.
Waste Water Base Drilling Fluid Disposal,
W76-08914 5D

DUKE UNIV., DURHAM, N. C. DEPT. OF CIVIL ENGINEERING.
The Role of Engineering in Minimizing Offshore Impacts,
W76-09331 5G

DUNSTAFFNAGE MARINE RESEARCH LAB., OBAN (SCOTLAND).
Acclimation of Rainbow Trout to Sea Water,
W76-09125 2L

EAST BAY MUNICIPAL UTILITY DISTRICT, OAKLAND, CALIF.
Utilization of Wastewater Sludge for Agricultural Soil Enrichment,
W76-09219 5D

EBA ENGINEERING CONSULTANTS LTD., EDMONTON (ALBERTA).
Countermeasures to Control Oil Spills in Western Canada,
W76-09346 5G

ECOLE PRATIQUE DES HAUTES ETUDES, PARIS (FRANCE).
A Lake Population: The Intha of Lake Inle. (Southern Shan States, Burma), (In French),
W76-09361 2H

ECONOMIC COMMISSION FOR EUROPE (UN), GENEVA (SWITZERLAND). DIV. OF ENERGY.
Environmental Aspects of the Cooling Systems of Thermal Power Stations: Report on the Seminar Held at Zurich, May Conclusions and Recommendations, (Les Aspects D'Environment Des Systems De Refroidissement Des Centralles Thermiques),
W76-08850 6G

EDISON WATER QUALITY RESEARCH LAB., N.J.
A Salt Marsh Microcosm: An Experimental Unit for Marine Pollution Studies,
W76-09318 5C

EDWARDS AND JONES LTD., STOKE-ON-TRENT (ENGLAND).
Modern Filter Press Technology for Sewage Sludge Dewatering,
W76-09021 5D

EIDGENOESSISCHES INSTITUT FUER REAKTORFORSCHUNG, WUERENLINGEN (SWITZERLAND).
A Two-Dimensional Hydrodynamic Model for Cooling-Tower Plumes,
W76-08851 5B

EKONO INC., BELLEVUE, WASH.
Economics and Energy: Reducing Mill Energy Consumption and Effluent Volume,
W76-09299 5G

ELECTRICITE DE FRANCE, CHATOU. DIRECTION DES ETUDES ET RECHERCHES.
Studies Carried out in France on the Ecological Consequences of Open-Circuit Cooling in Thermal Power Stations, (Etudes Realisees en France sur Les Consequences Ecologiques de la Refrigeration des Centrales Thermiques en Circuit Ouvert),
W76-08875 5C

ENDINBURGH UNIV. (SCOTLAND). GRANT INST. OF GEOLOGY.
Areal and Seasonal Variations in the Chemistry of Suspended Particulate Matter in a Deep Water Fjord,
W76-08829 2L

ENERGOPROJEKT, BELGRADE, (YUGOSLAVIA).
Waste-Heat Disposal from Steam Electric Plants with Reference to the Stochastic Nature of Some Environmental Conditions and to Thermal Pollution Control Regulations,
W76-08865 5G

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, WASHINGTON, D. C. (ASSIGNEE).
Separation by Solvent Extraction,
W76-09061 5D

ENGINEERING ENTERPRISES, INC., NORMAN, OKLA.
Subsurface Brine Disposal - Be Reasonable,
W76-09261 5B

ENTE NAZIONALE PER L'ENERGIA ELETTRICA, ROME (ITALY). DIREZIONE DELLA COSTRUZIONI.
Regulations and Environmental Investigations Associated with Nuclear Station Thermal Discharges,
W76-08886 5G

ENVIRONMENT IMPROVEMENT, INC., TORRANCE, CALIF. (ASSIGNEE).
Water Purification Process and Apparatus,
W76-09059 5D

ENVIRONMENTAL PROTECTION AGENCY, GULF BREEZE, FLA. GULF BREEZE ENVIRONMENTAL RESEARCH LAB.
River Pollution by Anticholinesterase Agents,
W76-08782 5C

ENVIRONMENTAL PROTECTION AGENCY, SEATTLE, WASH. REGION X.
Pollution From Non-Point Sources,
W76-09232 5B

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. (ASSIGNEE).
Ligand Exchange Process for Removal of Ammonia,
W76-09056 5D

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C. OFFICE OF SOLID WASTE MANAGEMENT PROGRAMS.
Anaerobic Digestion of Solid Waste and Sewage Sludge into Methane,
W76-09153 5D

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF TOXIC SUBSTANCES.
Environmental Aspects of Chemical Use in Well Drilling Operations.
W76-08889 5G

ENVIRONMENTAL PROTECTION SERVICE, EDMONTON (ALBERTA). AQUATIC TOXICOLOGY LAB.
Acute Toxicity of Well-Drilling to Rainbow Trout,
W76-08899 5A

ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO).
Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic,
W76-09334 5G

ENVIRONMENTAL RESEARCH LAB., DULUTH, MINN.
Growth and Survival of Young-of-the-Year Emerald Shiners (Notropis Atherinoides) at Different Temperatures,
W76-08779 5C

ENVIRONMENTAL RESEARCH LAB., NARRAGANSETT, R. I.
Development and Application of Criteria for Marine Cooling Waters,
W76-08885 5G

ENVIRONMENTAL SCIENCE RESEARCH LAB., NAGOYA (JAPAN).
New Method for Removing Sodium Sulfide from Sludge,
W76-09278 5D

ENVIRONMENTAL SYSTEMS CORP., KNOXVILLE, TENN.
Atmospheric Dispersion of Cooling-Tower Blowdown,
W76-08853 5B

EXXON CO., HOUSTON, TEX.
Effects of Drilling Operations on the Marine Environment,
W76-08909 5G

EXXON CO., HOUSTON, TEX. OPERATIONS DEPT.
Techniques of Deep Well Drilling,
W76-08890 8B

EXXON CO., NEW ORLEANS, LA. SOUTHEASTERN DIV.
Offshore Petroleum Drilling and Production,
W76-09332 5G

EXXON PRODUCTION RESEARCH CO., LINDEN, N.J.
Hydrocarbons in Water and Sediment Samples from Coal Oil Point Area, Offshore California,
W76-09384 5B

EXXON RESEARCH AND ENGINEERING CO., LINDEN, N.J. (ASSIGNEE).
Method for Clarifying Oily Water Mixtures,
W76-09057 5G

FIELD STUDIES COUNCIL, PEMBROKE (ENGLAND). OIL POLLUTION RESEARCH UNIT.
Biological Effects of Refinery Effluents,
W76-09322 5C

FISHERIES AND MARINE SERVICE, ST. ANDREWS (NEW BRUNSWICK). BIOLOGICAL STATION.
Toxicity and Environmental Properties of Chemicals used in Well-Drilling Operations,
W76-08906 5C

FISHERIES AND MARINE SERVICE, ST. JOHN'S (NEWFOUNDLAND). BIOLOGICAL STATION.
Field Evaluation of Benzopyrene Hydroxylase Induction as a Monitor for Marine Petroleum Pollution,
W76-09116 5A

FISHERIES AND MARINE SERVICE, STE. ANNE DE BELLEVUE (QUEBEC). ARCTIC BIOLOGICAL STATION.
Responses of Arctic Marine Crustaceans to Crude Oil and Oil-Tainted Food,
W76-09123 5C

FISHERY RESEARCH CENTRE, FORT COLLINS, COLO.
Acute and Chronic Toxicity of Lead to Rainbow Trout Salmo Gairdneri, in Hard and Soft Water,
W76-08781 5C

FLORIDA DEPT. OF ADMINISTRATION, TALLAHASSEE. DIV. OF STATE PLANNING.
The OCS Forgotten Land: Territorial Sea, Nearshore, and Estuary,
W76-09330 5G

FOREST SERVICE (USDA), ST. PAUL, MINN. NORTH CENTRAL FOREST EXPERIMENT STATION.
Sewage Effluent Infiltrates Frozen Forest Soil,
W76-09288 5B

FOUNDATION OF CANADA ENGINEERING CORP. LTD., HALIFAX (NOVA SCOTIA).
Separation Processes Used for Pollution Control in the Pulp and Paper Industry,
W76-09340 5D

FOX (F. M.) AND ASSOCIATES, INC., WHEAT RIDGE, COLO.
Water Monitoring - Jim Bridger Project - Sweetwater County, Wyoming,
W76-09349 5A

GEOLOGICAL SURVEY, ALBUQUERQUE, N. MEX.
The Effects of Ground-Water Development on the Water Supply in the Post Headquarters Area, White Sands Missile Range, New Mexico,
W76-09137 5B

GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.
Evaluation of Seismicity and Earthquake Shaking at Offshore Sites,
W76-09379 5G

GEOLOGICAL SURVEY, AUSTIN, TEX.
Records of Wells, Drillers' Logs, Water-Level Measurements, and Chemical Analyses of Ground Water in Chambers, Liberty, and Montgomery Counties, Texas, 1966-74,
W76-09144 7C

LIBRARY U. OF T. ARLINGTON, TEXAS

GEOLOGICAL SURVEY, COLUMBUS, OHIO.
Hydrologic Concepts of Artificially Recharging the Floridan Aquifer in Eastern Orange County, Florida--A Feasibility Study,
W76-09150 4B

GEOLOGICAL SURVEY, DENVER, COLO.
Hydrological Problems Associated with Developing Geothermal Energy Systems,
W76-09260 4B

GEOLOGICAL SURVEY, EDGEWATER, MD.
Macroscopic Benthic Fauna of Three Tidal Creeks Adjoining the Rhode River, Maryland,
W76-09143 5B

GEOLOGICAL SURVEY, HELENA, MONT.
Ground-Water Levels and Chemical Quality of Ground Water in Lincoln, Montana,
W76-09132 7C

Results of Phytoplankton Sampling at National Stream Quality Accounting Network Stations in Montana--1975 Water Year,
W76-09146 5A

GEOLOGICAL SURVEY, INDIANAPOLIS, IND.
A Technique for Estimating the Time of Travel of Water in Indiana Streams,
W76-09138 4A

GEOLOGICAL SURVEY, JACKSON, MISS.
Ground-Water Data for Sunflower County, Mississippi,
W76-09140 7C

Ground-Water Data for Carroll County, Mississippi,
W76-09141 7C

GEOLOGICAL SURVEY, LITTLE ROCK, ARK.
Discharge Data at Water-Quality Monitoring Stations in Arkansas,
W76-09145 7C

GEOLOGICAL SURVEY, MADISON, WIS.
Low-Flow Characteristics and Mean Annual Discharge of North Branch Manitowoc River at Potter, Wisconsin,
W76-09147 7C

GEOLOGICAL SURVEY, MADISON, WIS. WATER RESOURCES DIV.
The Availability of Ground Water for Irrigation in the Rice Lake-Eau Claire Area, Wisconsin,
W76-09348 4B

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Sediment Transport, Turbidity, Channel Configuration, and Possible Effects of Impoundment of the Mad River, Humboldt County, California,
W76-09136 2J

GEOLOGICAL SURVEY, MENLO PARK, CALIF. ENGINEERING GEOLOGY BRANCH.
Application of Ground-Water Flow Theory to a Subsurface Oil Spill,
W76-09350 2L

GEOLOGICAL SURVEY, MENLO PARK, CALIF. WATER RESOURCES DIV.
The Time Stability of Dissolved Mercury in Water Samples-I. Literature Review,
W76-08767 5A

GEOLOGICAL SURVEY, METAIRIE, LA.
Responsibilities of Offshore Drilling Regulations,
W76-08918 5G

GEOLOGICAL SURVEY OF CANADA, OTTAWA (ONTARIO).
Some Comments on Interferences by CU(II) Ions and AG(I) Ions on the Wet Reduction-Flameless Atomic Absorption Determination of Mercury,
W76-09039 5A

The Formation and Detection of Metal Dispersion Halos in Organic Lake Sediments,
W76-09129 2J

GEOLOGICAL SURVEY, RESTON, VA.
Hydrologic Unit Map--1974, State of Minnesota.
W76-09131 7C

Statistics of Data Transfer,
W76-09133 4A

Summary Appraisals of the Nation's Ground-Water Resources--California Region,
W76-09139 4B

A Guide to State Programs for the Reclamation of Surface Mined Areas,
W76-09142 5G

Mineral Resource Management of the Outer Continental Shelf.
W76-09306 6G

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
Design of Nationwide Water-Quality-Monitoring Networks,
W76-09209 5A

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH.
Water-Resources Investigations of the U.S. Geological Survey in Selected Coal-Energy Areas of Utah,
W76-09148 4B

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Hydrologic Environmental Effects of Sprayed Sewage Effluent, Tallahassee, Florida,
W76-09134 5B

Summary of Hydrologic Data Collected During 1974 in Dade County Florida,
W76-09135 7C

Water Resources of Walton County, Florida,
W76-09149 4A

GEORGIA UNIV., ATHENS.
Photographic Analysis of Water Quality Changes,
W76-09199 5A

GEORGIA UNIV., ATHENS. DEPT. OF REAL ESTATE.
Implications of Zoning as An Urban Water Management Measure,
W76-08755 6F

GEORGIA UNIV., ATHENS. DEPT. OF ZOOLOGY.
A Reservoir Cove Ecosystem Model,
W76-08830 5C

GESELLSCHAFT FUER KERNFORSCHUNG M.B.H., KARLSRUHE (WEST GERMANY).
Fog Formation and Fog Elimination,
W76-08854 5G

GIDROKHIMICHESKII INSTITUT, NOVOCHERKASSK (USSR).
Mechanism of Conversion of Lignin and its Derivatives in Natural Waters (Mekhanizm prevrashcheniya lignina i ego proizvodnykh prirodnoj vode),
W76-09280 5B

GILBERT ASSOCIATES, INC., READING, PA.
Coatings for Wastewater Treatment Plants,
W76-09014 8G

Adapting Industrial Processes for Multi-Purpose Industrial Port Islands,
W76-09378 5G

GKY AND ASSOCIATES, ALEXANDRIA, VA.
Decision Perspectives on Urban Storm Water Pollution,
W76-09207 5G

GOVERNMENT INDUSTRIAL RESEARCH INST., OSAKA (JAPAN).
The Role of pH on the Acute Toxicity of Sulfite in Water,
W76-08775 5C

GOVIND BALLABH PANT UNIV. OF AGRICULTURE AND TECHNOLOGY, PANTNAGAR (INDIA).
Zinc Nutrition of Rice in Relation to Iron and Manganese Uptake Under Different Water Regimes,
W76-08974 3F

GUAM UNIV., AGANA. MARINE LAB.
Effects of Copper on the Coral Reef Echinoid Echinometra Mathaei,
W76-09113 5C

GULF COAST RESEARCH LAB., OCEAN SPRINGS, MISS.
Phase III: Sedimentology,
W76-09241 2L

GULF COAST RESEARCH LAB., OCEAN SPRINGS, MISS. FISHERIES SECTION.
Phase I: Area Description,
W76-09239 2L

Phase II: Hydrology,
W76-09240 2L

Phase IV: Biology,
W76-09242 2L

GULF SOUTH RESEARCH INST., NEW ORLEANS, LA. DEPT. OF ANALYTICAL CHEMISTRY.
Environmental Implications of Sediment Bulk Analysis Techniques for Trace Metals in Offshore Well-Drilling Operations,
W76-08908 5A

GULF UNIVERSITIES RESEARCH CONSORTIUM, GULFPORT, MISS.
The Offshore Ecology Investigation,
W76-09382 5G

HALLIBURTON CO., DUNCAN, OKLA. CHEMICAL RESEARCH AND DEVELOPMENT DEPT.
Thermal Degradation of Drilling Mud Additives,
W76-08901 8G

HANSHIN CITY IMPROVEMENT BUREAU (JAPAN).
Electric Equipment for Mukogawa Sewage Treatment Plant, Hyogo Prefecture (Hyogoken mukogawa shorijo no denki setsubi),
W76-09000 5D

HARRIS (FREDERICK R.), INC., NEW YORK.
Evaluation of Multi-Purpose Industrial-Port Islands: Sea Island Structure Engineering Research Study,
W76-09375 5G

HAWAII UNIV., HONOLULU. DEPT. OF AGRONOMY AND SOIL SCIENCE.
Determining Both Water Characteristics and Hydraulic Conductivity of a Soil Core at High Water Contents from a Transient Flow Experiment,
W76-09271 2G

HAWAII UNIV., HONOLULU. PACIFIC BIOMEDICAL RESEARCH CENTER.
Mercury Content of Biota in Coastal Waters in Hawaii,
W76-08776 5C

HAZEN AND SAWYER, NEW YORK.
Capabilities and Costs of Technology Associated with the Achievement of the Requirements and Goals of the FWPCA of 1972 for Pulp and Paper Industry.
W76-09229 5G

HEBREW UNIV., JERUSALEM (ISRAEL). DEPT. OF BOTANY.
Desert Ecosystems: Higher Trophic Levels,
W76-09064 2A

HEDCO, INC., PARAMUS, N.J. (ASSIGNEE).
Apparatus and Method for Making Snow with Uniform Drop Size,
W76-09051 7B

HOKKAIDO UNIV., MURORAN (JAPAN). INST. OF ALGOLOGICAL RESEARCH.
Observations of Colonial Multiplication in a Rapidly Growing Alga, Gonium Multicoccum Pocock (Volvocaceae),
W76-08826 5C

HOOKER CHEMICALS AND PLASTICS CORP., NIAGARA FALLS, N.Y. (ASSIGNEE).
Process for Electrolysis of Brine,
W76-09053 5D

HYDROCOMP INC., ATLANTA, GA.
Criteria for Selecting a Water Quality Model for 208 Planning,
W76-09212 5G

IDAHO UNIV., MOSCOW. DEPT. OF CIVIL ENGINEERING.
Impact of Changes in Irrigation water Management in Eastern Idaho,
W76-08925 3F

IFE UNIV., (NIGERIA). DEPT. OF AGRICULTURAL ENGINEERING.
The Performance-Potential of Polyelectrolytes and High Velocity Gradients in the Treatment of Wastewaters,
W76-09179 5D

ILLINOIS STATE WATER SURVEY, URBANA.
Unit Hydrographs - A Comparative Study,
W76-09254 2E

ILLINOIS UNIV. AT THE MEDICAL CENTER, CHICAGO. SCHOOL OF PUBLIC HEALTH.
A Continuous Flow Bioassay Method to Evaluate the Effects of Outboard Motor Exhausts and Selected Aromatic Toxicants on Fish,
W76-08780 5C

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF AGRICULTURAL ENGINEERING.
Erosion for Corn Tillage Systems,
W76-09248 3F

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF AGRONOMY.
Natural (15)N Abundance in Soil, Leaves, and Grain as Influenced by Long Term Additions of Fertilizer N at Several Rates,
W76-08765 3F

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF CIVIL ENGINEERING.
Reverse Osmosis Separation of Polar Organic Compounds in Aqueous Solution,
W76-09165 5D

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF MICROBIOLOGY.
Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms,
W76-08752 5B

IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND). DEPT. OF PUBLIC HEALTH ENGINEERING.
Factors Affecting the Extraction and Analysis of Polynuclear Aromatic Hydrocarbons in Water,
W76-09200 5A

INDIAN AGRICULTURAL RESEARCH INST., NEW DELHI. DIV. OF AGRONOMY.
Effect of Soil-Moisture Regimes and N and P Fertilization on Berseem Grown for Fodder,
W76-08987 3F

INDIAN INST. OF TECH., BOMBAY. DEPT. OF CIVIL ENGINEERING.
Pressure Fluctuations in Submerged Jump,
W76-09265 8B

INDUSTRIAL BIO-TEST LABS. NORTHBROOK, ILL. ENVIRONMENTAL SCIENCES DIV.
Comparative Effects of Two Modes of Cooling Water Discharge on Mississippi River Biota and Environmental Ecosystems,
W76-08888 5C

INSTITUTE FOR APPLIED RESEARCH ON NATURAL RESOURCES BAGHDAD (IRAQ).
Comparative Evaluation of Yearly Climatic Factors with the Five Years Averages for Fudhaliya Agro-Meteorological Station,
W76-09066 2B

Comparative Evaluation of Climatic Factors and Conditions at Fudhaliya Agro-Meteorological Station and Baghdad Airport Meteorological Station,
W76-09067 2B

Hydrogeological Conditions of Al-Hamad Area, Iraq,
W76-09068 2F

INSTITUTE OF BIOLOGY OF THE SOUTHERN SEAS, SEVASTOPOL (USSR).
Interrelation Between Weight and Linear Indices in Black Sea Oysters, (In Russian),
W76-09087 2I

Effect of Food Concentration on Efficiency of its Assimilation by Planktonic Crustaceans with Different Feeding Mechanisms, (In Russian),
W76-09092 2I

INSTITUTE OF PAPER CHEMISTRY, APPLETON, WIS.
The Benthos of Pictou Harbor and Northumberland Strait, Canada -- A Measure of the Impact of Treated Kraft Pulp Mill Effluent,
W76-09294 5C

INSTITUTO ESPANOL DE OCEANOGRAFIA, MADRID (SPAIN). CENTRAL LABORATORIES.
Mercury Concentrations in Spring and Fall Zooplankton of the Estuary of the Arosa River, (In Spanish),
W76-08768 5C

INSTITUTO NATIONAL DE LIMNOLOGIA, SANTO TOME (ARGENTINA).
Thermal Structure of Lake Mascardi (Province of Rio Negro, Argentina, (In Spanish),
W76-09358 2H

INSTYTUT INZYNIERII OCHRONY SRODOWISKA POLITECHNIKI SLASKIEJ, GLIWICE (POLAND).
Need for an Integral Approach to to the Problem of Quantitative Determination of Lignosulfonic Acids in Mill Effluents and Surface Waters (O potrzebie kompleksowego ujmowania problemu ilosciowego oznaczania kwasow ligninosulfonowych w sciekach pocelulozowych i wodach powierzchniowych),
W76-09277 5A

INSTYTUT RYBACTWA SRODLADOWEGO, OLSZTYN-KORTOWO (POLAND).
Influence of Mineral Fertilization of Lakes on Fish Growth,
W76-08799 5C

INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA (AUSTRIA).
Environmental Effects of Cooling Systems at Nuclear Power Plants,
W76-08848 5C

INTERNATIONAL LIVESTOCK CENTRE FOR AFRICA, ADDIS ABABA (ETHIOPIA).
The Nature and Causes of Desertization,
W76-09069 4C

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION, CULTUS LAKE (BRITISH COLUMBIA). SWELTZER CREEK SALMON RESEARCH LAB.
Chemical Characteristics, Acute Toxicity and Detoxification of Foam in Two Aerated Lagoons,
W76-09295 5C

INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION LTD., LONDON (ENGLAND).
Occurrence, Cause and Avoidance of the Spilling of Oil by Tankers,
W76-09314 5B

JAGELLONIAN UNIV., KRAKOW (POLAND). DEPT. OF HYDROBIOLOGY.
Ciliate Associations (Ciliata) in the Pradnik Stream, Which is Polluted by Residual Waters of a Dairy, (In French),
W76-08777 5C

JONES AND HENRY ENGINEERS LTD., TOLEDO, OHIO.
Methods for Filtering Nitrified Effluents,
W76-09015 5D

JORDON/MATHIS AND ASSOCIATES, SAN FRANCISCO, CALIF.; AND ARMY ENGINEER DISTRICT, SAN FRANCISCO, CALIF.
Flood Plain Information: Rush Creek-Petaluma River to U. S. Highway 101, Marin County, California.
W76-08812 4A

KAZAN INST. OF BIOLOGY (USSR).
Effect of Hardening on the State of Water in Seedlings of Winter Cultures, (In Russian),
W76-09095 2I

KENTUCKY UNIV., LEXINGTON. DEPT. OF AGRICULTURAL ENGINEERING.
Evaluation of a Monthly Water Yield Model,
W76-09246 2A

KEURING VAN ELECTROTECHNISCHE MATERIALEN N.V., ARNHEM (NETHERLANDS). ENVIRONMENTAL DEPT. OF THE CENTRAL LAB.
Two Methods of Measuring the Heat Dissipation of Discharged Cooling Water: A Phenomenological Approach,
W76-08868 5B

KOCHI UNIV. (JAPAN). INST. OF FISHERIES.
On the Histological Structure and Function of Digestive Organs of the Fed and Starved Larvae of the Yellowtail, Seriola Quinqueradiata, (In Japanese),
W76-09088 2I

KYUSHU UNIV., FUKUOKA (JAPAN). WOOD CHEMISTRY LAB.
Studies on Oxygen-Alkali Treatment of Ligneous Materials. Part V. Recycle and Reuse of Waste Liquor in O-PA-P Bleaching Sequence (In Japanese),
W76-09337 3E

On Spent Semichemical Pulping Liquors. (4) Xylan in Neutral Sulfite Semichemical Spent Liquor (In Japanese),
W76-09338 5C

LA PLATA UNIV. (ARGENTINA). INSTITUTO DEL MUSEO.
A New Stratified Plankton Sampler for Shallow Waters, (In Spanish),
W76-09193 7B

LABORATOIRE NATIONAL D'HYDRAULIQUE, CHATOU (FRANCE).
Heating of Estuarine and Coastal Waters by Nuclear Power Stations in France, (Echauffement Des Eaux Par Des Centrales Nucleaires En Estuaire Et Bord De Mer En France),
W76-08859 5B

LANGKAER VAENGE, COPENHAGEN (DENMARK).
Ammonia Removal by Use of Clinoptilolite,
W76-09180 5D

LAVAL UNIV., QUEBEC. CENTRE D'ETUDES NORDIQUES.
Zonation of Snow Conditions in Forest-Tundra, Hudson Bay, New Quebec, (In French),
W76-08759 2C

LAYNE ATLANTIC CO., NORFOLK, VA. WATER RESOURCES DIV.
Techniques of Shallow Well Drilling,
W76-08891 8B

LENINGRADSKAYA LESTEKHICHESKAYA AKADEMIYA (USSR).
Phenols -- Products of Lignin Degradation -- in Effluents of the Baikal Pulp and Paper Mill (Fenoli -- produkty razrusheniya lignina -- v stochnykh vodakh Baikal'-skogo tsellyuloznogo zavoda),
W76-09281 5A

LIVERPOOL POLYTECHNIC (ENGLAND). DEPT. OF BIOLOGY.
Diatom Community Response to Variations in Effluent Concentration,
W76-08835 5C

LIVERPOOL UNIV. (ENGLAND). DEPT. OF BOTANY.
Leaching Losses of Ammonium and Nitrate in the Reclamation of Sand Spoils in Cornwall,
W76-08760 3C

LONDON UNIV. (ENGLAND).
Beach-Offshore Dredging: Some Environmental Consequences,
W76-09335 5G

LOUISIANA STATE UNIV., BATON ROUGE. COASTAL STUDIES INST.
Wind and Current Effects on Large-Scale Oil Slicks,
W76-09310 5G

LOUVAIN UNIV. (BELGIUM). LABORATORIE DE HYGIENE; AND LOUVAIN UNIV. (BELGIUM). SCHOOL OF PUBLIC HEALTH.
The Effect of Thermal Pollution on the Distribution of Naegleri Fowleri,
W76-08930 5C

MAGYAR TUDOMANYOS AKADEMIA, SZEGED. NOVENYELETTANI KUTATO INTEZET.
Valyl tRNA's of Anacystis Nidulans,
W76-08827 5C

MARINE BIOLOGICAL LAB., WOODS HOLE, MASS. BOSTON UNIV. MARINE PROGRAM.
The Effect of Fertilization on the Species Composition of Salt Marsh Diatoms,
W76-08774 5C

MARINE SCIENCE INST., BAYOU LA BATRE, ALA.
Ecological Effects of Offshore Construction,
W76-09307 6G

MARIST COLL., POUGHKEEPSIE, N. Y. ENVIRONMENTAL SCIENCE PROGRAM.
Uptake and Effect of Cadmium on Zebrafish,
W76-08772 5C

MARYLAND DEPT. OF NATURAL RESOURCES, ANNAPOLIS.
Chlorination and Iodination of Poliovirus and F2,
W76-09196 5A

MARYLAND DEPT. OF NATURAL RESOURCES, ANNAPOLIS. POWER PLANT SITING PROGRAM.
The Chalk Point Cooling Tower Project,
W76-08861 5B

MARYLAND UNIV., COLLEGE PARK. DEPT. OF MICROBIOLOGY.
Microbial Ecology of Petroleum Utilization in Chesapeake Bay,
W76-09319 5C

MASSACHUSETTS INSTITUTE OF TECH., CAMBRIDGE.
A Model for Salt Drift Deposition from Spray Ponds,
W76-08866 5B

MASSACHUSETTS UNIV., AMHERST. DEPT. OF CIVIL ENGINEERING.
Field Evaluation of a Predictive Model for Thermal Stratification in Lakes and Reservoirs,
W76-08920 2H

MASSACHUSETTS UNIV., AMHERST. DEPT. OF FORESTRY AND WILDLIFE MANAGEMENT.
Models for Evaluation of Freshwater Wetlands,
W76-08921 4A

MASSACHUSETTS UNIV., GLOUCESTER.
Effects of Seawater Extracts of Crude Oil
Carbon Budgets in Two Species of Mussels,
W76-09320

MAX C. FLEISCHMANN COLL. OF AGRICULTURE, RENO, NEV.
The Effects of Increasing Salinity on
Pyramid Lake Fishery,
W76-08753

MAX-PLANCK-INSTITUT FUER LIMNOLOG ZU PLOEN (WEST GERMANY).
The Application of the Scanning Elect
Microscope to Freshwater Phytoplankton T
onomy and Morphology,
W76-09225

MAX-PLANCK-INSTITUT FUER METALLFORCHUNG, STUTTGART (WEST GERMANY). INSTITUT FUER WERKSTOFFWISSENSCHAFTEN.
Multi-Reaction Proton Activation Analysis
Traces of Molybdenum,
W76-09036

MELITOPOLSKII PEDAGOGICHESKII INSTITUT (USSR).
Formation of Fish Fauna of the Berdya
Reservoir in the First Twelve Years of its
istence, (In Russian),
W76-09392

METCALF AND EDDY, INC., NEW YORK.
Water Plant Waste Treatment: State of the A
Part II,
W76-09045

MICHIGAN UNIV., ANN ARBOR.
Analytical Chemistry in Water Pollution C
trol,
W76-09221

MICHIGAN UNIV., ANN ARBOR. DEPT. OF CIVIL ENGINEERING.
Probability Models of Wastewater Treatm
Plant Operation,
W76-09210

MIDDLE TENNESSEE STATE UNIV., MURFREESBORO. DEPT. OF BIOLOGY.
Insecticide Residues in Two Turtle Species F
lowing Treatment with DDT,
W76-08778

MILAN UNIV. (ITALY). LABORATORIO DI ZOOLOGIA.
The Po River at the Island of Serafini,
Italian),
W76-09305

MISSISSIPPI STATE UNIV., STATE COLLEG
The Phenol-Sulfuric Acid Test,
W76-09191

MISSOURI AGRICULTURAL EXPERIMENTA STATION, COLUMBIA.
Phosphate Determinations in Waters Using
Anion Exchange Resin,
W76-09370

MISSOURI UNIV., ROLLA. DEPT. OF CHEMISTRY.
Kinetics and Mechanisms of the Oxidati
Degradation of Nitrilotriacetic Acid (NTA)
Aqueous Solutions,
W76-08843

MONASH UNIV., CLAYTON (AUSTRALIA). DEPT. OF MECHANICAL ENGINEERING.
Rationale for a Water Pollution Code Part
The Waste System and the Natural System,
W76-08839

MOSCOW STATE UNIV. (USSR). DEPT. OF PHYSICS; AND MOSCOW STATE UNIV. (USSR). DEPT. OF SOIL MELIORATION.
Effect of the Mozhaysk Reservoir on Soil of the Bank Area of the Surrounding Territory, (In Russian),
W76-09081 2G

MOSKOVSKII GOSUDARSTVENNYI MEDITSINAKII INSTITUT (I) (USSR). DEPT. OF PUBLIC HYGIENE.
The Significance of Isomery in Hygienic Standardization of Industrial Contaminations of Water Bodies, (In Russian),
W76-08864 5A

MOTOR-COLUMBUS CONSULTING ENGINEERS INC., BADEN (SWITZERLAND).
Combined Dry/Wet-Cooling Towers: Their Environmental Promise and Their Problems,
W76-08852 5B

MOUNT SINAI SCHOOL OF MEDICINE, NEW YORK.
The Effect of Lead on Mouse Brain Development,
W76-09038 5C

MUSEUM NATIONAL D'HISTOIRE NATURELLE, PARIS (FRANCE). LABORATOIRE DE PHANEROGAMIE.
First Observations on the Forest of Cameroon on Sandy Coastal Cordons, (In French)
W76-09100 2I

N L INDUSTRIES, INC., HOUSTON, TEX. BAROID DIV.
Drilling Fluid Principles and Operations,
W76-08893 8G

NAGOYA UNIV. (JAPAN). BIOLOGICAL INST.
Studies on Phosphorylation Coupled with Denitrification and Aerobic Respiration in Pseudomonas Denitrificans,
W76-08823 5C

NANCY UNIV. (FRANCE).
Microbiological and Algological Survey of A Primary Stage of Eutrophication in a Stream, (In French),
W76-09399 5C

NARA PREFECTURE SEWERAGE DEPT. (JAPAN).
Sewerage Project on Upstream Area of the Yamato River,
W76-09168 5D

NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC., NEW YORK.
Study to Define Changes in Pulp Mill Effluent-Contributed Color in Receiving Waters Detectable by Human Observers,
W76-09276 5C

NATIONAL ENVIRONMENTAL SATELLITE SERVICE, WASHINGTON, D.C.
An Evaluation of ERTS Data for Oceanographic uses Through Great Lake Studies,
W76-09244 2H

NATIONAL MARINE FISHERIES SERVICE, ANN ARBOR, MICH. GREAT LAKES FISHERY LAB.
Feeding Behavior and Temperature and Light Tolerance of Mysis Relicta in the Laboratory,
W76-08931 5C

NATIONAL MARINE FISHERIES SERVICE, AUKE BAY, ALASKA. AUKE BAY FISHERIES LAB.
Toxicity and Avoidance Tests with Prudhoe Bay Oil and Pink Salmon Fry,
W76-09317 5C

NATIONAL MARINE FISHERIES SERVICE, BEAUFORT, N. C. ATLANTIC COASTAL FISHERIES CENTER.
Effects of Temperature, Copper and Chlorine on Fish During Simulated Entrainment in Power-Plant Condenser Cooling Systems,
W76-08878 5C

NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WASH.
Interagency Investigations of a Persistent Oil Spill on the Washington Coast. Animal Population Studies, Hydrocarbon Uptake by Marine Organisms, and Algae Response Following the Grounding of the Troopship General M.C. Meigs,
W76-09324 5C

NATIONAL MARINE FISHERIES SERVICE, TIBURON, CALIF. TIBURON FISHERIES LAB.
Respiratory Response of Juvenile Chinook Salmon and Striped Bass Exposed to Benzene, A Water-Soluble Component of Crude Oil,
W76-09323 5C

NATIONAL MARINE FISHERIES SERVICE, WASHINGTON, D.C. DATA BUOY OFFICE.
Development of a Water Quality Instrumentation Package for Long-Term Operation from Buoys and Other Unattended Marine Platforms,
W76-09372 5G

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, NEW YORK. MARINE ECOSYSTEMS ANALYSIS PROGRAM.
New York Alternative Dumpsite Assessment - Reconnaissance Study of Surficial Sediments,
W76-09383 5G

NATIONAL RESEARCH INST. FOR OCCUPATIONAL DISEASES, JOHANNESBURG (SOUTH AFRICA).
Effect of Sample Preparation on Blood Lead Values,
W76-09130 5A

NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD, UPPSALA. LIMNOLOGICAL SURVEY.
An Automatic Release Instrument with Underwater Buoy for Marking of Field Equipment,
W76-09268 7B

NATIONAL WATER QUALITY LAB., CINCINNATI, OHIO. NEWTOWN FISH TOXICOLOGY LAB.
Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality,
W76-08783 5C

NATIONAL WATER WELL ASSOCIATION, WORTHINGTON, OHIO.
Objectives of Well-Drilling Regulations,
W76-08917 5G

NATIONAL WATER WELL ASSOCIATION, WORTHINGTON, OHIO. RESEARCH FACILITY.
Mobility of Well-Drilling Additives in the Ground Water System,
W76-08904 5B

NATIONAL WEATHER SERVICE, GARDEN CITY, N.Y. EASTERN REGION.
Prediction of Meteorological Factors Related to Beach Erosion at New Jersey and Long Island, N.Y.,
W76-09270 2L

NAVAL OCEANOGRAPHIC OFFICE, WASHINGTON, D.C.
Ocean Dumping--A Rational Approach to an International Problem,
W76-09304 5G

NEILL AND GUNTER LTD., FREDERICTON (NEW BRUNSWICK).
Options for the Use and Disposal of Bark,
W76-09302 5E

NEVADA UNIV., LAS VEGAS. CENTER FOR WATER RESOURCES RESEARCH.
Transform Approach to Solution of Groundwater Flow Equations,
W76-08922 2F

NEW MEXICO INST. OF MINING AND TECHNOLOGY, SOCORRO.
A Rapid Method of Estimating Mean Areal Rainfall,
W76-09368 2B

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF CIVIL ENGINEERING.
The Effects of a Synthetic Chili Waste on Biological Sewage Treatment Plant Operations,
W76-08845 5D

NEW YORK OCEAN SCIENCE LAB., MONTAUK.
Effects of Water Soluble Extracts of Oil on Phytoplankton,
W76-09325 5C

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY.
Kinetics and Control Tests of Nitrification-Denitrification Process, Part II: Respiration and Control Tests,
W76-09366 5D

NEW YORK STATE DEPT. OF HEALTH, ALBANY. DIV. OF LABS. AND RESEARCH.
An Improved Determination of Chemical Oxygen Demand in Water and Wastes by a Simplified Acid Dichromate Digestion,
W76-09203 5A

NICOLAS COPERNICUS UNIV. OF TORUN, ILAWA (POLAND). DEPT. OF HYDROBIOLOGY.
The Peripheral Flood Zones of Gniewkowo Lowland from 1969 to 1972, (In Polish),
W76-09079 2I

NICOLAS COPERNICUS UNIV. OF TORUN (POLAND). INST. OF BIOLOGY; AND NICOLAS COPERNICUS UNIV. OF TORUN (POLAND). ZAKLAD BOTANIKI OGOLNEJ.
Plant Associations of Lake Mieliwo and the Adjacent Peat Bogs in the Brodnica District, (In Polish),
W76-09099 2H

NORGES TEKNISKE HOEGSKOLE, TRONDHEIM. RIVER AND HARBOR LAB.
Trapping of Heat in Sill Fjords,
W76-08856 5C

Computations of the Temperature Response of Stratified Sill Fjords to Cooling-Water Discharges,
W76-08857 5B

LIBRARY U. OF I. URBANA-CHAMPAIGN

NORSK INSTITUTT FOR VANNFORSKNING, BLINDERN.
Biological Effects of Primary, Secondary, and Tertiary Sewage Treatment in Lotic Analog Recipients,
W76-08792 5C

Observation and Monitoring of Water Quality by use of Experimental Biological Methods,
W76-08793 5A

Thermal Effects on Marine Biota in Experimental Systems,
W76-08877 5C

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING.
Agricultural Water Demands in North Carolina,
W76-08841 3F

Determination of the Hydraulic Conductivity - Drainable Porosity Ratio from Water Table Measurements,
W76-09249 2F

NORTH CAROLINA UNIV. AT WILMINGTON. INST. OF MARINE BIOMEDICAL RESEARCH.
Potential Effects of Oil Drilling and Dumping Activities on Marine Biota,
W76-08907 5C

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
Availability of Aluminum Phosphate from Alum-Treated Wastewater for Algal Growth,
W76-08842 5D

NORTH DAKOTA UNIV., FARGO. DEPT. OF CIVIL ENGINEERING.
Comparison of Warburg and Marais Methods of Determining Oxygen Uptake Rate Constants,
W76-09189 5A

NORTHERN GREAT PLAINS RESOURCE PROGRAM, DENVER, COLO.
Northern Great Plains Resource Program. Surface Resource Work Group--Regional Profile.
W76-09228 4C

NORTHUMBRIAN WATER AUTHORITY, GOSFORTH (ENGLAND).
The Tyneside Sewerage Scheme,
W76-09184 5D

NORTHWOOD PULP AND TIMBER LTD., PRINCE GEORGE (BRITISH COLUMBIA).
Secondary Effluent Treatment at Northwood Pulp and Timber Limited,
W76-09297 5D

NOTRE DAME UNIV., IND. ENVIRONMENTAL HEALTH ENGINEERING.
Removal of Faecal Coliform from Waste Water by Proper Aerobic Biological Treatment,
W76-09171 5D

OAK RIDGE NATIONAL LAB., TENN.
Temperature Selection By Fish--A Factor in Power-Plant Impact Assessments,
W76-08882 5C

A Method for Estimating the Toxicity of Chlorinated Discharges,
W76-08928 5C

OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE-MER, PARIS (FRANCE).
Mollusks of the Ceratophyllum Carpets of Lake Chad: Biomasses and Seasonal Variations of the Density, (In French).
W76-09094 2H

OFFSHORE TECHNOLOGY CONFERENCE, DALLAS, TEX.
Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II,
W76-09333 5G

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II.
W76-09371 5G

Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III.
W76-09374 5G

OHIO STATE UNIV., COLUMBUS. DEPT. OF AGRONOMY.
Drainage System Effects on Physical Properties of a Lakebed Clay Soil,
W76-09259 2G

OHIO STATE UNIV., COLUMBUS. DEPT. OF BOTANY.
Changes in the Algal Flora of East Harbor, Ottawa County, Ohio, Since 1900,
W76-08834 5C

OHIO STATE UNIV., PUT-IN-BAY. CENTER FOR LAKE ERIE AREA RESEARCH.
Zooplankton of Western Lake Erie at Put-in-Bay: A Quantitative Study, April 1973-March 1974,
W76-08833 5C

OIL BASE INC., HOUSTON, TEX.
Handling and Treatment of Oil-Base Drilling Muds,
W76-08913 8G

OJI PAPER CO. LTD., KASUGAI (JAPAN).
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluents: An Approach of a Closed System Using Calcium Aluminate Hydrates (In Japanese),
W76-09284 5D

OKAYAMA TOBACCO EXPERIMENT STATION (JAPAN).
Interception of Rainfall at Different Growth Stages by the Canopy of Tobacco Plants, (In Japanese).
W76-08986 3F

OKLAHOMA STATE DEPT. OF AGRICULTURE, OKLAHOMA CITY.
Effects of Initial Flooding on Forest Vegetation at Two Oklahoma Lakes,
W76-08831 4A

ONTARIO HYDRO, TORONTO.
Thermal Discharge Studies on the Great Lakes-the Canadian Experience,
W76-08869 5G

ONTARIO-MINNESOTA PULP AND PAPER CO. LTD., FORT FRANCES (ONTARIO).
Secondary Treatment at Ontario-Minnesota Pulp and Paper Company Limited, Fort Frances, Ontario,
W76-09301 5D

OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL ECONOMICS.
Water Conservation and Irrigated Agriculture
W76-09236

OREGON STATE UNIV., CORVALLIS. DEPT. OF GEOGRAPHY.
Protection of Free-Flowing Rivers,
W76-09235

OREGON STATE UNIV., CORVALLIS. DEPT. OF SOIL SCIENCE.
Water and Food Production Demands,
W76-09237

OREGON STATE UNIV., CORVALLIS. WATE RESOURCES RESEARCH INST.
Water Resources Policy Issues - 1975.
W76-09230

ORGONICS, INC., SLATERSVILLE, R.I. (ASSIGNEE).
Process for Treating Sewage Sludge and Fer izer Products Thereof,
W76-08984

OSAKA PREFECTURE UNIV., (JAPAN). DEPT OF APPLIED CHEMISTRY.
Chemical Interference Effects in the Atom Absorption Spectrometric Determination Lead with Premixed Inert Gas (Entrained Ai Hydrogen Flames.
W76-09043

OSLO UNIV. (NORWAY). INST. OF MARINE BIOLOGY; AND OLSO UNIV. (NORWAY). DEPT. OF LIMNOLOGY.
A Method for the Rapid Sorting of Plankt into a Number of Size Groups,
W76-09397

OTTAWA UNIV. (ONTARIO). DEPT. OF BIOLOGY; AND OTTAWA UNIV. (ONTARIO). DEPT. OF BIOCHEMISTRY.
Isolation and Characterization of A tinopolyspora Halophila, Gen. ET SP. Nov An Extremely Halophilic Actinomycete,
W76-08837

PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION, CORVALLIS, OREG FORESTRY SCIENCES LAB.
Fish Habitat in Forest Lands,
W76-09233

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF CIVIL ENGINEERING.
Municipal Wastewater Odor Still a Proble Part 2,
W76-09044

PIERCE COUNTY HEALTH DEPT., TACOMA, WASH.
Hepatitis Attributed to Polluted Stream,
W76-09220

PRINCE GEORGE PULP AND PAPER LTD. (BRITISH COLUMBIA).
Filter Media Comparison at Prince George Pu and Paper (Limited),
W76-09286

PUBLIC WORKS RESEARCH INST., TOKYO (JAPAN).
Study on the Balance of Heavy Metals in A tivated Sludge Treatment Process (Gesui sho shisetsu ni okeru jukinzokurui no shushi ni ka suru kenkyu),
W76-09222

PUERTO RICO NUCLEAR CENTER, RIO PIEDRAS. RADIOECOLOGY DIV.
Thermal Studies on Tropical Marine Ecosystems in Puerto Rico,
W76-08872 5C

PULP AND PAPER RESEARCH INST. OF CANADA, POINTE CLAIRE (QUEBEC).
Colour Measurement of Pulp Mill Effluents,
W76-09296 5A

Detoxification and Decolorization of Kraft Pulp Mill Effluents using Activated Carbon,
W76-09298 5D

PURDUE UNIV., LAFAYETTE, IND. DEPT. OF CHEMISTRY.
Contents of Eleven Trace Elements in Ureilite Achondrites,
W76-09041 5A

QUEBEC UNIV., TROIS-RIVIERES.
Influence of Heat from the Gentilly Nuclear Power Station on Water Temperature and Gastropoda, (Influence De L'Apport Thermique Originaire de la Centrale Nucleaire Gentilly Sur La Temperature De L'eau Et Sur Les Gasteropodes),
W76-08874 5C

QUEENSBURY WATER DEPT., NEW YORK.
Three-Media Filtration Plant Treats a Problem Water,
W76-09155 5F

RAIN BIRD SPRINKLER MFG. CORP., GLENDORA, CALIF. (ASSIGNEE).
Pressure and Flow Regulation Device,
W76-09049 3F

RAYMOND TECHNICAL FACILITIES, INC., NEW YORK.
Features of Various Offshore Structures,
W76-09311 8A

RAYTHEON OCEANOGRAPHIC AND ENVIRONMENTAL SERVICES, BEDFORD, MASS.
Environmental Site Assessment for a Massachusetts Bay Deepwater Oil Terminal,
W76-09380 5G

READING UNIV. (ENGLAND). DEPT. OF GEOPHYSICS; AND READING UNIV. (ENGLAND). DEPT. OF AGRICULTURAL BOTANY.
Rainfall Trends in the West African Sahel,
W76-09269 2B

RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Kinetics and Control Tests of Nitrification-Denitrication Process, Part I: Kinetics,
W76-09365 5D

RHEINSTRAHL A. G., ESSEN (WEST GERMANY). (ASSIGNEE).
Fluidized Furnace Construction for Burning Partly Dehydrated Sludge,
W76-08988 5E

ROBERT S. KERR ENVIRONMENTAL RESEARCH LAB., ADA, OKLA.
Ground Water Problems Associated with Well-Drilling Additives,
W76-08902 5B

ROCKLAND COUNTY SEWAGE TREATMENT PLANT, ORANGEBURG, N. Y.
Measurement of Metal Toxicity by Biochemical Oxygen Demand,
W76-09127 5A

ROSTOCK UNIV. (EAST GERMANY). DEPT. OF BIOLOGY.
Investigations on the Phytoplankton and Some Environmental Parameters of the Shattal-Arab (Iraq), (In German)
W76-09084 2L

RUSSELL AND AXON, ST. LOUIS, MO.; AND ARMY ENGINEER DISTRICT, ST. LOUIS, MO.
Flood Plain Information: St. Charles County, Missouri, Part 2, Peruque Creek.
W76-08819 4A

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J. DEPT. OF ECONOMICS.
Methods of Estimating Residential Land Use for Water Resources Management,
W76-08924 4C

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J. DEPT. OF ENTOMOLOGY AND ECONOMIC ZOOLOGY.
Interactive Effects of Predation Pressure and Insecticide (Temefos) Toxicity on Populations of the Marsh Fiddler Crab Uca Pugnax,
W76-09114 5C

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J. DEPT. OF SOILS AND CROPS.
Two-Step Phosphate Removal from Solution Using Aluminum Salts,
W76-09182 5D

SAN DIEGO UNIV., CALIF. DEPT. OF BIOLOGY.
A Comparison of Short-Term Effects of Thermal Addition on Photosynthesis and Plant-Water Stress in Three Ecosystems,
W76-08884 5C

SANDCO LIMITED, OTTAWA (ONTARIO). (ASSIGNEE).
Environment Protective Oil Skimming and Removal Apparatus,
W76-09048 5G

SASKATCHEWAN UNIV., REGINA. DEPT. OF BIOLOGY.
The in Vitro Sensitivity of Some Species of Chlorophyceae to a Selected Range of Herbicides,
W76-08824 5C

SAVANNAH RIVER ECOLOGY LAB. AIKEN, S. C.
Ecology of Artificially Heated Streams, Swamps and Reservoirs on the Savannah River Plant, the Thermal Studies Program of the Savannah River Ecology Laboratory,
W76-08870 5C

Thermal Ecology of Dragonflies in Habitats Receiving Reactor Effluent,
W76-08881 5C

SCHREIBER (AUGUST), HANOVER (WEST GERMANY).
Method for Biologically Treating Sewage and an Installation for Carrying out the Method,
W76-09047 5D

SCIENCE APPLICATIONS, INC., MCLEAN, VA.
Surface Effects Skimmer Developments,
W76-09308 5G

SEVILLE UNIV., (SPAIN), DEPT. OF ANALYTICAL CHEMISTRY.
Simultaneous Spectrophotometric Determination of Nickel and Cobalt in Mixtures with 3-Hydroxypicolinealdehyde Azine,
W76-09042 5A

SIMONS (H. A.) INTERNATIONAL LTD., VANCOUVER (BRITISH COLUMBIA).
Diffuser Design,
W76-09291 8A

SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
Possible Influence of Atmospheric Transport on the Total Mercury Content of Southeastern Atlantic Continental Shelf Surface Waters,
W76-09224 5B

Report on the Hydrologic and Sedimentologic Study of the Offshore Spoil Disposal Area, Savannah, Georgia,
W76-09309 5E

SOUTH CAROLINA DEPT. OF HEALTH AND ENVIRONMENTAL CONTROL, COLUMBIA.
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards Experimental Studies,
W76-09157 5D

SOUTH CAROLINA MARINE RESOURCE RESEARCH INST., CHARLESTON.
A New Device For Subsampling Plankton Samples,
W76-09396 7B

SOUTHWESTERN GREAT PLAINS RESEARCH CENTER, BUSHLAND, TEX.
No-Till Seeding of Irrigated Sorghum Double Cropped After Wheat,
W76-08756 3F

STATE UNIV. OF NEW YORK AT ALBANY. DEPT. OF BIOLOGICAL SCIENCES.
Environmental and Intrinsic Control of Filtering and Feeding Rates in Arctic Daphnia,
W76-08933 5C

STEVENS, THOMPSON AND RUNYAN, INC., PORTLAND, OREG. ENVIRONMENTAL ENGINEERING DIV.
Portland Adds Secondary Treatment,
W76-09013 5D

SUN OIL CO., RICHARDSON, TEX. PRODUCTION SERVICE LAB.
The Handling and Treating of Water-Based Drilling Muds,
W76-08912 5D

TECHNION-ISRAEL INST. OF TECH. HAIFA, ISRAEL. ENVIRONMENTAL ENGINEERING LAB.
Determination of Ammonia and Kjeldahl Nitrogen by Indophenol Method,
W76-09201 5A

TECHNISCHE HOCHSCHULE, MUNICH (WEST GERMANY).
On the Risk Assessment of Offshore Structures,
W76-09373 5G

TEOLLISUUDEN VOIMA OY INDUSTRINS KRAFT AB. KILE (FINLAND).
Heat Discharges into the Sea at the Olkiluoto Site: Laboratory Model Test Results and Reasons for Selected Arrangements,
W76-08858 5B

LIBRARY U. OF I. URBANA-CHAMPAIGN

TETRA TECH, INC., PASADENA, CALIF.
Mass Transport and Dispersion Off a Tidal Inlet,
W76-09381 5G

TEXAS A AND M. UNIV., COLLEGE STATION.
Industry Candidates and General Locations for Artificial Industrial-Port Islands,
W76-09377 5G

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF OCEANOGRAPHY.
Wind-Driven Flow of Water Influenced by a Canopy,
W76-08801 2H

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF PETROLEUM ENGINEERING.
Disposal of Drilling Fluids and Drilled-up Solids in Offshore Drilling Operations,
W76-08915 5D

TEXAS RAILROAD COMMISSION, AUSTIN, TEX.
Regulation of Onshore and Offshore Oil Field Waste Disposal,
W76-08919 5E

TEXAS UNIV. HEALTH SCIENCE CENTER, HOUSTON. SCHOOL OF PUBLIC HEALTH.
Quantitative Assessment of Changes in Urban Runoff,
W76-09267 4C

TORONTO UNIV. (ONTARIO). DEPT. OF BOTANY; AND TORONTO UNIV. (ONTARIO). INST. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
The Toxicity of Crude Oil and Its Components to Freshwater Algae,
W76-09321 5C

TORONTO UNIV. (ONTARIO). DEPT. OF ZOOLOGY AND ERINDALE COLL. (ONTARIO).
Glycerophosphatide Content and Composition of Trout (Salvelinus Fontinalis M.) Brain,
W76-08929 5C

TORONTO UNIV. (ONTARIO). INST. FOR ENVIRONMENTAL STUDIES AND ENGINEERING.
The Effect of Dursban Upon Fresh Water Phytoplankton,
W76-08773 5C

TOSHIBA MACHINE CO., TOKYO (JAPAN). INDUSTRIAL APPARATUS ENGINEERING DEPT.
Quality Control in Sewage Treatment Plant (Gesuishorijo no shishutsu seigyo),
W76-09205 5D

Recent Trends of Process Control for Water Works and Drainage (Jogesuido purosesu seigyo no doko),
W76-09214 5G

Computer Control of Sewage and Rain Water Pumps at Sewage Treatment Plant (Gesuishorijo no osui, amamizu ponpu no keisanki seigyo),
W76-09215 8C

TOULOUSE-3 UNIV. (FRANCE). LAB. OF BOTANY AND BIOGEOGRAPHY.
Vegetation and Landslides, (In French),
W76-09101 4C

TOULOUSE-3 UNIV. (FRANCE). LABORATOIRE D'HYDROBIOLOGIE.
The Sediments of High Mountain Lake: Structure: Nature and Populations, (In French),
W76-09347 2J

TSUISHIN JR. COLL. OF AGRICULTURE, AICHI (JAPAN).
Effects of Lime, Phosphate and Soil Conditioner on Growth and Fruit Quality of Netted Melon, (In Japanese),
W76-08989 3C

UNITED STATES LAKE SURVEY, DETROIT, MICH.
Flood Plain Information: Middle River Rouge, Northville, Michigan.
W76-08820 4A

UNIVERSIDAD DE NORTE, ANTOFAGASTA (CHILE). SEDE ANATOGAGASTA.
Periodicity in the Biometric Variations of Loxechinus Albus Molina, (In Spanish),
W76-09089 2I

UNIVERSIDAD DE ORIENTE, CUMANA (VENEZUELA). INST. OF OCEANOGRAPHY.
Environmental Conditions and Productivity in the Terminos Lagoon, Campeche, Mexico, (In Spanish),
W76-08900 2L

Notes on the Importance of Dissolved and Particulate Organic Matter in Marine Food Chains, (In Spanish),
W76-08916 5C

UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO CITY. INSTITUTO DE BIOLOGIA.
Comparison of Two Methods for Determination of Primary Productivity on Coastal Waters of the Gulf of Mexico, (In Spanish),
W76-09391 5A

UNIVERSITY COLL., CARDIFF (WALES). DEPT. OF MICROBIOLOGY.
The Nature of Activated Sludge Flocs,
W76-09188 5D

UNIVERSITY COLL., DUBLIN (IRELAND). DEPT. OF ZOOLOGY.
A Light Weight Corer for Sampling Soft Subaqueous Deposits,
W76-09266 2J

UNIVERSITY COLL. OF SCIENCE, CALCUTTA (INDIA); AND UNIVERSITY COLL. OF TECHNOLOGY, CALCUTTA (INDIA).
Sewage Treatment with Activated Fly-Ash and Regenerated Alum Sludge,
W76-09183 5D

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG (SOUTH AFRICA). DEPT. OF APPLIED MATHEMATICS.
On the Components of Time Series; The Removal of Spatial Dependence,
W76-08803 2B

UTAH STATE UNIV., LOGAN. DEPT. OF SOIL CHEMISTRY.
Effect of Drilling Fluid Components Mixtures on Plants and Soils,
W76-08897 5C

UTAH STATE UNIV. LOGAN. ENGINEERING EXPERIMENT STATION.
Structural Performance of Buried Plastic Drain Tubing,
W76-08771 8G

VERMONT UNIV., BURLINGTON. DEPT. OF PLANT AND SOIL SCIENCE.
Nutrient Mass Balance in Columns Representing Fill Systems for Disposal of Septic Tank Effluents,
W76-09164 5

VETERINARY RESEARCH LABS., BELFAST (NORTHERN IRELAND).
An Investigation of Antibiotic and Dr Residues in Fish,
W76-09124 5

VIRGINIA POLYTECHNIC INST. AND STATE UNIV. BLACKSBURG.
Behavioral Impairment Produced by Exposu to Subclinical Amounts of Methylmercu Chloride,
W76-09037 5

VIRGINIA POLYTECHNIC INST., AND STATE UNIV., BLACKSBURG. CENTER FOR ENVIRONMENTAL STUDIES.
Temperature Influence on Chemical Toxicity Aquatic Organisms,
W76-08934 5

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF AEROSPAC AND OCEAN ENGINEERING.
Penetration and Mixing of Heated Discharg into Waterways,
W76-08926 5

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF AGRICULTURAL ECONOMICS.
User Charges for Inland Waterways: A Revie of Issues in Policy and Economic Impact,
W76-08847 6

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF CIVIL ENGINEERING.
Design Procedure for a Contact Stabilizati Activated Sludge Process,
W76-09211 5

VIRGINIA POLYTECHNIC INST., BLACKSBURG. DEPT. OF PHYSICS.
Water Pollution Monitoring Using Match Spatial Filters,
W76-09194 5

VIRGINIA SUPPLY AND WELL CO., ATLANTA, GA.
How to Get Good Samples by Rotary Drilling
W76-09363 8

VOLKERT (DAVID) AND ASSOCIATES, BETHESDA, MD.
Monograph of the Effectiveness and Cost Water Treatment Processes for Removal Specific Contaminants. Vol. 1. Techni Manual,
W76-09227 5

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT PRUDOVOG RYBNOGO KHOZIAISTVA, RYBNOE (USSR).
Physiological Evaluation of the Nutritio Value of Artificial Fish Feeds, (In Russian),
W76-09090 5

WAKAYAMA PREFECTURAL INST. OF PUBLIC HEALTH (JAPAN).
Interaction Between Surfactant and Dye I Application of the Acridine Orange Method the Survey of Pollution of Alkylbenzene S fonate in Rivers and the Survey of Water Pol tion in Kinokawa,
W76-09364 5

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
A Theory of Flow Resistance for Vegetated Channels,
W76-09252 4A

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF FORESTRY AND RANGE MANAGEMENT.
Recreation Use Patterns and User Attitudes on the Snake River,
W76-08751 6B

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
The Effects of Waste Water Diversion on Heavy Metal Levels in the Sediments of a Large Urban Lake,
W76-08754 5B

WASHINGTON UNIV., SEATTLE. SCHOOL OF LAW.
Water Diversion and the Moratorium,
W76-09234 4A

WASHINGTON UNIV., ST. LOUIS, MO. CENTER FOR THE BIOLOGY OF NATURAL SYSTEMS.
A Simulation Model of Biophysiochemical Transformations of Nitrogen in tile-Drained Corn Belt Soil,
W76-08761 5B

WATER POLLUTION CONTROL NATIONAL RESEARCH CENTER, CAIRO (EGYPT).
Conditioning Improves Sludge Filterability,
W76-09181 5D

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
Review of Advanced Treatment Techniques for Waste Water,
W76-09159 5D

The Use of Oxygen in the Treatment of Waste Water,
W76-09167 5D

Microbiology and Activated Sludge,
W76-09172 5D

WATERLOO UNIV. (ONTARIO). DEPT. OF EARTH SCIENCES.
Hydraulic Properties of a Porous Medium: Measurement and Empirical Representation,
W76-09255 2G

WAYNE STATE UNIV., DETROIT, MICH. DEPT. OF CIVIL ENGINEERING.
Alum Sludge from Water Plant Conditions Sewage Sludge,
W76-09163 5F

WEST VIRGINIA UNIV., MORGANTOWN. WATER RESEARCH INST.
Physiological Effects of Sublethal Levels of Acid Water on Fish,
W76-08927 5C

WESTERN AUSTRALIA DEPT. OF AGRICULTURE, SOUTH PERTH. SOILS DIV.
Plant Collection for Saltland Revegetation and Soil Conservation,
W76-09071 2I

WESTERN AUSTRALIA DEPT. OF FISHERIES AND FAUNA, PERTH.
Wilson Inlet: A Seasonally Closed Western Australian South Coast Estuary,
W76-09390 2L

WESTON (ROY F.), INC., WEST CHESTER, PA.
Evaluating Rotating Biological Contactor Performance,
W76-09173 5D

WILSON MUD SERVICE, LTD., EDMONTON (ALBERTA).
Treatment and Disposal of Waste Fluids from Onshore Drilling Sites,
W76-08910 5D

WISCONSIN UNIV., MADISON.
A Comparison of Aerial Infra-Red and In-Situ Thermal Plume Measurement Techniques,
W76-08860 5A

WISCONSIN UNIV. MADISON, DEPT. OF BACTERIOLOGY.
Predicting the Ecological Consequences of Thermal Pollution from Observations on Geothermal Habitats,
W76-08883 5C

WISCONSIN UNIV., MADISON. DEPT. OF SOIL SCIENCE.
Variability of Hydraulic Conductivity in Two Subsurface Horizons of Two Silt Loam Soils,
W76-09257 2G

WISCONSIN UNIV., MADISON. WATER CHEMISTRY PROGRAM.
Phosphorus Availability in Particulate Materials Transported by Urban Runoff,
W76-08804 5B

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Identification of Nitrogen as a Growth-Limiting Nutrient in Wastewaters and Coastal Marine Waters Through Continuous Culture Algal Assays,
W76-09195 5A

WYOMING UNIV., LARAMIE.
Oversnow Runoff Events Affect Streamflow and Water Quality,
W76-09274 2C

WYOMING UNIV., LARAMIE. DEPT. OF AGRICULTURAL ENGINEERING.
Intercontinental Comparison of Evaporation Estimates,
W76-08800 2D

YANO GIKEN CO., LTD. OSAKA (JAPAN). (ASSIGNEE).
Method and Device for Attaching Shut-Off Control Valve to Distributing Water Pipe Such as Service Pipe Without Stopping Passage of Water Therethrough,
W76-09050 3F

YOKOSUKA WATERWORKS BUREAU (JAPAN).
Instrumentation and Control for Water Works (Suidosetsubi no keisoku to seigyo),
W76-09024 5F

YORK UNIV., DOWNSVIEW (ONTARIO). DEPT. OF GEOGRAPHY.
The Effect of Road Deicing Salts on Sodium Concentration in an Urban Water Course,
W76-09218 5B

ZAPOROZHSKII GOSUDARSTVENNYI MEDITSINSKII INSTITUT (USSR).
Problem of Blood-Sucking Flies in the Zones Affected by Big Water Reservoirs in the Ukrainian SSR, (In Russian),
W76-08991 5G

LIBRARY U. OF I. URBANA-CHAMPAIGN

ACCESSION NUMBER INDEX

W76-08751 6B
W76-08752 5B
W76-08753 5C
W76-08754 5B
W76-08755 6F
W76-08756 3F
W76-08757 2I
W76-08758 3F
W76-08759 2C
W76-08760 3C
W76-08761 5B
W76-08762 2G
W76-08763 3C
W76-08764 3C
W76-08765 3F
W76-08766 3F
W76-08767 5A
W76-08768 5C
W76-08769 2G
W76-08770 3F
W76-08771 8G
W76-08772 5C
W76-08773 5C
W76-08774 5C
W76-08775 5C
W76-08776 5C
W76-08777 5C
W76-08778 5C
W76-08779 5C
W76-08780 5C
W76-08781 5C
W76-08782 5C
W76-08783 5C
W76-08784 2L
W76-08785 5C
W76-08786 5C
W76-08787 5C
W76-08788 5C
W76-08789 4A
W76-08790 5C
W76-08791 5C
W76-08792 5C
W76-08793 5A
W76-08794 5C
W76-08795 5C
W76-08796 5C
W76-08797 5A
W76-08798 5C
W76-08799 5C
W76-08800 2D
W76-08801 2H
W76-08802 2G
W76-08803 2B
W76-08804 5B
W76-08805 4D
W76-08806 4A
W76-08807 4A
W76-08808 4A
W76-08809 4A
W76-08810 4A
W76-08811 4A
W76-08812 4A
W76-08813 4A
W76-08814 4A
W76-08815 4A
W76-08816 4A
W76-08817 4A
W76-08818 4A
W76-08819 4A
W76-08820 4A
W76-08821 4A
W76-08822 4A
W76-08823 5C
W76-08824 5C
W76-08825 5C
W76-08826 5C
W76-08827 5C
W76-08828 5C
W76-08829 2L
W76-08830 5C
W76-08831 4A
W76-08832 2I
W76-08833 5C
W76-08834 5C
W76-08835 5C
W76-08836 5C
W76-08837 5C
W76-08838 5A
W76-08839 5G
W76-08840 5D
W76-08841 3F
W76-08842 5D
W76-08843 5B
W76-08844 2G
W76-08845 5D
W76-08846 6F
W76-08847 4A
W76-08848 5C
W76-08849 5G
W76-08850 6G
W76-08851 5B
W76-08852 5B
W76-08853 5B
W76-08854 5G
W76-08855 5G
W76-08856 5C
W76-08857 5B
W76-08858 5B
W76-08859 5B
W76-08860 5A
W76-08861 5B
W76-08862 5G
W76-08863 5B
W76-08864 5A
W76-08865 5G
W76-08866 5B
W76-08867 5B
W76-08868 5B
W76-08869 5G
W76-08870 5C
W76-08871 5C
W76-08872 5C
W76-08873 5C
W76-08874 5C
W76-08875 5C
W76-08876 5C
W76-08877 5C
W76-08878 5C
W76-08879 5C
W76-08880 5C
W76-08881 5C
W76-08882 5C
W76-08883 5C
W76-08884 5C
W76-08885 5G
W76-08886 5G
W76-08887 5G
W76-08888 5C
W76-08889 5G
W76-08890 8B
W76-08891 8B
W76-08892 8G
W76-08893 8G
W76-08894 8G
W76-08895 5C
W76-08896 5C
W76-08897 5C
W76-08898 2L
W76-08899 5A
W76-08900 2L
W76-08901 8G
W76-08902 5B
W76-08903 8G
W76-08904 5B
W76-08905 5B
W76-08906 5C
W76-08907 5C
W76-08908 5A
W76-08909 5G
W76-08910 5D
W76-08911 5D
W76-08912 5D
W76-08913 8G
W76-08914 5D
W76-08915 5D
W76-08916 5C
W76-08917 5G
W76-08918 5G
W76-08919 5E
W76-08920 2H
W76-08921 4A
W76-08922 2F
W76-08924 4C
W76-08925 3F
W76-08926 5B
W76-08927 5C
W76-08928 5C
W76-08929 5C
W76-08930 5C
W76-08931 5C
W76-08932 5C
W76-08933 5C
W76-08934 5C
W76-08935 5C
W76-08936 5C
W76-08937 5C
W76-08938 5C
W76-08939 5C
W76-08940 5C
W76-08941 5C
W76-08942 5C
W76-08943 5C
W76-08944 5C
W76-08945 5C
W76-08946 5C
W76-08947 5C
W76-08948 5C
W76-08949 5C
W76-08950 5C
W76-08951 5C
W76-08952 5C
W76-08953 5C
W76-08954 5C
W76-08955 5C
W76-08956 5C
W76-08957 5C
W76-08958 5C
W76-08959 5C
W76-08960 5C
W76-08961 5C
W76-08962 8B
W76-08963 5D
W76-08964 8G
W76-08965 8F
W76-08966 8G
W76-08967 8B
W76-08968 8G
W76-08969 8C
W76-08970 8F
W76-08971 5D
W76-08972 5D
W76-08973 8C
W76-08974 3F
W76-08975 5D
W76-08976 5D
W76-08977 5D
W76-08978 5D
W76-08979 5D
W76-08980 5D
W76-08981 2G
W76-08982 5D
W76-08983 5D
W76-08984 5D
W76-08985 5D
W76-08986 3F
W76-08987 3F
W76-08988 5E
W76-08989 3C
W76-08990 5D
W76-08991 5G
W76-08992 5D
W76-08993 5D
W76-08994 5D
W76-08995 5D
W76-08996 8G
W76-08997 5F
W76-08998 5D
W76-08999 5D
W76-09000 5D
W76-09001 5D
W76-09002 5A
W76-09003 5F
W76-09004 5D
W76-09005 5D
W76-09006 5D
W76-09007 5D
W76-09008 5F
W76-09009 5D
W76-09010 5D
W76-09011 5D
W76-09012 5D
W76-09013 5D
W76-09014 8G
W76-09015 5D
W76-09016 5D
W76-09017 5D
W76-09018 5D
W76-09019 5D
W76-09020 5D
W76-09021 5D
W76-09022 5D
W76-09023 5D
W76-09024 5F
W76-09025 5D
W76-09026 5D
W76-09027 5D
W76-09028 5D
W76-09029 5D
W76-09030 5D
W76-09031 5D
W76-09032 8G
W76-09033 4A
W76-09034 3E
W76-09035 6G
W76-09036 5A
W76-09037 5C
W76-09038 5C
W76-09039 5A
W76-09040 5A
W76-09041 5A
W76-09042 5A
W76-09043 5A
W76-09044 5D
W76-09045 5D
W76-09046 5D
W76-09047 5D
W76-09048 5G
W76-09049 3F
W76-09050 3F
W76-09051 7B
W76-09052 3A
W76-09053 5D
W76-09054 5D
W76-09055 5D
W76-09056 5D
W76-09057 5G
W76-09058 5D
W76-09059 5D
W76-09060 5F
W76-09061 5D
W76-09062 2B
W76-09063 3F

LIBRARY U. OF I. URBANA-CHAMPAIGN

W76-09064	2A	W76-09143	5B	W76-09222	5A	W76-09301	5D
W76-09065	3E	W76-09144	7C	W76-09223	5D	W76-09302	5E
W76-09066	2B	W76-09145	7C	W76-09224	5B	W76-09303	5E
W76-09067	2B	W76-09146	5A	W76-09225	5A	W76-09304	5G
W76-09068	2F	W76-09147	7C	W76-09226	5C	W76-09305	2E
W76-09069	4C	W76-09148	4B	W76-09227	5F	W76-09306	6G
W76-09070	4C	W76-09149	4A	W76-09228	4C	W76-09307	6G
W76-09071	2I	W76-09150	4B	W76-09229	5G	W76-09308	5G
W76-09072	4B	W76-09151	5E	W76-09230	6B	W76-09309	5E
W76-09073	2J	W76-09152	5D	W76-09231	3E	W76-09310	5G
W76-09074	2I	W76-09153	5D	W76-09232	5B	W76-09311	8A
W76-09075	3C	W76-09154	5D	W76-09233	8I	W76-09312	5B
W76-09076	4A	W76-09155	5F	W76-09234	4A	W76-09313	5B
W76-09077	2K	W76-09156	5D	W76-09235	6E	W76-09314	5B
W76-09078	5C	W76-09157	5D	W76-09236	3F	W76-09315	5C
W76-09079	2I	W76-09158	5D	W76-09237	6D	W76-09316	5C
W76-09080	2I	W76-09159	5D	W76-09238	2L	W76-09317	5C
W76-09081	2G	W76-09160	8C	W76-09239	2L	W76-09318	5C
W76-09082	2G	W76-09161	5D	W76-09240	2L	W76-09319	5C
W76-09083	2I	W76-09162	5D	W76-09241	2L	W76-09320	5C
W76-09084	2L	W76-09163	5F	W76-09242	2L	W76-09321	5C
W76-09085	2I	W76-09164	5E	W76-09243	2J	W76-09322	5C
W76-09086	2H	W76-09165	5D	W76-09244	2H	W76-09323	5C
W76-09087	2I	W76-09166	5D	W76-09245	2F	W76-09324	5C
W76-09088	2I	W76-09167	5D	W76-09246	2A	W76-09325	5C
W76-09089	2I	W76-09168	5D	W76-09247	4D	W76-09326	5C
W76-09090	2I	W76-09169	5D	W76-09248	3F	W76-09327	5C
W76-09091	2I	W76-09170	5D	W76-09249	2F	W76-09328	5C
W76-09092	2I	W76-09171	5D	W76-09250	8B	W76-09329	5G
W76-09093	5C	W76-09172	5D	W76-09251	2G	W76-09330	5G
W76-09094	2H	W76-09173	5D	W76-09252	4A	W76-09331	5G
W76-09095	2I	W76-09174	5D	W76-09253	5B	W76-09332	5G
W76-09096	4C	W76-09175	5D	W76-09254	2E	W76-09333	5G
W76-09097	2I	W76-09176	5D	W76-09255	2G	W76-09334	5G
W76-09098	4A	W76-09177	5D	W76-09256	2G	W76-09335	5G
W76-09099	2H	W76-09178	5D	W76-09257	2G	W76-09336	5G
W76-09100	2I	W76-09179	5D	W76-09258	2G	W76-09337	3E
W76-09101	4C	W76-09180	5D	W76-09259	2G	W76-09338	5C
W76-09102	2I	W76-09181	5D	W76-09260	4B	W76-09339	5A
W76-09103	5C	W76-09182	5D	W76-09261	5B	W76-09340	5D
W76-09104	5C	W76-09183	5D	W76-09262	5B	W76-09341	5D
W76-09105	5C	W76-09184	5D	W76-09263	5C	W76-09342	3E
W76-09106	7B	W76-09185	5A	W76-09264	2L	W76-09343	4B
W76-09107	5C	W76-09186	5A	W76-09265	8B	W76-09344	5G
W76-09108	5G	W76-09187	5A	W76-09266	2J	W76-09345	8C
W76-09109	5C	W76-09188	5D	W76-09267	4C	W76-09346	5G
W76-09110	5C	W76-09189	5A	W76-09268	7B	W76-09347	2J
W76-09111	5C	W76-09190	5A	W76-09269	2B	W76-09348	4B
W76-09112	5C	W76-09191	5A	W76-09270	2L	W76-09349	5A
W76-09113	5C	W76-09192	5A	W76-09271	2G	W76-09350	2L
W76-09114	5C	W76-09193	7B	W76-09272	5B	W76-09351	8C
W76-09115	5C	W76-09194	5A	W76-09273	5G	W76-09352	3F
W76-09116	5A	W76-09195	5A	W76-09274	2C	W76-09353	2F
W76-09117	4C	W76-09196	5A	W76-09275	5B	W76-09354	4B
W76-09118	5C	W76-09197	5A	W76-09276	5C	W76-09355	8C
W76-09119	5C	W76-09198	5A	W76-09277	5A	W76-09356	5F
W76-09120	5C	W76-09199	5A	W76-09278	5D	W76-09357	5G
W76-09121	5A	W76-09200	5A	W76-09279	5D	W76-09358	2H
W76-09122	5C	W76-09201	5A	W76-09280	5B	W76-09359	8G
W76-09123	5C	W76-09202	5A	W76-09281	5A	W76-09360	5B
W76-09124	5C	W76-09203	5A	W76-09282	5C	W76-09361	2H
W76-09125	2L	W76-09204	5F	W76-09283	5B	W76-09362	7C
W76-09126	5C	W76-09205	5D	W76-09284	5D	W76-09363	8G
W76-09127	5A	W76-09206	5F	W76-09285	5D	W76-09364	5A
W76-09128	5C	W76-09207	5G	W76-09286	5D	W76-09365	5D
W76-09129	2J	W76-09208	8C	W76-09287	5A	W76-09366	5D
W76-09130	5A	W76-09209	5A	W76-09288	5B	W76-09367	5E
W76-09131	7C	W76-09210	5D	W76-09289	5D	W76-09368	2B
W76-09132	7C	W76-09211	5D	W76-09290	5D	W76-09369	5C
W76-09133	4A	W76-09212	5G	W76-09291	8A	W76-09370	5A
W76-09134	5B	W76-09213	5G	W76-09292	5D	W76-09371	5G
W76-09135	7C	W76-09214	5G	W76-09293	5A	W76-09372	5G
W76-09136	2J	W76-09215	8C	W76-09294	5C	W76-09373	5G
W76-09137	5B	W76-09216	5B	W76-09295	5C	W76-09374	5G
W76-09138	4A	W76-09217	5C	W76-09296	5A	W76-09375	5G
W76-09139	4B	W76-09218	5B	W76-09297	5D	W76-09376	5G
W76-09140	7C	W76-09219	5D	W76-09298	5D	W76-09377	5G
W76-09141	7C	W76-09220	5C	W76-09299	5G	W76-09378	5G
W76-09142	5G	W76-09221	5A	W76-09300	5C	W76-09379	5G

6-09380 5G
6-09381 5G
6-09382 5G
6-09383 5G
6-09384 5B
6-09385 5G
6-09386 5G
6-09387 5G
6-09388 5G
6-09389 5B
6-09390 2L
6-09391 5A
6-09392 2H
6-09393 5B
6-09394 5B
6-09395 2K
6-09396 7B
6-09397 7B
6-09398 5G
6-09399 5C
6-09400 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

ABSTRACT SOURCES

CE	ACCESSION NUMBER	TOTAL
CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W76-08756 08760--08761 08763--08767 08770--08771 09369--09370	12
RDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W76-08848--08863 08865--08888 08928--08961	74
ranklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W76-08962--08973 08975--08980 08982--08985 08988, 08990 08992--09032 09044--09045 09151--09192 09194--09223 09364--09367	143
llinois State Water Survey, Hydrology	W76-08800--08805 09238--09271 09368	41
nstitute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W76-09272--09282 09284--09304 09306--09311 09337--09342	44
ational Water Well Association, Water Well Construction Technology	W76-08889--08897 08899 08901--08915 08917--08919 09343--09346 09348--09357 09359--09360 09362--09363	46
niversity of Arizona, Arid Land Water Resources	W76-09062--09075	14
niversity of North Carolina, Metropolitan Water Resources Planning and Management	W76-08806--08822 09033--09035	20
niversity of Wisconsin, Eutrophication	W76-08823--08831 08833--08838 09224--09227	19

LIBRARY U. OF I. URBANA-CHAMP.

SOURCE	ACCESSION NUMBER	TOTA
A. CENTERS OF COMPETENCE (CONTINUED)		
University of Wisconsin, Water Resources Economics	W76-08839 09228--09237	
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W76-08751--08755 08840--08847 08920--08927	
C. OTHER		
BioSciences Information Service	W76-08757--08759 08762 08768--08769 08777, 08784 08832, 08864 08898, 08900 08916, 08974 08981 08986--08987 08989, 08991 09076--09102 09193, 09283 09305, 09347 09358, 09361 09389--09400	
Biological Consultant and Information Services (Effects of Pollutants on Aquatic Life)	W76-08772--08776 08778--08783 08785--08799 09103--09128	
Ocean Engineering Information Service (Patents)	W76-09046--09061	
Ocean Engineering Information Service (Outer Continental Shelf)	W76-09312--09336 09371--09388	
U. S. Geological Survey	W76-09131--09150	
Vanderbilt University, Metals Pollution	W76-09036--09043 09129--09130	

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976-210-951/29

LIBRARY U. OF I. URBANA-CHAMPAIGN

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

LIBRARY U. OF I. URBANA-CHAMPAIGN

Subject Fields

- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
- 6 WATER RESOURCES PLANNING
- 7 RESOURCES DATA
- 8 ENGINEERING WORKS
- 9 MANPOWER, GRANTS, AND FACILITIES
- 10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

OFFICIAL BUSINESS

PRINTED MATTER

U.S. MAIL

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE

AN EQUAL OPPORTUNITY EMPLOYER

John Littlewood
Documents Division
220 D Library
Champaign, Ill 61820

16.33391
Se48

SELECTED WATER RESOURCES ABSTRACTS

The Library of the
OCT 4 1976
University of Illinois
at Urbana-Champaign

VOLUME 9, NUMBER 18
SEPTEMBER 15, 1976

W76-09401 -- W76-10000
CODEN: SWRABW

LIBRARY U. OF I. URBANA-CHAMP.

SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

SELECTED WATER RESOURCES ABSTRACTS (SWRA) is available to Federal agencies and their contractors or grantees in water resources research upon request, citing contract or grant number and sponsoring agency. Write: Manager, Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior, Washington, DC 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from NTIS, 5285 Port Royal Road, Springfield, VA 22161. Annual subscription rates are: SWRA Journal only, $75 ($95 foreign); Journal and Annual Indexes, $100 ($125 foreign); Indexes only, $50 ($65 foreign).

Some documents abstracted in this journal can be purchased from NTIS at prices shown in the entry; prices subject to change. Other documents are available from originating organizations or authors as indicated in the citation.

SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

LIBRARY U. OF I. UNIVERSITY ARCHIVES

VOLUME 9, NUMBER 18
SEPTEMBER 15, 1976

W76-09401 -- W76-10000

Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the action of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

LIBRARY U. OF I. URBANA-CHAMPAIGN

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

WATERSHED RESPONSE TO PARTIAL AREA APPLICATIONS OF SIMULATED RAINFALL,
Northeastern Forest Experiment Station, Pennington, N. J.
E. S. Corbett, W. E. Sopper, and J. A. Lynch.
In: Proceedings International Symposium on Hydrological Characteristics of River Basins, Tokyo, Japan, Dec. 1-8, 1975, IAHS-AISH Publication No. 117, 1975, p. 63-73.

Descriptors: *Rainfall-runoff relationships, *Subsurface stormflow, *Interflow, *Hydrograph analysis, *Flow characteristics, *Simulated rainfall, Streamflow, Hydrology, Storm runoff, Base flow, Hydrographs, Experimental watersheds, Peak runoff, Recession curves, Sprinkler irrigation, Field capacity, Irrigation systems, Watersheds(Basins).
Identifiers: Partial area hydrology, Watershed response, Hydrologic behavior, Stormflow duration, Quickflow, Delayed flow, Stream channel, Lower slopes, Upper slopes, Hydrograph characteristics, Hydrograph components.

To investigate the hydrologic behavior and response of a small forested drainage basin, an irrigation system was designed to apply a uniform amount of simulated rainfall to parts or all of a 7.9-hectare watershed. Partial area analyses indicated that the source of stormflow during the rising limb of a storm hydrograph was dynamic, originating initially from the channel area and extending upslope as saturated soil conditions extended upslope. The duration of peakflow and the rate of decline of the recession limb up to the time that quickflow ended was controlled by the upper slope of the watershed. Quickflow accounted for most of the runoff regardless of the area of application; the channel and lower slope produced somewhat more than the upper slope and ridgetop. When watershed soils were at or near field capacity, 74% of a 48.8 mm simulated rainstorm (6.1 mm/hr) applied to the total watershed was discharged as quickflow. When the storms of the same size were applied to the ridge and upper slope, channel and lower slope, and channel areas only, 39%, 61%, and 52% of the applied rainfall was converted into quickflow. (Forest Service)
W76-09467

HYDROLOGIC SYSTEMS ANALYSIS MODEL FOR GENERATING RUNOFF TIME SERIES (HIDROLOGIAI) RENDSZERVIZSGALATI MODELL VIZHOZAMIDOSER ELOALLITASARA (II. RESZ),
BME Institute for Water Resources and Hydraulics, Budapest (Hungary).
I. Kontur.
Hidrologiai Kozlony, Vol. 56, No. 1, p 17-20, January, 1976. 4 ref.

Descriptors: *Runoff, *Hydrographs, *Model studies, Groundwater, Mathematical models, Infiltration, Evaporation, *Systems analysis.

Assuming that the catchment's runoff times are exponentially distributed, a flood wave is obtained which follows the gamma function. For its practical determination, two isochronous maps of the catchment must be prepared by assuming normal velocity for one and, for the other, the probable highest velocity. This method, which uses a probablistic model, is less sensitive to erroneous velocity estimates than one based on conventional catchment characteristics. The velocity distribution function's shape is also obtained as a by-product. The construction can be simplified further by assuming a constant ratio of the shortest to the normal runoff times. A model also considering infiltration and evaporation regards both underground and surface runoff as stochastic processes; as a result, the seepage velocity is also a random variable. Infiltration evaporation, and further precipitation flow are described by a random walk model. The model permits ready allowance for the reduced unit flood yield when the catchment area increases. The normal and maximum seepage velocities are parameters of the underground system. No spatial variation was assumed. The underground runoff hydrograph also assumes a gamma distribution shape. The model has been applied to determine a nonuniform slope section's runoff hydrograph. The model parameters were checked by analyzing the relationship of the stochastic model to the linear system. The combined approach to studying underground and surface runoff considers the hydrological processes' physical foundations more thoroughly than earlier models, and considers the water particles' potential paths using a random-walk formulation instead of using the hydrological processes. (Snyder-FIRL)
W76-09557

DISAGGREGATION MODELS IN HYDROLOGY REVISITED,
Ecole Polytechnique de Montreal (Quebec).
J. M. Mejia, and J. Rousselle.
Water Resources Research, Vol. 12, No. 2, p 185-186, April 1976. 5 ref.

Descriptors: *Synthetic hydrology, *Time series analysis, *Statistical models, Hydrology, Analytical techniques, Correlation analysis, Seasonal, Hydrologic data, Flow, *Model studies.
Identifiers: *Disaggregation models, Seasonal values, Model modification.

The synthesis of hydrologic sequences has been advanced as a useful tool in water resource systems. Valencia and Schaake developed a methodology for the disaggregation of synthesized yearly flow sequences in such a way that the statistics at different time resolutions were preserved. Though the data inside a given year preserve the statistics for all levels of aggregation, they are linked with the past only through the statistics at the yearly level. To overcome this shortcoming, a modification in the methodology was proposed and tested on 24 years of hydrologic information for two stations located in the watershed of the North River. The results supported the theory behind the modified model. (Singh-ISWS)
W76-09573

THE CONCENTRATION OF DISSOLVED SOLIDS AND RIVER FLOW,
Manhattan Coll., Bronx, N. Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09577

SENSITIVITY OF LINEAR AND NONLINEAR SURFACE RUNOFF MODELS TO INPUT ERRORS,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh, and D. A. Woolhiser.
Journal of Hydrology, Vol. 29, No. 3/4, p 243-249, April 1976. 2 fig, 1 tab, 11 ref.

Descriptors: *Model studies, *Hydrologic data, *Precipitation excess, Hydrology, Storage, Peak discharge, Hydrographs, Rainfall-runoff relationships, Data collections, Surface runoff.
Identifiers: *Linear models, *Non-linear models, *Input errors.

The relationship between errors in runoff peak predictions by linear and nonlinear surface runoff models and errors in input intensity were examined. Usually the input into surface runoff models is the rainfall excess rate which may be incorrect because of sampling errors, because of spatial non-uniformity of the rainfall and the small number of sampling points, or because of bias in the amount of rain caught by the gages. It was shown that if input intensity errors are sufficiently large, a linear model optimally identified according to a least-squares criterion may perform better than a nonlinear model even though the system is truly nonlinear. (Lardner-ISWS)
W76-09578

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGED-SIZED CATCHMENT AREA, I. CONCEPTS AND RELATIONSHIPS,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
F. Bultot, and G. L. Dupriez.
Journal of Hydrology, Vol. 29, No. 3/4, p 251-272, April 1976. 5 fig, 6 ref.

Descriptors: *Hydrologic systems, *Mathematical models, Europe, *Watersheds(Basins), Rainfall-runoff relationships, Water yield, Infiltration, Runoff, Hydrology, Subsurface runoff, Water balance, *Model studies.
Identifiers: *Conceptual models.

The model enables the calculation, in daily values, of water transfers (interception by vegetation, evapotranspiration, surface runoff, infiltration, percolation, etc.) of the state of the different phases of the water cycle (water accumulated in the snow cover, in the vegetative cover, on the surface, in the zone of aeration, and in the zone of saturation of the soil, etc.) and of the flow at the outlet of the area (surface runoff, interflow and base flow). The aim of this model is to establish a detailed water balance of a catchment area, to follow its daily evolution, and to understand the factors that determine its nature. This work sets out the concepts and justifies the mathematical functions and relationships used. (See also W76-09580) (Lee-ISWS)
W76-09579

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGE-SIZED CATCHMENT AREA, II. ESTIMATE OF PARAMETERS, VALIDITY OF MODEL, APPLICATION,
Institut Royal Meteorologique de Belgique (Brussels). Hydrology Section.
F. Bultot, and G. L. Dupriez.
Journal of Hydrology, Vol. 29, No. 3/4, p 273-292, April 1976. 6 fig, 4 tab, 2 ref.

Descriptors: *Hydrologic systems, *Mathematical models, *Watersheds(Basins), Europe, Rainfall-runoff relationships, Water yield, Infiltration, Runoff, Hydrology, *Model studies, Water balance.
Identifiers: *Validity of model, Parameter estimation, Conceptual model.

Methods used to determine parameters were described, the validity of the model was tested, and some of its applications were presented. The validity of the model was tested against data for the period 1966-1972, which was used for determining the parameters, and also against data for the year 1962. The results presented referred to: (1) The functioning of the model. Two figures relating to two periods chosen as examples show the simultaneous daily evolution of different variables and emphasize the complex interactions between water transfers and the daily state of the different phases of the water cycle. (2) Forecast. One figure supplied gives a comparative survey of the flows calculated and observed at the outlet of the catchment area during 1962 (a year that was not taken into account in determining the parameters). (3) The water balance of the catchment area. One table groups the values of the different terms of the water balance that can be estimated by using the model, and particularly in important intermediate terms such as recharge and the state of the groundwater. Only the monthly values are shown

LIBRARY U. OF I. Urbana-Champaign

in the table, whose primary purpose was to show the detailed character of the water balance which may be established by means of this model. (See also W76-09579) (Lee-ISWS)
W76-09580

DESIGN OF WATER RESOURCES PROJECT WITH INADEQUATE DATA IN INDIA - GENERAL AND PARTICULAR CASE STUDIES,
International Hydrological Decade, New Delhi (India). Indian National Committee.
For primary bibliographic entry see Field 4A.
W76-09621

HYDROLOGY FOR ENGINEERS, SECOND EDITION,
Stanford Univ., Calif.
For primary bibliographic entry see Field 8B.
W76-09661

A REVIEW AND ANALYSIS OF SELECTED HYDROLOGIC MODELING CONCEPTS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W76-09718

NATIONAL SYMPOSIUM ON URBAN RAINFALL AND RUNOFF AND SEDIMENT CONTROL,
Kentucky Univ. Lexington, Coll. of Engineering.
For primary bibliographic entry see Field 4C.
W76-09729

OVERVIEW OF RAINFALL-RUNOFF PROCESS IN URBAN AREAS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
C. T. Haan.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control: Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 1-13, October 1974. 14 fig, 6 tab, 10 ref.

Descriptors: *Urban runoff, *Precipitation(Atmospheric), *Rainfall-runoff relationships, Hydrologic cycle, Rainfall, Reviews, Streamflow, Hydrographs, Water loss, Infiltration, Hydrologic equation, Channels, Channel flow, Roughness(Hydraulic), Frequency analysis, Flow, Peak discharge, Depth-area-duration analysis, Flood frequency, Design storm, Design data, Hydrology, Urban hydrology.

This paper covered some of the basic principles and terminology associated with urban hydrology. It was primarily intended as background or briefing material for those not already well versed in hydrology. This paper is a primer on urban hydrology which explains some basic hydrologic concepts, commonly used terminology, and currently used methods in urban hydrology. (See also W76-09729) (Sims-ISWS)
W76-09730

RUNOFF FREQUENCY PROCEDURE FOR SYNTHETIC HYDROGRAPH DEVELOPMENT,
Colorado Univ., Denver.
W. C. Hughes.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 41-43, October 1974. 4 fig, 2 ref.

Descriptors: *Rainfall-runoff relationships, *Hydrographs, *Analytical techniques, Runoff, Rainfall, Precipitation(Atmospheric), Design data, Design storm, Frequency curves, Frequency analysis, Precipitation excess, Probability, Hydrology.

A method was proposed for determining the runoff volume, or precipitation excess, of given recurrence interval when only precipitation data is available. In the proposed method the joint probability associated with a given precipitation volume and a given basin runoff coefficient was shown to approximate the exceedance probability associated with the resulting runoff volume, where the basin runoff coefficient and its probability of occurrence are a function of the antecedent precipitation index. The method was tested using data from two basins and was shown to generate runoff volumes of reasonable comparison with the actual runoff frequency curves. (See also W76-09729) (Sims - ISWS)
W76-09733

VERIFICATION OF NUMERICAL MODELS OF LAKE ONTARIO, III. LONGTERM HEAT TRANSPORTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-09783

ROLE OF CARBONATE ROCKS IN MODIFYING FLOOD FLOW BEHAVIOR,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
E. L. White.
Water Resources Bulletin, Vol. 12, No. 2, p 351-370, April 1976. 5 fig, 7 tab, 19 ref, 1 append.

Descriptors: *Carbonate rocks, *Flood flow, *Karst, Drainage effects, Subsurface drainage, Karst hydrology, Runoff, Peak discharge, Watersheds(Basins), Drainage area, Topography, Sinks, Internal water, Limestones, Correlation analysis, Stochastic processes, Groundwater, Flood forecasting.
Identifiers: *Mean annual food, *Multivariate analysis, *Factor analysis, *Cluster analysis, Variance, Binary correlation, Basin parameters.

The interrelationships between the runoff characteristics of watersheds (expressed as the mean annual flood), standard basin parameters (area, drainage properties, and relief), and the parameters which describe the solutional modification of the basins (carbonate rock fractions, sinkhole development, and measures of internal drainage) were used to group 62 carbonate watersheds. Simple binary correlations were obtained by direct plotting of the data. This was followed by multivariate analyses: factor and cluster analyses. Following the cluster analysis, which separated the basins into three groups, the variance within each group was examined again by binary correlations and by factor analysis. Predictions equations for those basins underlain by dolomite rock and for those basins underlain by carbonate rock with very little surface expression were proposed. Basins underlain by karstic limestone had a large amount of variance within the data set; therefore no prediction equation could be obtained. (Visocky - ISWS)
W76-09784

NATIONAL CONFERENCE OF DISTRICT CHIEFS, ALBUQUERQUE, NEW MEXICO, SEPTEMBER 28-OCTOBER 3, 1975--PROCEEDINGS,
Geological Survey, Reston, Va.
Open-file report 76-467, 1976. 133 p. E. B. Chase, editor.

Descriptors: *Conferences, *Water resources development, *Project post-evaluation, *Project planning, *Project purposes, Projections, Water supply, Water demand, Water quality, Water conservation, Hydrologic budget, Natural resources, Land use.
Identifiers: Conference proceedings.

This proceedings volume summarizes a conference held every five years by the U.S. Geological Survey's Water Resources Division. Subjects covered are the role of Water Resources Division District Chiefs as Geological Survey Representative, the state of the Water Resources Division, and plans and programs for the next five years. (Woodard-USGS)
W76-09838

ESTIMATING SELECTED PARAMETERS FOR THE KENTUCKY WATERSHED MODEL FROM WATERSHED CHARACTERISTICS,
Virginia State Water Control Board, Richmond.
W. L. Magette, V. O. Shanholtz, and J. C. Carr.
Water Resources Research, Vol. 12, No. 3, p 472-476, June 1976. 2 fig, 3 tab, 14 ref.

Descriptors: *Watersheds(Basins), *Mathematical models, *Estimating, *Parametric hydrology, Simulation analysis, Streamflow, Drainage, Basins, Regression analysis, Computers, Systems analysis, Optimum development plans, Water supply, Model studies, Forecasting.
Identifiers: Ungaged areas, Multiple regression models, Synthetic flows, *Kentucky watershed model.

Competition among users for a relatively fixed supply of water has focused attention on the need for effective means to plan for the optimum use of this resource. Parametric models, which lend themselves to computer application and attempt to simulate the hydrologic cycle, have become recognized as useful aids to such planning. Herein, multiple linear equations to predict selected parameters for the Kentucky watershed model (KWM) have been presented. The independent variables consist of easily determinable watershed characteristics. The relationship provides a means by which the KWM can be used to predict streamflows from ungaged drainage basins. Examples are given for five test watersheds, yielding variable results. (Bell-Cornell)
W76-09852

PARAMETER OPTIMIZATION FOR WATERSHED MODELS,
New South Wales Univ., Kensington, Australia. School of Civil Engineering.
P. R. Johnston, and D. H. Pilgrim.
Water Resources Research, Vol. 12, No. 3, p 477-486, June 1976. 13 fig, 16 ref.

Descriptors: *Watersheds(Basins), *Mathematical models, *Parametric hydrology, *Optimization, Numerical analysis, Performance, Value, Soil moisture, Drainage, Systems analysis, Model studies.
Identifiers: Algebraic analysis, *Boughton model.

A detailed search for the optimum values of the parameters of the Boughton model is described. The Simplex and Davidon optimization methods were used. Rapid initial reductions in the objective function were readily achieved, but the solutions approached several widely different apparent optima. Alternate use of different optimization methods and numerical and algebraic studies enabled considerable further progress to be made in the search. Much information was obtained on various aspects of parameter optimization. These include interdependence and indifference of parameters, the form of the response surface and the occurrence of discontinuities, the required length of the 'warm-up' period for different types of stores, and the effects of using different types of objective functions. As typical stores were analyzed and the only basic assumption involved was that the data contained errors, the findings should apply to most watershed models. (Bell-Cornell)
W76-09853

YMPOSIUM ON MODELING TECHNIQUES, OLUME I.
nerican Society of Civil Engineers, New York.
oceedings of the 2nd Annual Symposium of the aterways, Harbors and Coastal Engineering vision of ASCE, San Francisco, California, ptember 3-5, 1975. American Society of Civil gineers, New York, 1975. 801 p.

escriptors: *Model studies, *Mathematical odels, *Hydraulic models, Navigation, Harbors, arinas, Waves(Water), Ocean waves, ydrodynamics, Channels, Sedimentation, vers, Inlets(Waterways), Discharge(Water), ts, Mixing, Flow, Streamflow, Estuaries, Tidal fects, Water quality, Environment, Hydraulics.

e objective of this symposium was to provide a rum in which the state-of-the-art of various pes of models could be discussed and to provide nechanism by which not only the relative merits mathematical and physical models could be viewed but also, and more fundamentally, the plicability of models to specific problems could evaluated. The program focused on nearly all pects of modeling as applied to rivers, harbors, eans, and coastal areas. This volume contained e papers from sessions on navigation and port cilities, wave dynamics, environment modeling, ets, discharges, jets, and mixing, mathematical er models, river structures, estuaries, and water ality. (See W76-09942 thru W76-09984) (Sims - WS)
76-09941

. LAWRENCE SEAWAY: A NEW GOAL OF EAR-ROUND NAVIGATION,
RCTEC, Inc., Columbia, Md.
r primary bibliographic entry see Field 2C.
76-09942

ECIFICATIONS FOR CONTAINER FACILI-ES BY SIMULATION,
r primary bibliographic entry see Field 6A.
76-09943

YDROLOGIC FORECASTING FOR THE HIO RIVER WATERWAY,
tional Weather Service, Cincinnati, Ohio. River recast Center.
r primary bibliographic entry see Field 2E.
76-09944

YBRID-ELEMENT METHOD FOR WATER AVES,
ssachusetts Inst. of Tech., Cambridge, Dept. of vil Engineering.
r primary bibliographic entry see Field 8B.
76-09945

RGE WAVE CHANNEL FOR 'FULL SCALE-ODELING' OF WAVE DYNAMICS IN SURF ONES,
chnische Hochschule, Hanover (West Ger-ny). Franzius-Institut fuer Grund und Wasser-u.
r primary bibliographic entry see Field 8B.
76-09946

AVE MOTIONS IN AN OFFSHORE HARBOR,
ssachusetts Inst. of Tech., Cambridge. Dept. of vil Engineering; and Massachusetts Inst. of ch., Cambridge. Ralph M. Parsons Lab. for ter Resources and Hydrodynamics.
r primary bibliographic entry see Field 8B.
76-09947

ODELING OF WIND-WAVES WITH JON-AP SPECTRA,
icago Bridge and Iron Co., Plainfield, Ill. rine Research and Development.
r primary bibliographic entry see Field 8B.
W76-09948

USE OF MATHEMATICAL MODELS IN THE PALO ALTO MARSHLAND REHABILITATION PROJECT,
Water Resources Engineers, Walnut Creek, Calif.
For primary bibliographic entry see Field 8B.
W76-09949

ESTUARINE ECOLOGIC SIMULATIONS,
Water Resources Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 2L.
W76-09950

ORGANIC SEDIMENT MODEL FOR WASTE-WATER OUTFALL,
Tetra Tech, Inc., Lafayette, Calif.
For primary bibliographic entry see Field 5B.
W76-09951

SOME HARD LESSONS IN NUMERICAL HYDRAULICS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W76-09952

SIMULATION OF TIDAL HYDRODYNAMICS - MASONBORO INLET,
Water Resources Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 8B.
W76-09953

RIVER DELTA COMPUTER SIMULATION MODEL (SIMUDELT),
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-09954

ANISOTROPIC SAND TRANSPORT IN TIDAL INLETS,
Foundation for Ocean Research, San Diego, Calif.
For primary bibliographic entry see Field 2L.
W76-09955

MODELING SEDIMENT MOVEMENT FOR MASONBORO INLET,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2L.
W76-09956

MASONBORO INLET FIXED-BED MODEL EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-09957

PRINCIPLE OF MANAGEMENT OF DEGENERATED INLETS AND ESTUARIES,
Laval Univ., Quebec. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09958

PARTICLE-LADEN JETS WITH APPLICATION TO OCEAN DUMPING,
Delaware Univ., Newark. Dept. of Civil Engineering and Marine Studies.
For primary bibliographic entry see Field 5B.
W76-09959

TEMPERATURE PREDICTIONS FOR OFFSHORE POWER PLANTS,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
For primary bibliographic entry see Field 5B.
W76-09960

SAMPLING NETWORK DESIGN FOR DISPERSION VERIFICATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09961

NEAR-FIELD JET PENETRATION AND RESERVOIR MIXING,
Georgia Inst. of Technology, Atlanta.
For primary bibliographic entry see Field 8C.
W76-09962

PHYSICAL MODEL OF DISCHARGE IN A TWO-LAYER STRATIFIED AMBIENT,
Duke Power Co., Charlotte, N. C.
For primary bibliographic entry see Field 8B.
W76-09963

NUMERICAL TWO-DIMENSIONAL FLOW MODEL FOR RIVER SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
For primary bibliographic entry see Field 2E.
W76-09964

TWO-DIMENSIONAL MODEL OF FLOW TOWARD INTAKES,
Nuclear Regulatory Commission, Washington, D.C. Hydrologic Engineering Section.
For primary bibliographic entry see Field 2E.
W76-09965

MATHEMATICAL MODEL OF FLOW IN A STREAM-AQUIFER SYSTEM,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-09966

FORECASTS FOR THE SACREMENTO RIVER SYSTEM,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 2E.
W76-09967

MATHEMATICAL MODELING OF ALLUVIAL CHANNELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09968

MOVABLE-BED RIVER-MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2E.
W76-09969

SEDIMENT DEPOSITION MODEL FOR TARBELA RESERVOIR,
Gilbert Associates, Inc., Reading, Pa.
For primary bibliographic entry see Field 2J.
W76-09970

UNDISTORTED MOVABLE-BED MODEL STUDY FOR A RIVER AND POWER PLANT INTAKE SYSTEM,
Battelle Memorial Inst., Richland, Wash.
For primary bibliographic entry see Field 8B.
W76-09971

LIBRARY U. OF I. Urbana-Champaign

PHYSICAL MODELING TECHNIQUES USED IN RIVER MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. River Regulation Branch.
For primary bibliographic entry see Field 2E.
W76-09972

RIVERBANK RECESSIONS FOR POWER PLANT FACILITIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09973

MODELING OF MEANDERING AND BRAIDING IN RIVERS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-09974

MODELING SEDIMENT TRANSPORT IN HYDRAULIC STRUCTURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-09975

SYSTEMS MODELING OF STRATIFIED FLUIDS,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
For primary bibliographic entry see Field 8B.
W76-09976

MODELING OF THREE-DIMENSIONAL FLOWS IN ESTUARIES,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W76-09977

RESULTS OF SALINITY TESTS ON THE SAN FRANCISCO BAY-DELTA HYDRAULIC MODEL,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 2L.
W76-09978

EXPERIENCE WITH A SMALL SCALE, HIGHLY DISTORTED FIXED BED MODEL OF THE LAGO MARACAIBO ESTUARY,
Laboratorio National de Hidraulica, Caracas (Venezuela).
For primary bibliographic entry see Field 2L.
W76-09979

HYDRODYNAMIC TRANSPORT PHENOMENA IN ESTUARIES AND COASTAL WATERS: SCOPE OF MATHEMATICAL MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 5B.
W76-09980

APPLICATION OF WATER QUALITY MODELS TO FINGER FILL CANALS,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-09981

RIVER AND ESTUARY MODELING WITH THE SIVA SYSTEM,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Centre.
M. B. Abbott, K. I. Dahl-Madsen, P. I. Hinstrup, A. Kej, and M. P. Vium.
In: Symposium on Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.). San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 745-763, 1975. 6 fig, 5 ref.

Descriptors: *Model studies, *Mathematical models, *Estuaries, *Rivers, Fjords, Computer models, Flow, Storm surge, Tides, Water levels, Tidal effects, Biological properties, Algae, Zooplankton, Nutrients, Pollutants, Sedimentation, Hydrodynamics, Hydraulics.
Identifiers: *Denmark.

The System 11, 'Siva', is a design system capable of constructing and running almost any model of one-dimensional one-layer (vertically homogeneous) flow when presented only with the specific model description consisting of: the points in the model and the way they are connected, the cross sections at each of these representative points, the resistance properties of the bed, ancillary data (such as lateral discharges and wind stress) and boundary data (such as elevations or discharges). The system-built model can incorporate extensive flood plains, it can be multiply connected, and it can accomodate rapid changes of section. The system incorporates routines for computing water quality indicators, including a transport-dispersion routine, a heat transfer routine, and the biochemical reaction routine for algal carbon, zooplankton carbon, detritus carbon, inorganic phosphorus and inorganic nitrogen. These routines can be coupled together so that the discharges and flow areas given by the hydrodynamic stages of the system can be used to calculate the transport, dispersion and interaction of the main biochemical indicators. The System 11, 'Siva', has been extensively field tested for the case of a Danish Fiord, the Limfiord, which is multiply connected and has a total length of about 100 miles. This fiord is open at both ends to the sea, where it is subject to tidal and storm surge variations, while its internal conditions are also much affected by wind. (See also W76-09941) (Sims-ISWS)
W76-09982

HYDRODYNAMIC AND MATERIAL TRANSPORT MODEL FOR MOBILE BAY, ALABAMA,
Alabama University, University. Department of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-09983

APPLICATION OF PHYSICAL TIDAL MODELS IN HARBOR AND MARINA DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09984

2B. Precipitation

MICRO-CLIMATE EFFECTS ON WATER USE EFFICIENCY BY PLANTS IN AN ARID CLIMATE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3B.
W76-09480

THE SAHELIAN DROUGHT AND ITS DEMOGRAPHIC IMPLICATIONS,
Australian National University, Canberra, Department of Demography.
For primary bibliographic entry see Field 6G.
W76-09486

EVALUATION OF MEAN SQUARE ERROR INVOLVED IN APPROXIMATING THE AREAL AVERAGE OF A RAINFALL EVENT BY A DISCRETE SUMMATION,
Puerto Rico Univ., Mayaquez. Dept. of Civil Engineering.
R. L. Bras, and I. Rodriguez-Iturbe.
Water Resources Research, Vol. 12, No. 2, p 181-184, April 1976. 3 fig, 8 ref. NWS 4-36738.

Descriptors: *Rainfall, *Data processing, *Networks, Mathematics, Mathematical studies, Analytical techniques, Average, Correlation analysis, Precipitation(Atmospheric), Hydrology.
Identifiers: Mean square error.

Two-dimensional areal processes are commonly evaluated in hydrology through a discretization in space over the region in which the process is being studied. Such a discretization involves an error in going from the continuous process to the discrete one. This error was studied theoretically, and graphs were presented for its evaluation as function of the size of the area, the functional form of the correlation equation in space, and the level of discretization or size of the sample. Correlation structures of the Bessel type and of the single and double exponential kind were considered, and their different implications were discussed. (Sims-ISWS)
W76-09572

ACCURACY OF RESERVOIR INFLOW FORECASTS BASED ON RADAR RAINFALL MEASUREMENTS,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
B. Anderl, W. Attmannspacher, and G. A. Schultz.
Water Resources Research, Vol. 12, No. 2, p 217-223, April 1976. 6 fig, 2 tab, 15 ref.

Descriptors: *Rainfall, *Radar, *Hydrographs, Runoff, Floods, Inflow, Reservoirs, Computers, Computer models, Mathematical models, Watersheds(Basins), Measurement, Instrumentation, Precipitation(Atmospheric), Meteorology.
Identifiers: *West Germany.

For efficient application of optimum operating procedures to flood protection reservoirs it is essential to forecast on line, i.e., during a storm, the relevant inflow hydrographs. This can be achieved with the aid of a weather radar linked to a computer in which the optimum reservoir operating program is stored as well as a program of a hydrologic rainfall-runoff model producing the reservoir inflow hydrographs from radar-measured rainfall data. These inflow hydrographs may be evaluated on the computer during each storm event and can be updated every 5 min, if necessary. The accuracy of these computed hydrographs was tested against the recordings of two river gages installed in catchments close to a weather radar at Hohenpeissenberg in Upper Bavaria. By using a linearly distributed mathematical catchment model it was shown that for the two rivers the synthetic hydrographs computed from radar-measured rainfall were more accurate than those obtained from continuous measurements of the official point rain gage network of the German Weather Service (one recording gage in 500 sq km) and that they were of the same accuracy as those obtained from a special very dense rain gage network (one recording gage in 25 sq km) set up for research purposes in the same area. (Sims-ISWS)
W76-09574

ON THE RAINFALL AND WATER POTENTIAL OF NEPAL,
Andhra Univ., Waltair (India). Dept. of Meteorology and Oceanography.
J. Subbaramayya, and V. R. Babu.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 3, p 95-97, March 1975. 6 fig, 1 tab, 10 ref.

Descriptors: *Orography, *Rainfall, *Water resources, Evapotranspiration, Topography, Meteorology, Hydrologic data.

dentifiers: *Nepal(India), Water potential, Water urplus.

The rainfall of Nepal is studied for purposes of unerstanding the nature of orographic influence. The water potential of the country is examined rom a hydro-meteorological point of view. It is ound that topographical features like valleys and idges and their exposure to wind, and the steepess of the mountain slopes, play an important ole in fixing the areas of maximum rainfall rather han does the mere elevation. The country has a et surplus of rain-water amounting to about .04x10 in. cubic metres. (Bell-Cornell)
W76-09642

A MODEL FOR THE THERMODYNAMIC GROWTH OF SEA ICE IN NUMERICAL INVESTIGATIONS OF CLIMATE,
Rand Corp., Santa Monica, Calif. Climate Dynamics Program.
For primary bibliographic entry see Field 2C.
W76-09722

THE DISTRIBUTION OF HEAVY RAINFALL IN A MAJOR URBAN AREA,
Illinois State Water Survey, Urbana.
F. A. Huff.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 53-60, October 1974. 5 fig, 2 tab, 8 ref.

Descriptors: *Rainfall, *Excessive precipitation, *Cities, *Rainfall disposition, Precipitation(Atmospheric), Precipitation intensity, Networks, Rain gages, Distribution patterns, Urban runoff, Hydrology, Meteorology.
Identifiers: *St. Louis(Mo), Urban effects.

Since 1971, a network of 225 recording raingages has been operated within a 26-mile radius of St. Louis in conjunction with an extensive 5-year investigation of urban effects on precipitation. Since improved sewer design and engineering is a current hydrologic problem of major interest, the network data are being analyzed to provide information applicable to this need. This paper summarized initial findings obtained from analyses of the 100 heaviest raincells recorded on the network during the summers of 1971-72 and the two-year pattern of storms producing one inch or more of rainfall. Results indicated a substantial increase in rainfall yield from raincells exposed to potential urban effects compared with no-effect cells. The one-inch rainfall pattern shows a distinct maximum in a region that is frequently in the path of storms passing across the two urban-industrial areas of St. Louis and Alton-Wood River. It was concluded that if these preliminary findings are verified in the remaining years of the project that frequency relations used in the design of urban and suburban systems will need to be re-evaluated to incorporate significant urban effects upon storm runoff. (See also W76-09729) (Sims - ISWS)
W76-09734

RELATIONSHIP OF HEAVY RAINFALL TO SOIL EROSION IN VIEW OF ITS FORECASTING, (IN BULGARIAN),
Afforestn. Erosion Control Experimental Station, Sandanski (Bulgaria).
For primary bibliographic entry see Field 2J.
W76-09807

METEOROLOGICAL FACTORS AND DISEASE EXPRESSIONS IN JUTE,
Jute Agricultural Research Inst., Barrackpore (India). Mycology and Plant Pathology Div.
For primary bibliographic entry see Field 3F.
W76-09931

2C. Snow, Ice, and Frost

A MODEL FOR THE THERMODYNAMIC GROWTH OF SEA ICE IN NUMERICAL INVESTIGATIONS OF CLIMATE,
Rand Corp., Santa Monica, Calif. Climate Dynamics Program.
A. J. Semtner, Jr.
Journal of Physical Oceanography, Vol. 6, No. 3, p 379-389, May 1976. 8 fig, 2 tab, 8 ref, 1 append.

Descriptors: *Sea ice, *Climates, *Model studies, Mathematical models, Oceans, Ice, Snow, Weather, Atmosphere, Melting, Temperature, Heat transfer, Heat balance, Heat flow, Oceanography, Meteorology.
Identifiers: *Ice thickness.

A model was presented whereby the thickness and extent of sea ice may be predicted in climate simulations. A basic one-dimensional diffusion process was taken to act in the ice, with modifications due to penetration of solar radiation, melting of internal brine pockets, and accumulation of an insulating snow cover. This formulation is similar to that of a previous study by Maykut and Untersteiner, but the introduction of a streamlined numerical method makes the model more suitable for use at each grid point of a coupled atmosphere-ocean model. In spite of its simplicity, the ice model accurately reproduces the results of Maykut and Untersteiner for a wide variety of environmental conditions. In 25 paired experiments, annual average equilibrium thicknesses of ice agreed within 24 cm for 75% of the cases; and the average absolute error for all cases was 22 cm. The new model has fewer computational requirements than one layer of ocean in the polar regions, and it can be further simplified if additional savings of computer time are desired. (Sims - ISWS)
W76-09722

OIL IN THE ARCTIC,
Massachusetts Inst. of Tech. Cambridge.
For primary bibliographic entry see Field 5C.
W76-09902

EFFECTS OF PETROLEUM POLLUTANTS ON ARCTIC MICROBIAL POPULATIONS,
Louisville Univ., Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-09909

AN ENVIRONMENTAL RESEARCH PROGRAM FOR DRILLING IN THE CANADIAN BEAUFORT SEA,
Gulf Oil Canada Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 5G.
W76-09912

ST. LAWRENCE SEAWAY: A NEW GOAL OF YEAR-ROUND NAVIGATION,
ARCTEC, Inc., Columbia, Md.
T. V. Kotras, J. W. Lewis, and D. C. N. Robb.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1-22, 1975. 5 fig, 1 tab, 12 ref.

Descriptors: *Model studies, *St. Lawrence Seaway, *Winter, *Ice, *St. Lawrence River, Mathematical models, Rivers, Locks, Lakes, Navigation, Economics, Ice breakup, Iced lakes, Ice cover, Lake ice, Canals.
Identifiers: All-year navigation.

For almost a third of each year, commercial ship traffic ceases movement on the St. Lawrence River between Montreal and Lake Ontario because of problems associated with the presence of ice in the river. As a step towards changing this situation, an investigation, referred to as the SPAN (System Plan for All-year Navigation) STUDY, of the economic feasibility of year-round navigation in this section of the river was recently completed. To assist in this investigation, a computer simulation model of the Seaway was developed to simulate the movement of ships through the Seaway during both normal conditions and winter ice months. The simulation determined the navigability of the Seaway, measured by the ship transit times and the Seaway capacity (ships/day), by processing ships through the Seaway while incorporating the effects of ice, weather, time of year, winter severity, amount of traffic, and types of ships navigating the Seaway. Use of the simulation provided a solid, rational basis for evaluation of the technological, economic, and environmental feasibility of extended season navigation on the St. Lawrence Seaway. It also provided a means of predicting the influence of ice control structures, installation of fixed aids to navigation, ice clearing ships, heating systems, bubbler systems, etc., on extended season navigation. This simulation model of the Seaway was described and some of the results of the investigation were presented. (See also W76-09941) (Sims - ISWS)
W76-09942

WATER TRANSPORT IN THE SILL AREA OF BALSFJORD NORTH NORWAY, DURING VERNAL MELTWATER DISCHARGE,
Tromsoe Univ. (Norway). Inst. of Biology and Geology.
For primary bibliographic entry see Field 2L.
W76-09999

2D. Evaporation and Transpiration

MICRO-CLIMATE EFFECTS ON WATER USE EFFICIENCY BY PLANTS IN AN ARID CLIMATE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3B.
W76-09480

EFFECTIVENESS OF WATER UTILIZATION BY PLANTS, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii and Agrokhimii.
S. I. Slukhai, K. S. Tkachuk, and T. Y. Kuzycheva.
Dopov Akad Nauk Ukr RSR Ser B Heol Heofiz Khim Biol. 36(4), p 368-371, 1974.

Descriptors: *Water utilization, Drought, Wheat, *Transpiration, Soil moisture, Moisture content, *Drought tolerance, *Plant physiology, Dehydration.

The influence of soil drought on effectiveness of water utilization by winter wheat was studied in connection with different indices of water regime. An increase in efficiency of transpiration under conditions of constant soil moisture deficiency (40% of total moisture-holding capacity) was connected with stabilization of plants water regime. Influence of sudden soil drought upon plants resulted in sharp tissue dehydration and reduction of plant transpiration efficiency.
W76-09809

CENOZOIC DEPOSITS OF SOUTHEASTERN NEW MEXICO AND AN OUTLINE OF THE HISTORY OF EVAPORITE DISSOLUTION,
Geological Survey, Colo.
For primary bibliographic entry see Field 2J.
W76-09837

LIBRARY U. OF F. Urbana-Champaign

EVAPORATION FROM HIGHLY SALINE SOILS IN AN EXPERIMENTAL PLOT IN THE TURKMEN SSR, (IN RUSSIAN),
Kh. Zamanmurad, and K. Bekiev.
Probl Osvoeniya Pustyn'. 3, p 66-70, 1974.

Descriptors: *Saline soils, *Evaporation, Salinity, Salts, Soil surfaces, Mineral water, Groundwater.
Identifiers: Turkmen-SSR, *USSR.

Evaporation of shallow ground waters from the highly saline soils is less than from non-saline ones. The annual course of evaporation is greatly influenced by the rate of salinity, composition of mineral salts and the type of soil surface salt cover.--Copyright 1975, Biological Abstracts, Inc.
W76-09887

2E. Streamflow and Runoff

WATER SYSTEM BEHAVIOR: DETERMINANTS IN AN ARID REGION,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-09483

DISAGGREGATION MODELS IN HYDROLOGY REVISITED,
Ecole Polytechnique de Montreal (Quebec).
For primary bibliographic entry see Field 2A.
W76-09573

IDENTIFICATION OF LINEAR SYSTEMS RESPONSE BY PARAMETRIC PROGRAMING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
S. P. Neuman, and G. D. Marsily.
Water Resources Research, Vol. 12, No. 2, p 253-262, April 1976. 18 fig, 23 ref.

Descriptors: *Input-output analysis, *Hydrograph analysis, *Runoff forecasting, Analytical techniques, *Linear programming, Hydrologic systems, Hydrology, Decision making, Hydrologic data, Precipitation(Atmospheric).
Identifiers: *Parametric programming, Multicriterion decision process, Bicriterion function, Impulse response function.

The impulse response function of a linear hydrologic system is extremely sensitive to minor errors in the input-output data. Low-amplitude random errors can cause severe oscillations in the response function. Objective methods are not available for filtering the input-output data to obtain physically realizable solutions. The ultimate goal of response function identification is to determine a solution which optimizes the predictive capabilities of the linear model. An important criterion of optimality is that the shape of the response function be physically plausible. Use of parametric linear programming was proposed to achieve this objective. The problem was formulated as a multicriterion decision process under uncertainty. Parametric programming served as a means of generating a continuous set of alternative solutions to the identification problem together with a bicriterion function representing these alternatives. The shape of the bicriterion curve was then used as a guide by the hydrologist in selecting a particular solution when he is relying on his own value judgment. (Singh-ISWS)
W76-09575

THE CONCENTRATION OF DISSOLVED SOLIDS AND RIVER FLOW,
Manhattan Coll., Bronx, N. Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09577

SENSITIVITY OF LINEAR AND NONLINEAR SURFACE RUNOFF MODELS TO INPUT ERRORS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W76-09578

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGED-SIZED CATCHMENT AREA, I. CONCEPTS AND RELATIONSHIPS,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
For primary bibliographic entry see Field 2A.
W76-09579

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGE-SIZED CATCHMENT AREA, II. ESTIMATE OF PARAMETERS, VALIDITY OF MODEL, APPLICATION,
Institut Royal Meteorologique de Belgique (Brussels). Hydrology Section.
For primary bibliographic entry see Field 2A.
W76-09580

A REVIEW AND ANALYSIS OF SELECTED HYDROLOGIC MODELING CONCEPTS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
J. L. Nieber, M. F. Walter, and R. D. Black.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-254 489, $4.50 in paper copy, $2.25 in microfiche. Cornell University Water Resources and Marine Sciences Center, Ithaca, Technical Report, June 1976. 66 p., 10 fig., 3 tab., 68 ref. OWRT A-061-NY(1), 14-31-0001-5032.

Descriptors: *Model studies, *Runoff, *Forecasting, Reviews, *Watershed management, Watersheds(Basins), Estimating, Base flow, Infiltration, Precipitation excess, Evaporation, Routing.
Identifiers: *Kinematic wave approximation, *Watershed runoff models.

Reviews and analyses were made of several selected hydrologic watershed runoff models that have been commonly used for forecasting floods and water supply. The three approaches to hydrologic modeling, deterministic, parametric, and stochastic, are compared to emphasize the advantages and disadvantages of each. A review of the literature gives the general development of rainfall excess routing techniques, infiltration and evaporation determination techniques and techniques for estimating groundwater flow. Aproaches of integrating these process submodels into a total watershed runoff model are considered. Several selected watershed modeling packages presently in use are discussed relative to origin, concept, and usefulness. The mathematical formulations are given for the kinematic wave approximation, the linearization of the kinematic wave equation, and the finite difference approximation to the equations for the linear reservoir and linear channel routing concepts. The comparative sensitivity of these various conceptual models to changes in the physical character of watersheds is analyzed.
W76-09718

RELATIONSHIP OF RATIONAL AND UNIT GRAPH METHODS IN RETENTION BASIN DESIGN,
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4C.
W76-09732

ILLUDAS - THE ILLINOIS URBAN DRAINAGE AREA SIMULATOR,
Illinois State Water Survey, Urbana.
M. L. Terstriep, and J. B. Stall.
In: National Symposium on Urban Rainfall a
Runoff and Sediment Control; Proceedings
symposium held July 29-31, 1974, Lexington, Ke
tucky. Report UKY BU106, p 73-83, Octob
1974. 8 fig, 5 tab, 20 ref.

Descriptors: *Model studies, *Computer mode
*Urban drainage, Mathematical models, Co
puter programs, Urban runoff, Basin
Watersheds(Basins), Paving, Grassed waterway
Roofs, Hydrographs, Infiltration, Soil wate
Storage, Runoff, Retention, Detention reservoi
Cities, Hydrology, Urban hydrology.

An objective method was presented for t
hydrologic design of storm drainage systems
urban areas. The method is based on a digi
model to be known as ILLUDAS, the Illino
Urban Drainage Area Simulator. ILLUDAS us
an observed or specific temporal rainfall patte
uniformly distributed over the basin as the prima
input. The basin is divided into sub-basins, one f
each design point in the basin. Paved-area a
grassed-area hydrographs are produced from ea
sub-basin by applying the rainfall pattern to the a
propriate contributing areas. These hydrograp
are combined and routed downstream from o
design point to the next until the outlet is reache
Pipe sizes are determined at each design point. D
tention storage can be included as part of t
design in any sub-basin. (See also W76-0972
(Sims-ISWS)
W76-09735

REMEDIAL MEASURES FOR URBAN FLOO
PEAK REDUCTION,
Georgia Inst. of Tech. Atlanta. School of Civil E
gineering.
A. M. Lumb, L. D. James, and A. Johnson.
In: National Symposium on Urban Rainfall a
Runoff and Sediment Control; Proceedings
symposium held July 29-31, 1974, Lexington, Ke
tucky. Report UKY BU106, p 85-91, Octob
1974. 4 fig, 5 tab, 12 ref.

Descriptors: *Model studies, *Urban runof
*Flood peak, Mathematical models, Comput
models, Computer programs, Watersheds(Basin
Paving, Grassed waterways, Roofs, Hydrograph
Hydraulics, Infiltration, Retention, Detentio
reservoirs, Cities, Rainfall, Runof
Roughness(Hydraulic), Hydrology, Urba
hydrology.

This study tested remedial measures for the reduc
tion of flood peaks in urban areas through the us
of a hydrologic model for the digital compute
The fact that urbanization in a watershed generall
increases peak flow rates over those in the nonu
banized watershed is well documented. Howeve
if the urbanization could be undertaken in
manner to minimize increases in runoff, then si
nificant savings in drainage structures coul
possibly be realized and degradation of th
downstream environment could be reduced. Th
methodology of this study included: (1) instrumen
tation of a small residential watershed, (2
development of a hydrologic model, (3) calibratio
and verification of the model, and (4) model simu
lation with hypothesized remedial measures fo
peak flow reduction. For the 11-acre residentia
watershed used in this study and for the assump
tions that were made, the 20% increase in the pea
flow from residential development could b
reduced that amount with a combination o
remedial measures including terracing, directin
flow from downspouts onto lawns and the use o
artificially roughened or vegetated channels. De
tention storage could also achieve the 20% reduc
tion in peak flows. (See also W76-09729) (Sims
ISWS)
W76-09736

A FLOOD MANAGEMENT MODEL FOR UR
BANIZING RIVER BASINS,
Massachusetts Inst. of Tech. Cambridge. Dept. o
Civil Engineering.

or primary bibliographic entry see Field 4C.
/76-09737

HYSICAL AND ECONOMIC ASPECTS AS-OCIATED WITH RUNOFF FROM URBAN ROWTH: A METHODOLOGICAL AP-ROACH,
owa Univ., Iowa City. Dept. of Economics.
or primary bibliographic entry see Field 4C.
/76-09749

ANAGEMENT OF FLOOD CONTROL AND RAINAGE IN THE URBANIZING ZONE,
arsons, Brinckerhoff, Quade and Douglas, Inc., ew York.
or primary bibliographic entry see Field 4A.
/76-09750

OLE OF CARBONATE ROCKS IN MODIFY-NG FLOOD FLOW BEHAVIOR,
ennsylvania State Univ., University Park. Inst. or Research on Land and Water Resources.
or primary bibliographic entry see Field 2A.
/76-09784

EGRESSION ANALYSIS AND PARAMETER DENTIFICATION,
eological Survey, Reston, Va.
or primary bibliographic entry see Field 7A.
/76-09824

YDROLOGIC UNIT MAP--1974, STATE OF LASKA,
eological Survey, Reston, Va.
or primary bibliographic entry see Field 7C.
/76-09826

YDROLOGIC UNIT MAP--1974, STATE OF REGON,
eological Survey, Reston, Va.
or primary bibliographic entry see Field 7C.
/76-09827

APPRAISAL OF WATER RESOURCES OF NORTHWESTERN EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
R. K. Livingston, D. L. Bingham, and J. M. Klein.
Colorado Water Conservation Board, Denver, Water Resources Circular No 22, 1975. 75 p, 33 ig, 3 plates, 14 tab, 36 ref.

Descriptors: *Water resources, *Surface waters, Groundwater resources, *Water quality, Colorado, Water yield, Streamflow, Lakes, Reservoirs, Hydrology, Hydrologic data, Hydrogeology, Available water, Water pollution ources, Water analysis.
dentifiers: *El Paso County(Colo).

An appraisal of the water resources of northwesten El Paso County, Colo., was made as he first part of a 3-year study of the entire county. Mean annual precipitation ranges from 14 to 30 in. nd is a function of altitude. The area is drained by Fountain Creek and its tributaries which have een described by means of the observed flow haracteristics at 27 stream-gaging sites and the stimated flow characteristics at 14 sites. A water udget shows the average annual water inventory s about 520,000 acre-ft, of which about 92 percent s evapotranspired. An inventory of lakes and eservoirs indicates the storage capacity of one eservoir, Northfield Reservoir No. 5, is over one-alf of the area's total surface-water storage apacity. The annual precipitation at Colorado Springs, the country's largest municipality, ranged etween 8 and 25 in. in the last 24 years. Colorado Springs obtains about 89 percent of its total omestic water supply from surface-water ources. The water supply for Colorado Springs appears adequate until 1990 due to the reuse and transmountain importation of water. Waters from streams draining Pikes Peak are of good quality for domestic use except for concentrations of fluoride which exceed limits of drinking-water standards. Downstream from Colorado Springs the water in Fountain Creek is badly polluted due to sewage. The principal aquifers are alluvial deposits and the Dawson Formation. Calculated recharge rates range from 0 to 4 in. per year. In the principal areas of recharge to the Dawson, the dissolved-solids concentration of water in the Dawson aquifer is less than 100 mg/litre. The dissolved-solids concentration of groundwater increases downgradient to about 500 mg/litre in areas of discharge. (Woodard-USGS)
W76-09828

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-09829

A PRIMER ON FLOODPLAIN DYNAMICS,
Geological Survey, Reston, Va.
T. Maddock, Jr.
Journal of Soil and Water Conservation, Vol 31, No 2, p 44-47, March-April 1976. 2 ref.

Descriptors: *Flood plains, *Floods, *Sediment transport, *Rivers, *Environmental effects, Channel erosion, Channel morphology, Construction, Urbanization, Flow characteristics, Vegetation, Biota.
Identifiers: *Flood plain changes.

The changes in the characteristics of flood plains with changing discharges of water and sediment are described. Included are relations between the hydraulics and vegetation of stream channels. Changes in a channel will reflect the activities of man that alter the characteristic discharge of water and sediment reaching a stream. Urbanization, for example, which during construction periods generally results in increased sediment concentrations, later results in increased rates of runoff and decreased sediment production. In the first stage sediment deposition takes place. In the second stage channel widening or deepening can be expected over the length of channel required for the peak to attenuate. Below that point the newly eroded material tends to deposit. (Woodard-USGS)
W76-09831

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME I.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 2A.
W76-09941

HYDROLOGIC FORECASTING FOR THE OHIO RIVER WATERWAY,
National Weather Service, Cincinnati, Ohio. River Forecast Center.
C. M. Relyea.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 43-62, 1975. 7 fig, 1 tab, 18 ref, 2 append.

Descriptors: *River forecasting, *Computer models, *Ohio River, Rivers, River systems, Streamflow forecasting, Navigation, Navigable rivers, Hydrologic data, River regulation, Flood control, Dams, Flood routing, Weather, Runoff, Hydrographs, Routing, Hydrology.

1975 may be considered the bicentennial year of substantial navigation on the Ohio River. For over a hundred years, the National Weather Service has been making weather and flood forecasts for the benefit of navigation. The shipping industry along the Ohio River and its navigable tributaries needs forecasts of stage, current velocity, ice formation, and weather conditions. Fast communications and computers now enhance the effectiveness of standard river forecast procedures. New procedures under consideration were described briefly, with particular emphasis on dynamic streamflow routing. (See also W76-09941) (Sims - ISWS)
W76-09944

SOME HARD LESSONS IN NUMERICAL HYDRAULICS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W76-09952

NUMERICAL TWO-DIMENSIONAL FLOW MODEL FOR RIVER SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
M. Chandrashekar, L. R. Muir, and T. E. Unny.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 407-425, 1975. 8 fig, 1 tab.

Descriptors: *Model studies, *River systems, *Flow, Mathematical models, Computer models, Rivers, Streamflow, Numerical analysis, Equations, Storage, Water levels, Discharge(Water), Hydraulics.
Identifiers: *Two-dimensional flow models, *Flow models.

A two-dimensional hydrodynamic model was described that solves the non-linear Navier-Stokes equations describing the free surface flow in a river system that could include islands and branch rivers. Within the limitations imposed by storage, etc., the program was given in general form such that, with a few changes, it could be made adaptable to any river system. A form of stretched co-ordinate system has been embodied in the finite difference formulation of the problem. The solutions for heads (elevations) and velocities were obtained using the two-dimensional implicit central difference scheme so that it can be considered unconditionally stable. A numerical example was worked out. (See also W76-09941) (Sims - ISWS)
W76-09964

TWO-DIMENSIONAL MODEL OF FLOW TOWARD INTAKES,
Nuclear Regulatory Commission, Washington, D.C. Hydrologic Engineering Section.
R. B. Codell.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 426-438, 1975. 6 fig, 8 ref.

Descriptors: *Model studies, *Intakes, *Rivers, *Flow, Streamflow, Discharge(Water), Nuclear powerplants, Mathematical models, Computer models, Equations, Hydraulics.
Identifiers: *Two-dimensional flow models, Flow models.

The vertically integrated equations of mass and momentum conservation were formulated in the stream function-vorticity domain for the solution of the two dimensional (areal) flow field near shoreline water intakes. It was found that the scale of typical shoreline intake problems is such that the inertial, bottom friction, and lateral stress terms in the momentum equations cannot be neglected if reasonable answers are expected. Results were presented for a simulation of a

LIBRARY U. OF I. URBANA-CHAMPAIGN

nuclear power plant intake on a river in the backwater of a dam, illustrating the usefulness of the techniques presented in evaluating possible entrainment of passive aquatic organisms. (See also W76-09941) (Sims - ISWS)
W76-09965

MATHEMATICAL MODEL OF FLOW IN A STREAM-AQUIFER SYSTEM,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
C. E. K. Rovey, and E. V. Richardson.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 439-457, 1975. 6 fig, 10 ref, 1 append.

Descriptors: *Model studies, *Flow, *Streams, *Aquifers, *Surface-groundwater relationships, Mathematical models, Computer models, Streamflow, Water table, Water levels, Groundwater, Seepage, Infiltration.
Identifiers: *Flow models.

A three-dimensional, finite difference model was developed for simulating flow in a groundwater-surface water system. The basis of the model was the finite difference form of Richard's equation for fully and partially saturated subsurface flow. The model was used to simulate flow in a stream-aquifer system. Effects of stream flow on groundwater movement were treated by applying the appropriate boundary conditions to Richard's equation. Contributions of groundwater to river flow were quantified by including seepage rates in the computation of river discharge. The accuracy of the model was tested by using it to simulate flow in a real stream-aquifer system, and comparing results obtained by the model to field measurements. Results obtained by the model included mean monthly streamflow values at each end of the study area for an eight-year time period, and a map of water table elevations throughout the region at the end of the run. Comparison of computed results with observed data indicated fair to good agreement. It was concluded that the model is capable of producing a reasonably accurate simulation of flow in a real stream-aquifer system. (See also W76-09941) (Sims - ISWS)
W76-09966

FORECASTS FOR THE SACREMENTO RIVER SYSTEM,
National Weather Service, Sacramento, Calif. River Forecast Center.
R. J. C. Burnash, and R. L. Ferral.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 458-465, 1975. 2 fig, 5 ref.

Descriptors: *Model studies, *Forecasting, *Rivers, *Tidal effects, River systems, Tides, Estuaries, Water levels, Navigable rivers, Flow, Streamflow, Runoff, Rainfall, Hydrology, *California.
Identifiers: *Sacramento River(Calif).

The Sacramento River Forecast Center of the National Weather Service cooperates with the State of California Department of Water Resources in providing a prediction service for river conditions in California. A principal river is the Sacramento, a navigable system in its lower reaches, which includes a major inland port facility at Sacramento. Forecasts of river levels and flow volumes along this system are produced using a series of deterministic and stochastic techniques. The structure of the forecast system includes a simulation of the contributing areas' snow accumulation and melt, a conceptual deterministic watershed runoff response model, and a variety of streamflow routing techniques. These systems process historic and real-time data, short period meteorological forecasts, and climatological records to produce deterministic and /or stochastic analyses of future conditions. The results include short period (up to one week) discrete forecasts of river conditions and long period (up to one year) forecasts of minimum tidal levels in the lower reaches for use in scheduling shipping and cargo loading. This system is currently being expanded to provide additional data for the operators of the numerous structures which control river levels. Such forecasts will assist the reservoir operations in the economic use of water as a resource as well as improving the analysis of future water levels in navigable areas. (See also W76-09941) (Sims - ISWS)
W76-09967

MATHEMATICAL MODELING OF ALLUVIAL CHANNELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09968

MOVABLE-BED RIVER-MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
M. de Vries, and J. J. van der Zwaard.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 484-500, 1975. 14 fig, 25 ref.

Descriptors: *Model studies, *Rivers, *Geomorphology, Mathematical models, Hydraulic models, Erosion, Sedimentation, Sediment transport, Sediments, River beds, Flow, Streamflow.

For morphological problems in rivers both physical and mathematical models are used to forecast changes in the river bed due both to natural causes and human interference. The state-of-the-art regarding this modelling was discussed mainly against the background of the research during the last decades carried out in the Delft Hydraulics Laboratory. For the two types of models the discussion focused on present capabilities, combined use, and possible future improvements. (See also W76-09941) (Sims - ISWS)
W76-09969

PHYSICAL MODELING TECHNIQUES USED IN RIVER MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. River Regulation Branch.
J. E. Foster.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 540-559, 1975. 10 fig, 1 ref.

Descriptors: *Model studies, *Rivers, *Hydraulic models, Streamflow, Flow, Erosion, Sedimentation, Roughness(Hydraulic), Hydraulic design, Beds, River beds, Bottom sediments, Channel morphology, Hydrographs, Hydraulics.
Identifiers: *Fixed-bed models, *Movable-bed models, River models, Modeling techniques.

This paper reviewed the basic considerations for determining the type of model needed for a particular study, the selection of scales, the type data to be collected, the accuracy expected, and the various techniques used to simulate prototype occurrences in river models. The design, operation techniques, and results of both fixed-bed and movable-bed model studies conducted at the Waterways Experiment Station were discussed as examples of river models being used to solve actual problems. (See also W76-09941) (Sims - ISWS)
W76-09972

MODELING OF MEANDERING AND BRAIDING IN RIVERS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-09974

RIVER AND ESTUARY MODELING WITH THE SIVA SYSTEM,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Centre.
For primary bibliographic entry see Field 2A.
W76-09982

2F. Groundwater

MONITORING WELLS,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 4B.
W76-09558

A THREE-DIMENSIONAL GALERKIN FINITE ELEMENT SOLUTION OF FLOW THROUGH MULTIAQUIFERS IN SUTTER BASIN, CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
S. K. Gupta, and K. K. Tanji.
Water Resources Research, Vol. 12, No. 2, p 155-162, April 1976. 6 fig, 1 tab, 9 ref. (Project UCAL-WRC-W438).

Descriptors: *Leakage, *Aquitards, Model studies, *Finite element analysis, *California, Aquifers, Groundwater movement, Groundwater basins, Heterogeneity, Dissolved solids, Connate water, Water quality, Digital computers, Equations, Groundwater, Data processing, Faults(Geologic), Hydraulic conductivity, Water table, Aquifer systems.
Identifiers: Multiaquifers, *Sutter Basin(Calif), Three-dimensional flow, Galerkin technique, Core storage, Processor time, Disk/tape, Leaky aquifers.

A three-dimensional finite element solution was obtained for the simultaneous consideration of multiaquifers coupled through semiconfining layers, and the model was applied to a groundwater regime in Sutter Basin, California. The use of a disk/tape in data handling and computation has reduced the core storage and processor time and increased the capability of a given computer system to simulate basins larger than are presently possible with the use of only core storage. This economy was achieved by storing on a disk/tape all the intermediate results which are needed repeatedly. On the Burroughs B6700 each steady state solution of 123 three-dimensional elements and 232 nodes was obtained with 20 kbit of memory and 1.49 min of processor time. (Visocky - ISWS)
W76-09562

THEORY OF MULTIPLE LEAKY AQUIFERS I. THE INTEGRODIFFERENTIAL AND DIFFERENTIAL EQUATIONS FOR SMALL AND LARGE VALUES OF TIME,
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Ingenieria.
L. Rodarte.
Water Resources Research, Vol. 12, No. 2, p 163-170, April 1976. 2 fig, 16 ref.

Descriptors: *Leakage, *Aquifers, *Aquicludes, *Aquitards, *Mathematical models, Equations, Theoretical analysis, Mathematical studies, Drawdown, Water wells, Pumping, Permeability,

quifer systems, Elasticity(Mechanical), Time, rtesian heads.
lentifiers: *Multiple aquifers, *Leaky aquifers, ntegrodifferential equations, Piezometric surface.

he general problem of multiple leaky aquifers as analyzed by using a particular problem as a arting point. Differential and integrodifferential uations for small and large values of time, valid r the analysis of multiple leaky aquifers, were otained. The proposed equations are appropriate r both the numerical and the analytic treatment f the regional evolution of the piezometric loads. Visocky - ISWS)
/76-09563

UMERICAL SIMULATION OF WASTE IOVEMENT IN STEADY GROUNDWATER LOW SYSTEMS,
Vaterloo Univ. (Ontario). Dept. of Earth ciences.
or primary bibliographic entry see Field 5B.
/76-09564

YDROLOGY OF THE MADISON FORMA-ION AND ITS POTENTIAL USE FOR WATER UPPLY FOR ENERGY DEVELOPMENT,
Vyoming Univ., Laramie. Water Resources esearch Inst.
. W. Huntoon.
vailable from the National Technical Informa-on Service, Springfield, Va 22161, as PB-254 543, 4.00 in paper copy, $2.25 in microfiche. Comple-on Report, April 1976. 42 p, 5 fig, 5 tab, 18 ref. OWRT A-019-WYO(2), 14-31-0001-4051, 5051, 053.

Descriptors: Aquifers, *Aquifer characteristics, Groundwater, *Recharge, Hydrology, Wyoming, *Hydrogeology, Water supply, Ener-y.
dentifiers: Madison formation(Wyo), Madison quifer(Wyo), Bighorn Mountains(Wyo), Powder River Basin(Wyo).

Precipitation on the Bighorn Mountains in Wyom-ng provides approximately 400,000 ac ft/yr of echarge water to the Madison aquifer in the Powder River Basin. The Madison aquifer is herein defined to include the Paleozoic Bighorn Dolomite, Jefferson Dolomite, Madison Limestone, Amsden Formation, and Tensleep Sandstone. Recharge takes place through outcrops primarily along fractures such as joints, parting along bedding, and secondary fractures associated with faults and folds. The fractures along faults nd folds produce zones of large secondary ermeability that parallel the trends of the struc-ures. These zones are important in the recharge rocess only where they trend from the flanks of he Bighorn range into the Powder River Basin. Movement of water through a paleokarst leveloped in the upper part of the Madison Limestone or through geologically young caves is egligible. The average annual recharge to the Madison aquifer along the 145 mi of outcrop ex-mined in Wyoming is 2,800 ac ft/mi. About 30% f this takes place through zones of secondary ermeability associated with tectonic structures. Each structure accounts for an average of 8,600 ac t/yr of recharge. Approximately 180,000 ac ft/yr nters the Madison Limestone based on the hickness of the Madison Limestone compared to he total thickness of the Madison aquifer.
W76-09757

GRAVITY GEOPHYSICS FOR GROUND-WATER EXPLORATION IN GLACIATED AREAS,
Michigan State University, East Lansing. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W76-09758

COMPUTER ESTIMATES OF NATURAL RECHARGE FROM SOIL MOISTURE DATA - HIGH PLAINS OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. A. Longenbaugh, and N. Krishnamurthi.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 661, $4.50 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 64, August 1975. 58 p, 13 fig, 1 tab, 33 ref. OWRT A-016-COLO(1).

Descriptors: *Natural recharge, Estimating, *Soil moisture, Soil water, *Groundwater recharge, *Mathematical models, Model studies, *Colorado, Soil physical properties, *Great Plains, Water table.
Identifiers: *Computer Estimates, Finite-difference solution, Soil moisture data, Newton-like method, Transient soil moisture.

The research has shown that transient soil moisture data observed at vertical positions at one station can be used as descriptors of natural groundwater recharge to evaluate its time distribution at that station. Hydraulic properties of the soil and initial and boundary conditions must be known before applying the mathematical model developed in this study to other locations. The model assumed that the moisture content of unsaturated soil below the zone of influence of evapotranspiration varies in the linear range of the soil water characteristic curve. The parameters of the model characterize the hydraulic properties of the soil and their spatial variability. They were estimated by a linear statistical model. The mathematical model was solved by a Finite-Difference technique adopting the Crank-Nicholson scheme. The model was verified with an analytical solution and the agreement for the case of homogeneous soil was very good. Field data collected during a drainage cycle were used to verify the model for non-homogeneous soil. The verification was also satisfactory in the latter case. The model was then applied to estimate recharge rates from data collected by the USGS and ARS at the Great Plains Field Experiment Station near Akron, Colorado. Estimated monthly recharge rates varied from a low of 0.02 inches to a high of 1.42 inches. Comparison of the Akron recharge estimates with other data indicates the values were acceptable. An average annual recharge of 4 inches was computed for the Akron site. This result was compatible with the observed rise of 3 feet in the local water table during the same time period.
W76-09761

ROLE OF CARBONATE ROCKS IN MODIFYING FLOOD FLOW BEHAVIOR,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2A.
W76-09784

THE CRITICAL DEPTH OF THE LEVEL OF SOIL-SALINIZING GROUND WATERS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W76-09808

RECONNAISSANCE MAP SHOWING RELATIVE AMOUNTS OF SOIL AND BEDROCK IN THE MOUNTAINOUS PART OF THE MORRISON-EVERGREEN QUADRANGLES AND ADJOINING AREAS TO THE WEST IN JEFFERSON COUNTY, COLORADO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09825

REPORT OF WATER LEVELS IN SELECTED OBSERVATION WELLS IN UTAH--APRIL 1976,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-09832

OPERATION AND MAINTENANCE OF A DEEP-WELL WATER-LEVEL MEASUREMENT DEVICE, 'THE IRON HORSE',
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-09835

GEOCHEMICAL AND ISOTOPIC ANALYSES OF WATERS ASSOCIATED WITH THE EDWARDS LIMESTONE AQUIFER, CENTRAL TEXAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-09836

A PROPOSED ALGORITHM FOR THE SOLUTION OF THE LARGE-SCALE INVERSE PROBLEM IN GROUNDWATER,
California Univ., Los Angeles. Dept. of Engineering Systems.
S. Chang, and W. W-G. Yeh.
Water Resources Research, Vol. 12, No. 3, p 365-374, June 1976. 4 fig, 7 tab, 23 ref. (California Water Resources Center project W290).

Descriptors: *Algorithms, *Groundwater, Flow, *Mathematical models, Constraints, Equations, Least squares method, Systems analysis, *Model studies, *Base flow.
Identifiers: Parameter identification, Quadratic programming.

A new algorithm is introduced for the solution of the problem of parameter identification associated with a two-dimensional unsteady state groundwater flow. The parameters to be identified are functions of the space variables. It is assumed that some observations on the dependent variable of the governing equation are available. The unknown parameters are directly identified from observations. An implicit finite difference scheme is used to approximate the original partial differential equation. A least squares criterion function is employed. The identification problem is then formulated as a standard quadratic programming representation by quasi-linearization. The formulation is further modified by a simple matrix operation which drastically reduces the dimension of the constraint set. The new algorithm is shown to be very effective in solving the large-scale inverse problem, and it is easily implemented, rapidly convergent, and able to handle any inequality constraints, a feature that is essential for such a problem. (Bell-Cornell)
W76-09850

MATHEMATICAL MODEL OF FLOW IN A STREAM-AQUIFER SYSTEM,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-09966

NUCLEAR TECHNIQUES IN HYDROLOGICAL STUDIES,
Uppsala Univ. (Sweden). Dept. of Hydrology; and Uppsala Univ. (Sweden). Dept. of Physical Geography.
E. Eriksson.
Indian Soc Nuclear Tech Agric Biol Newsl. 2(2), p 51-54, 1973.

Descriptors: *Groundwater movement, Water supply, Water sources, Asia, Groundwater recharge, Root zone.
Identifiers: *Nuclear techniques(Hydrology), *India.

Nuclear methods for evaluating ground water supplies, movement of ground water, root zone water, recharge rate and origin of ground water are

LIBRARY U. OF A. ...

discussed and applied to water problems in India.--Copyright 1974, Biological Abstracts, Inc.
W76-09996

2G. Water In Soils

EFFECT OF DIFFERENT SPRING SOIL MOISTURE LEVELS ON MOISTURE STRESS,
National Weather Service, Cincinnati, Ohio. River Forecast Center.
For primary bibliographic entry see Field 3F.
W76-09412

WATERSHED RESPONSE TO PARTIAL AREA APPLICATIONS OF SIMULATED RAINFALL,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 2A.
W76-09467

EFFECT OF THINNING ON THE FOLIAGE AND FOREST FLOOR PROPERTIES OF PONDEROSA PINE STANDS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 4A.
W76-09474

WATER CONSERVATION IN ARID-ZONE SOILS,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3B.
W76-09478

WATER UTILIZATION AND SOIL SALINITY: CONTROL IN ARID ZONE AGRICULTURE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3C.
W76-09482

REDOX POTENTIAL IN IRRIGATED DESERT SOILS AS AN INDICATOR OF AERATION STATUS,
Imperial Valley Conservation Research Center, Brawley, California.
B. D. Meek, and L. B. Grass.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 870-875, Sept-Oct, 1975. 10 fig, 2 tab, 15 ref.

Descriptors: *Oxidation-reduction potential, *Irrigation effects, *Soil-water-plant relationships, *Sierozems, Sprinkler irrigation, Flood irrigation, Soil moisture, Soil microorganisms, Arid lands, Environmental effects, Soil temperature, Soil tests, Aeration.
Identifiers: Drip irrigation, Oxygen diffusion rate.

Six experiments were designed to evaluate the effects of temperature, flooding time, soil water content, and energy source on the redox potential (Eh) of irrigated desert soils. Field heterogeneity required the use of 10 to 20 electrodes placed in a 30-cm square to characterize a treatment. Eh varied over a short distance, with no effects due to poisoning or erratic electrode readings; a 5 C temperature increase at the 15-cm depth caused a 50-mV drop in redox potential. Soil saturation time correlated directly with Eh decline; Eh decreased less during drip or sprinkler irrigation than when soil was flooded. To lower Eh, soil moisture must be increased beyond a critical value to seal the surface to atmospheric oxygen. Measurement of the oxygen diffusion rate and quantities of iron or manganese in the soil solution will aid determination of the soil's aeration status. (Jahns-Arizona)
W76-09488

A QUANTITATIVE ANALYSIS OF THE FACTORS AFFECTING PLANT NUTRIENT UPTAKE FROM SOME SOILS,
University of Oxford, Oxford, England, Soil Science Laboratory.
J. P. Baldwin.
Journal of Soil Science, Vol. 26, No. 3, p 195-206, Sept., 1975. 3 fig, 22 ref.

Descriptors: *Nutrients, *Soil moisture, *Root systems, *Plant growth, *Soil-water-plant relationships, Soil analysis, Nutrient requirements, *Absorption, Soil structure, Potassium, Phosphates, Nitrates, Fertilizers.
Identifiers: *Nutrient uptake, Nutrient diffusion.

A model is discussed for a growing root system's absorption of nitrate, phosphate and potassium in soils supporting grasses and arable crops. The main determinants in nutrient supply are its total diffusible quantity, the rate at which the nutrient can move and the distance it must travel to a root surface. Diffusion coefficients for potassium and phosphate are often low, with mass flow adding little to the supply; a well-developed root system is required for adequate exploitation of soil reserves. Nitrate, however, moves easily to roots, either by diffusion or mass flow and the entire rooting volume is depleted fairly rapidly. These findings suggest that crop performance in a particular soil is influenced by individual root system morphologies. Soil structure and moisture regimes are crucial in determining the hospitality of a soil to plant roots. These factors deserve equal attention with chemical composition of the soil when formulating fertilizer recommendations. (Jahns-Arizona)
W76-09489

STABILITY ANALYSIS OF INFILTRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia), Div. of Environmental Mechanics.
J. R. Philip.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1042-1049, November-December 1975. 1 tab, 21 ref, 1 append.

Descriptors: *Infiltration, *Stability, Mathematical studies, *Equations, *Seepage, Gravitational water, Infiltration rates, Movement, Percolation, Ponding, Soil moisture, Soil water movement, Unsaturated flows, Laboratory tests, Hydrodynamics, Model studies, Water pressure, Soils.
Identifiers: *Wetting fronts, *Nonswelling soils, *Stability analysis, Delta-function model.

A rigorous hydrodynamic stability analysis of the delta-function model of infiltration was developed. Raats recently proposed as the criterion for instability that wetting front velocity should increase with front penetration. This detailed analysis, on the other hand, showed that the fundamental criterion is that the water pressure gradient immediately behind the front should oppose the flow. The two criteria agree only in the special case where five significant parameters of the system are all constant and independent of depth, or of depth to the front. The Raats criterion fails in the various more general cases with one or more of these quantities variable. Care should be exercised in applying results for the delta-function model to flows with gradual wetting fronts, especially when nonwetting strata are involved. (Prickett-ISWS)
W76-09588

NITROGEN IN THE SUBSURFACE ENVIRONMENT,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
For primary bibliographic entry see Field 5B.
W76-09662

UPWARD WATER MOVEMENT IN FIELD CORES,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-09726

COMPUTER ESTIMATES OF NATURAL RECHARGE FROM SOIL MOISTURE DATA - HIGH PLAINS OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-09761

TRANSFORMATION OF CONCENTRATED AND COMPLEX PHOSPHORUS FERTILIZERS IN MODOW-BOG SOIL WITH A HIGH MOISTURE CONTENT, (IN AZERBAIJANI),
For primary bibliographic entry see Field 5B.
W76-09786

THE LEACHING BEHAVIOR OF DIFFERENT NITROGEN SOURCES IN LYSIMETER EXPERIMENTS, (IN GERMAN),
Badische Anilin- und Soda-Fabrik A. G., Ludwigshafen am Rhein (West Germany). Landwirtschaftliche Versuchsstation.
J. Jung, and J. Dressel.
Z Acker-Pflanzenbau. 140(1), p 1-10, 1974.

Descriptors: *Leaching, *Fertilizers, *Lysimeters, *Nitrogen, Instrumentation, *Percolation, Soils, Crop response, Nutrients, Cover crops, *Cereal crops.

Nitrogen losses from percolation were mainly due to the amount and distribution of rainfall. The extent of leaching during the 6 summer months was affected by the crop cover. The amount of rainfall had considerable influence on N leaching when there was no winter crop (6 winter months) or when rainfall exceeded the water requirements of the plants and the water capacity of the soil. Leaching of the slow-release N fertilizers was dependent to a large degree on crop rotation. Reduced leaching was ascertained for plants with a long vegetation period. Where this condition was not present, the leaching losses were greater than those for mineral fertilizers. With a vegetable/root crop rotation the slightly soluble N forms, as a result of initially low nutrient needs and the relatively long growth period of the cultivated plants, produced a superior yield to that of the normal N fertilizers due to lower leaching losses. Conversely, with the addition of slightly soluble N to the root crop/cereal rotations the yield was markedly lower. This was probably due to the deviation in the N requirement curve of cereal and the 'dosed' release of slightly soluble N. With mineral N and slightly soluble N the leaching losses were higher from fall than from spring fertilization. This can be mainly attributed to the relatively mild winter conditions at the trial site.--Copyright 1975, Biological Abstracts, Inc.
W76-09793

THE WATER SUPPLY SYSTEM OF SOIL AND NITROGEN LOSS WITH RUNOFF WATERS IN NONCHERNOZEM AREAS, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR).
I. S. Shatilov, A. G. Zamaraev, and G. V. Chapovskaya.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina. 11, p 5-7, 1974.

Descriptors: Water supply, *Nitrogen, Runoff, Soils, Rainfall, *Soil moisture, Snowmelt, *Fertilization, Crop production, Wheat.
Identifiers: Nonchernozem soils.

The water supply of soil is ensured by fall rainfall and soil moisture transfer during winter to the freezing zone. Winter precipitation as melted water is accumulated in fields with a deviation of 0.008-0.015. N loss in water during (NH4)2NO3 administration by snow is more than half of the

amount administered, almost 1/3 in early spring fertilization of winter crops. Thus N fertilization of winter crops is essential for ensuring the increase in yield. The studies were made in Moscow and Leningrad, USSR.--Copyright 1975, Biological Abstracts, Inc.
W76-09794

EFFECT OF AN ELECTRIC CURRENT ON WATER STABILITY OF THE STRUCTURE OF SALINIZED SOLONETZ, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
P. K. Roy.
Biol Nauki. 17(12), p 113-117, 1974.

Descriptors: *Saline soils, Saline water, Soil structure, *Soil aggregates, *Electric currents, *Permeability, *Soil stability, Soil horizons.
Identifiers: *Salonetz soils.

The passage of an electric current through salinized solonetz during its flushing increased the content of water-stable aggregates. Under the effect of the current the impervious lower gypsum-bearing horizons became permeable.--Copyright 1975, Biological Abstracts, Inc.
W76-09804

METHOD OF EVALUATING THE EFFECTIVENESS OF TECHNIQUES FOR INCREASING THE RESISTANCE OF SOILS TO EROSION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
For primary bibliographic entry see Field 4D.
W76-09805

THE CRITICAL DEPTH OF THE LEVEL OF SOIL-SALINIZING GROUND WATERS, (IN RUSSIAN),
V. I. Chkhikvishvili.
Soobshch Akad Nauk Gruz SSR. 77(1), p 153-156, 1975.

Descriptors: *Leaching, *Salts, *Soil horizons, Groundwater, Mineral water, Irrigation, Drainage, *Saline soils, Depth.
Identifiers: *USSR(Georgia).

In the poorly drained plains and drainless depressions of the irrigated zone of Georgia USSR, considerable quantities of salts are leached annually into the soil horizons by mineralized ground waters lying at depths of 1.6-2.5 m.--Copyright 1975, Biological Abstracts, Inc.
W76-09808

RECONNAISSANCE MAP SHOWING RELATIVE AMOUNTS OF SOIL AND BEDROCK IN THE MOUNTAINOUS PART OF THE MORRISON-EVERGREEN QUADRANGLES AND ADJOINING AREAS TO THE WEST IN JEFFERSON COUNTY, COLORADO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09825

METHOD AND COMPOSITION FOR PREVENTING WATER CONTAMINATED WITH INDUSTRIAL WASTE FROM SEEPING THROUGH SOIL CONTAINING SAID WATER,
American Colloid Co., Skokie, Ill. (Assignee).
For primary bibliographic entry see Field 5G.
W76-09858

THE MODIFIED FERNOW FROST GAGE,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 7B.
W76-09880

VOLUME CHANGES IN SWELLING CLAYS,
Calif. State Coll., Rohnert Park.
G. Sposito.
Soil Sci. 115(4), p 315-320, 1973.

Descriptors: *Clays, Thermodynamics, Compressibility, *Montmorillonite, Sodium, *Soils, Absorption.
Identifiers: *Swelling clays.

A thermodynamic description of swelling by a clay-water-air system is presented. This description, at constant temperature, is identical with the mechanical theory of swelling developed by Philip. A new relationship is derived which shows the connection between the shrinkage curve, the load line, the swelling pressure and the compressibility of a clay at any water content. This relation is applied to the pressure-chamber data of Anderson and Low to compute the partial density of water adsorbed by Na-montmorillonite.--Copyright 1974, Biological Abstracts, Inc.
W76-09881

EVAPORATION FROM HIGHLY SALINE SOILS IN AN EXPERIMENTAL PLOT IN THE TURKMEN SSR, (IN RUSSIAN),
For primary bibliographic entry see Field 2D.
W76-09887

THE QUALITATIVE ORGANIC MATTER COMPOSITION OF SOME MARSHY SOILS OF NIZHNEVELIKORETSK PLAIN, (IN RUSSIAN),
Leningrad State Univ. (USSR).
N. N. Matinyan, and A. Yu. Pertsovich.
Vestn Leningr Univ Ser Biol. 1, p 129-134, 1974.

Descriptors: *Organic matter, *Bogs, Marshes, Soils, Drainage, Soil horizons, Cultivation, Plains, Acids, *Fulvic acids.
Identifiers: *USSR(Nizhnevelikoretsk plain).

The qualitative organic matter composition of heavy textured marshy (bog) soils and the influence of a drainage were studied. An increase of the degree of bogginess is accompanied by an accumulation of organic matter in the A1 horizon at the expense of the most mobile fractions. Drainage and cultivation lower the general quantity of the organic matter and decrease of fulvic acids.--Copyright 1975, Biological Abstracts, Inc.
W76-09888

EFFECT OF EXCESS SOIL MOISTURE ON THE CONTENT OF PHOSPHORUS COMPOUNDS IN BARLEY, (IN RUSSIAN),
Leningrad State Pedagogical Inst. (USSR). Dept. of Botany.
For primary bibliographic entry see Field 3F.
W76-09913

INVESTIGATIONS ON THE ERODIBILITY OF A DEEPLY PLOWED GRAY-BROWN PODZOLIC SOIL FROM LOESS ON A SLOPE BY MEANS OF SIMULATED RAIN, (IN GERMAN),
Niedersaechsisches Landesamt fuer Bodenforschung, Hanover (West Germany).
For primary bibliographic entry see Field 2J.
W76-09917

COMPARATIVE STUDY IN MEASURING FLUID SURFACE TENSION AND FLUID CONTENT WITH THE AID OF ELECTRICAL RESISTANCE ELEMENTS 'IN SITU' AND IN THE LABORATORY, (IN FLEMISH),
H. Verplancke, R. Hartmann, and M. De Boodt.
Meded Fac Landbouwwet Rijksuniv Gent. 38(1), p 51-66, 1973.

Descriptors: *Moisture tension, Measurement, *Surface tension, *Soil moisture, *Electrical resistance, Calibration.

The moisture tension or suction of a soil 'in situ' can be measured with electrical resistance units. Calibration curves, expressing the electrical resistance in terms of soil moisture tension, can be made as well in the laboratory as in the soil 'in situ.' A study was made of the accuracy of 3 calibration procedures, i.e., the 'in situ calibration' and 2 laboratory ones, respectively on undisturbed and disturbed soil samples. The laboratory calibration procedure on undisturbed soil samples proved best. Here the use for suction measurements only is recommended. Hysteresis phenomena complicate the calibration and so the units should not be used for moisture content measurements.--Copyright 1974, Biological Abstracts, Inc.
W76-09923

STEADY-STATE METHOD OF MEASURING UNSATURATED HYDRAULIC CONDUCTIVITY,
Battelle Pacific Northwest Labs., Richland, Wash. Water and Land Resource Dept.
J. J. C. Hsieh, and C. G. Enfield.
Commun Soil Sci Plant Anal. 5(2), p 123-129, 1974.

Descriptors: *Hydraulic conductivity, Measurement, Soil water, Moisture content, Soil moisture, Unsaturated flow.
Identifiers: Steady state method.

The technique is simple to perform as a routine operation, and the hydraulic conductivity for the entire field moisture range can be determined from a single experiment. By controlling the water potential at the porous plate bottom of an open soil container and controlling the rate of evaporation from the soil surface, a steady-state or constant water flux through the soil column was obtained. Several temperature compensated soil psychrometers were used to measure the potential gradient of the water in the soil column. The water flux was measured using a calibrated water supply. The steady-state hydraulic conductivity can be determined as a function of water potential.--Copyright 1974, Biological Abstracts, Inc.
W76-09924

THE SOFTENING OF THE KANTO VOLCANIC ASH SOIL, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Agricultural Engineering.
M. Komamura, and H. Takenaka.
J Agric Sci Tokyo Nogyo Daigaku. 17(4), p 331-341, 1973.

Descriptors: *Soil moisture, Asia, Testing procedures, Soil compaction.
Identifiers: *Soil softening, *Japan(Kanto volcanic ash soil).

The softening of the soils is an important problem in earth work. Relationships between softening of the Kanto volcanic ash soil (Japan) and change of suction of soil moisture (pF) were studied. Cone penetration, unconfined compression, triaxial compression and pF of the soil water were measured. The degree of softening is different in each soil layer. The relationship between pF and the cohesion of soil is log10C = pF. Softening index (S) defined by pF value is useful to judge the degree of softening.--Copyright 1974, Biological Abstracts, Inc.
W76-09925

EFFECT OF WATER QUALITY AND MANAGEMENT PRACTICES ON SOME CHEMICAL PROPERTIES OF SOILS,
West Pakistan Agricultural Univ., Lyallpur. Dept. of Soil Sciences.
For primary bibliographic entry see Field 3C.
W76-09926

LIBRARY U. OF I. URBANA-CHAMPAIGN

DEPENDENCE OF PASTURE GRASS YIELD ON SOIL MOISTURE LEVEL, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR).
For primary bibliographic entry see Field 4A.
W76-09930

TOTAL POROSITY AND PORE SIZE DISTRIBUTION IN UNTILLED AND TILLED LOESS SOILS, (IN GERMAN),
Goettingen Univ. (West Germany). Institut fuer Pflanzenbau und Pflanzenzuechtung.
W. Ehlers.
Z Pflanzenernaehr Bodenkd. 134(3), p 193-207, 1973.

Descriptors: *Loess, Soils, *Podzols, *Porosity, Seasonal, Cultivation, Tillage.

Soil samples were collected from a 2-6 cm depth of a gray brown podzolic soil (Typudalf) derived from loess. Total porosity differed in untilled and tilled plots on the average by 4.7 vol. %. The seasonal changes were pronounced on tilled soil. Values of total porosity were higher during spring and fall than during summer. Values were influenced by soil cultivation, rainfall and green manure crops. The changes of the fraction of large pores (>30 microns), expressed on a volume basis, were similar to the changes in total porosity in direction but greater in extent. The seasonal changes of the fractions of medium pores (3-30 microns), small pores (0.2-3.0 microns) and very small pores (<0.2 microns) were apparently independent of the changes in total porosity. Compacting and loosening the soil affected mainly the amount of large pores. The seasonal changes of soil water content in the field influenced pore size distribution. With constant total porosity, increasing water content induced pore size redistribution in favor of the pores >300 microns and 1.5-3.0 microns. A decrease in total porosity did not induce an increase in homogeneity. The average total porosity of the untilled and tilled soil was near the lower and upper limits, respectively, of the range, which was considered to be the optimum for air capacity.--Copyright 1975, Biological Abstracts, Inc.
W76-09939

STUDIES ON THE RELATIONSHIPS BETWEEN MOISTURE AND SUCTION IN SOME SOILS OF THE TISA PLAIN, (IN RUMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
S. Balan.
An Inst Stud Cercet Pedol. 40, p 31-43, 1972(1974).

Descriptors: *Soil moisture, Moisture content, *Chernozems, Europe, Soil texture, Distribution, Grains.
Identifiers: *Romania(Tis Plain), Suction.

In finely textured wet meadow soils, the interaction phenomena between water and colloidal soil particles are more intense than in meadow chernozems, carbonate meadow chernozems, leached chernozems and other medium-textured soils of the Tisa Plain (Romania). The interactions between water and soil particles are closely correlated to texture and mineralogical composition. The medium-textured chernozems of the Western Plain, influenced or not by ground water, have a water-holding capacity corresponding to a suction of 1/3 atm; in heavy soils having a very fine grain size distribution (>80% clay below 2 microns) it ranges 2/3-1 atm. Highly significant correlations exist between the nature and content of the clay fraction <2 microns in size, the cation exchange capacity, the hygroscopicity coefficient, the specific surface and the humidity corresponding to suctions of 15, 8, 4 and 1 atm.--Copyright 1975, Biological Abstracts, Inc.
W76-10000

2H. Lakes

CHARACTERISTICS OF COASTAL CIRCULATION AFFECTING THE TRANSPORT AND DISPERSION OF MATERIAL RELEASED FROM THE NUCLEAR INDUSTRY,
Energy and Research and Development Administration, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-09504

HYDROLOGIC AND CHEMICAL ANALYSIS OF THE PRINCIPAL PIEDMONTESE TRIBUTARIES OF LAGO MAGGIORE IN RELATION TO ITS TROPHIC MODIFICATIONS, (IN ITALIAN),
For primary bibliographic entry see Field 5C.
W76-09576

PHOSPHORUS AND NITROGEN CYCLE ON A TRANSECT IN LAKE ONTARIO DURING THE INTERNATIONAL FIELD YEAR 1972-1973 (IFYGL),
Canada Centre for Inland Waters, Burlington (Ontario). Applied Limnology and Physical Processes Section.
For primary bibliographic entry see Field 5C.
W76-09594

PHYTOPLANKTON OF THE SALINE WATERS OF KANEM (CHAD): X. CONCLUSIONS, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Dept. of Hydrobiology.
A. Iltis.
Cah O R S T O M Ser Hydrobiol. 9(1), p 13-17, 1975.

Descriptors: Phytoplankton, Saline water, Ponds, Cyanophyta, Africa, Aquatic algae, Biomass, Salinity, Lakes.
Identifiers: *Lake Chad(Chad).

The algal flora of saline waters of Kanem near Lake Chad does not have a pronounced tropical character. Cyanophyta generally compose the major part of the phytoplanktonic biomass. A positive correlation exists between algal density and salinity. Specific diversity and Motomura's constant decrease in relation to the increase in salinity. According to the salinity and the biological characteristics, 3 biological zones may be defined among the permanent lakes. In the temporary ponds, algal populations evolve rapidly and continually. (See also W75-06778, W73-13796)--Copyright 1976, Biological Abstracts, Inc.
W76-09596

ON LONG-TERM STABILITY OF ZOOPLANKTON COMPOSITION,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 5C.
W76-09600

AN UNDERWATER TEMPERATURE-DEPTH DATA COLLECTION DEVICE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
D. N. Baumgartner.
Special Report No. 26, February 1976. 30 p, 15 fig, 1 tab, 4 ref, 3 append.

Descriptors: *Pressure measuring instruments, *Lake Michigan, *Great Lakes, *Water temperature, *Water pressure, *Instrumentation, Underwater, Data collections, Remote sensing, Electrical equipment, Physical properties, Electricity, Electrical engineering, Properties, Thermal properties, Water properties, Surface waters, Depth.
Identifiers: *Temperature-depth probe(Underwater), Signal transmission, Submerged probe, Data demodulation, Tape recorder, Probe circuit, Probe housing.

An underwater probe has been constructed which, when towed by a vessel, transmits temperature and pressure (depth) information to a receiver and recorder on deck. A carrier signal, which is frequency modulated by temperature and pressure, is sent up the towing cable which also is used to conduct power to the probe. The ondeck receiver records the modulated carrier signal on a low-cost cassette tape recorder. The temperature and pressure information are demodulated and can be monitored or recorded as voltage analog outputs. (Henley-ISWS)
W76-09727

CHANGES IN THE SEDIMENTATION CHARACTERISTICS OF AN URBANIZING WATERSHED, DALLAS AND COLLIN COUNTIES, TEXAS,
Texas Dept. of Community Affairs, Austin.
For primary bibliographic entry see Field 4C.
W76-09745

MATERIALS BUDGETS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W76-09756

SEDIMENTATION RATES AND SEDIMENT THICKNESS IN LAKE CHAMPLAIN,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W76-09759

SEDIMENT PROPERTIES, LAKE CHAMPLAIN: 1971-1975,
Vermont Univ., Burlington. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-09763

VERIFICATION OF NUMERICAL MODELS OF LAKE ONTARIO, III. LONGTERM HEAT TRANSPORTS,
Canada Centre for Inland Waters, Burlington (Ontario).
T. J. Simons.
Journal of Physical Oceanography, Vol. 6, No. 3, p 372-378, May 1976. 5 fig, 11 ref.

Descriptors: *Heat transfer, *Model studies, *Lake Ontario, *Great Lakes, Circulation, Water circulation, Mixing, Mathematical models, Heat, Temperature, Water temperature, Lakes, Limnology.
Identifiers: Model verification.

Numerical computations of water circulations, combined with observed temperature distributions, permit estimates of heat transports in Lake Ontario throughout the 1972 International Field Year. Weekly estimates of heat budgets and surface fluxes are available from ship surveys and meteorological observations, thus allowing for validation of model results. Whereas the hydrodynamic model employs a grid mesh of 5 km, the present verification study was based on 21 lake zones, with the mean depth contour separating shore zones from mid-lake areas. Agreement between simulations and observations ranged from satisfactory to poor, as a function of both time and space. The model was found to perform best along the north shore and in the fall season. Analysis of the results points at low model resolution and gaps in the observational network as the major causes of failure to reproduce south shore heat transports. Persistent overestimates of heat advection by vertical circulations were ascribed to the present structure of the hydrodynamic model. A brief discussion was included of the present heat

transport calculations in the context of estimating vertical mixing properties for different lake zones. (See also W75-01987 and W75-07462) (Sims - ISWS)
W76-09783

SEDIMENTATION AND PHOSPHORUS BALANCE IN LAKE LUCERNE (HORW BAY) AND IN THE ROTSEE, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W76-09790

ROTIFER PRODUCTION IN LAKE BAIKAL, (IN RUSSIAN),
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 5C.
W76-09791

THE ALGAL POPULATION OF DUEMMER LAKE IN THE YEARS 1970/71, (IN GERMAN),
Niedersaechsische Landesinstitut Marschen und Wurtenforsch., Wilhelmshaven (West Germany).
For primary bibliographic entry see Field 5C.
W76-09812

IRON-MANGANESE MICROORGANISMS STUDIED BY OVERGROWING TECHNIQUE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institute of Lakes Keeping.
For primary bibliographic entry see Field 5A.
W76-09813

CHARACTERISTICS OF THIONIC BACTERIA FROM THE LAKES OF THE MARI ASSR, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-09814

THE ROLE OF MICROFLORA IN THE PRODUCTIVITY OF A SALMON BREEDING LAKE, (IN RUSSIAN),
Akademiya Nauk SSSR, Borok. Inst. of Biology Inland Waters.
For primary bibliographic entry see Field 5C.
W76-09818

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-09829

CALCULATION OF WATER TEMPERATURES IN CLEAR LAKE, IOWA,
Ichthyol. Assoc., Berwick, Pa. Icthyological Associates, Inc., Berwick, Pa.
For primary bibliographic entry see Field 5B.
W76-09879

FEEDING HABITS OF THE POPULATION OF WHITEFISH (COREGONUS LAVARETUS (L.)) IN HAUGATJERN: A EUTROPHIC NORWEGIAN LAKE,
Tromsoe Museum (Norway). Dept. of Norway.
O. J. Jacobsen.
Norw J Zool. 22(4), p 295-318, 1974.

Descriptors: Eutrophication, Lakes, Daphnia, *Fish diets, Seasonal, *Fish food organisms, Spawning, Zooplankton.
Identifiers: Coregonus-Lavaretus, Cyclops, *Whitefish, *Fish feeding habits, *Norway(Haugatjern Lake).

Mature whitefish from Lake Haugatjern, probably the most productive Norwegian fishing water, fed most intensively during and just after the spring turnover; the females increased their food uptake just after the spawning season also. The variations in feeding intensity were probably due to hydrographical and physiological factors. Immature fish fed more intensively than older fish, but not with such regular fluctuations as the mature fish. In the summer the mature fish fed mostly on zooplankton and during the rest of the yr on bottom food; zooplankton food always dominated in 0-2 yr old whitefish. Daphnia was selected by all whitefish groups and was the most important plankton item; Cyclops was avoided.
W76-09882

THE VEGETATION OF THE 'LUKNIANY LAKE' NATURE RESERVE IN THE MAZURIAN LAKE DISTRICT,(IN POLISH),
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Inst. of Plant Biology.
For primary bibliographic entry see Field 5C.
W76-09990

PRIMARY PRODUCTION IN THE FROZEN LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 5C.
W76-09991

THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN LAKE BALATON APRIL-SEPTEMBER 1972,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 5C.
W76-09992

2I. Water In Plants

COMPARATIVE EVALUATION OF FOOD PLANTS OF THE ARARAT COCHINEAL SCALE (PORPHYROPHORA HAMELII) (IN RUSSIAN),
Akademiya Nauk Armyanskoi SSR, Erevan. Institut Zoology.
A. A. Sevumyan, S. M. Sarkisyan, R. N. Sarkisov, and R. A. Galstyan.
Biol Zh Arm 27(11); p 96-98, 1974.

Descriptors: *Grasses, *Microorganisms, Parasitism.
Identifiers: Aeluropus-Litoralis, Ararat, Cochineal scale, *Food plants, Phragmites, Australis, Porphyrophora-Hamelii, *Scale, Shore grass, *Reeds.

Information is given on the comparative value of food plants, the shore grass Aeluropus littoralis and the reed Phragmites austrais, of the Ararat cochineal scale, obtained on the basis of the degree of infestation by the scale under natural conditions and by a comparison of the weight, length, width and fecundity of female scales on these plants. The reed is a second food plant for the scale, the primary plant being the shore grass.-Copyright 1975, Biological Abstracts, Inc.
W76-09406

EFFECT OF THINNING ON THE FOLIAGE AND FOREST FLOOR PROPERTIES OF PONDEROSA PINE STANDS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 4A.
W76-09474

DROUGHT ADAPTATIONS IN TWO CALIFORNIAN EVERGREEN SCLEROPHYLLS,
Australian National Univ., Canberra. Dept. of Environmental Biology; and Australian National Univ., Canberra. Research School of Biological Sciences.
P. A. Morrow, and H. A. Mooney.
Oecologia (Berl). 15(3), p 205-222, 1974.

Descriptors: California, *Evergreens, *Water stress, *Drought resistence, Plant morphology, Plant physiology.
Identifiers: Arbutus-Menziesii, Heteromeles-Arbutifolia, *Sclerophylls.

A field study was initiated to determine the patterns of water stress imposition and stomatal resistance to gas exchange in representative species of 2 evergreen sclerophyllous communities in California. In concurrent experiments, plant water potential, temperature and vapor pressure gradient were varied to determine the relative importance of morphological and physiological parameters in delaying onset of water stress during drought periods. In general, stomatal and photosynthetic responses to water stress were similar in both species. Both were able to fix C even when leaf water potentials dropped as low as -25 bars. Stomatal movements were positively correlated with soil water potential rather than to leaf water potential. Water stress developed much more rapidly in Arbutus menziesii, a plant of more northerly distribution, than in Heteromeles arbutifolia where they occur on adjacent sites. Morphological parameters were primarily responsible for the very different patterns of water stress imposition. Consequently, Arbutus is limited to areas of shorter drought duration than is Heteromeles and this is reflected in their differing distributions.--Copyright 1975, Biological Abstracts, Inc.
W76-09476

DISTRIBUTION OF PONDEROSA PINE FOREST DENSITIES ON THE SALT-VERDE RIVER BASIN,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 4A.
W76-09477

A QUANTITATIVE ANALYSIS OF THE FACTORS AFFECTING PLANT NUTRIENT UPTAKE FROM SOME SOILS,
University of Oxford, Oxford, England, Soil Science Laboratory.
For primary bibliographic entry see Field 2G.
W76-09489

ON THE ECOLOGY OF COLLEMBOLA AND ORIBATIDS IN A LANDSEA TRANSITION ZONE (COLLEMBOLA, INSECTA-ORIBATEI, ACARI) (IN GERMAN),
Kiel Univ. (West Germany). Zoologisches Institut.
For primary bibliographic entry see Field 2L.
W76-09635

A DESCRIPTION OF ATLANTIC MACKEREL, SCOMBER SCOMBRUS, EGGS AND EARLY LARVAE,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Lab.
P. L. Berrien.
Fishery Bulletin, Vol. 73, No. 1, p 186-192, 1975, 2 fig, 2 tab, 22 ref.

Descriptors: Biology, Embryonic growth stages, *Growth stages, *Eggs, Larvae, Fish.
Identifiers: *Atlantic mackerel.

Eggs and early larvae stages of laboratory reared Atlantic mackerel are described. The purpose was to augment published descriptions of the species. The diameter of the eggs ranged from 1.01 to 1.28 mm and of those that were cultured the mean

LIBRARY U. OF I. URBANA-CHAMPAIGN

diameter was 1.20 mm. The cultured eggs were stripped from a single female. The eggs were spherical and had a single, yellowish oil globule, 0.22 to 0.38 mm in diameter. Soon after blastopore closure, melanophores assume a distinct pattern on the embryo and are present on the oil globule but absent from the yolk surface until immediately prior to hatching. Hatching occurred between 90 and 102 h after fertilization at an average temperature of 13.8 degrees C. This was a slightly faster rate of development than had been previously reported. The yolk-sac stage ended by 137 h for the yolk in all specimens was absorbed by that time. (Chilton-ORNL)
W76-09656

EFFECTS OF FLOODING AND OF IRRIGATION WATER SALINITY ON EUCALYPTUS CAMALDULENSIS DEHN. FROM THREE SEED SOURCES,
Volcani Inst. of Agricultural Research, Ilanot (Israel). Forestry Div.
For primary bibliographic entry see Field 3C.
W76-09664

CONTRIBUTION OF SALTS TO THE WATER POTENTIAL OF WOODY PLANTS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 3C.
W76-09691

SUGAR BEET PHOTOSYNTHESIS AND PRODUCTIVITY CULTIVATED BY IRRIGATED FARMING IN THE KIRGIZ SSR, (IN RUSSIAN),
Kirghiz State Univ., Frunze (USSR).
For primary bibliographic entry see Field 3F.
W76-09810

PHYTOMASS DYNAMICS OF ABOVEGROUND AND UNDERGROUND ORGANS OF MEADOW STEPPE PLANTS, (IN RUSSIAN),
T. Khoang.
Byull Mosk O-Va Ispyt Prir Otd Biol. 79(4), p 139-141, 1974.

Descriptors: Soil moisture, Vegetation. *Growth rates, *Plant growth, *Plant physiology, Arid lands, Degradation(Decomposition), Deserts, *Meadows, Weather.
Identifiers: Phytomass(Plants), Meadow steppe plants, USSR.

The mass of aboveground plant organs had a single maximum in June due to high soil moisture conditions, followed by a dying-off which peaked in Sept. then decreased due to autumn rains. The underground phytomass had maxima in both June (the higher) and Aug. Accumulation of dead aboveground and underground organs during the vegetation period was associated with varying decomposition rates which in turn depended on weather conditions. In a wet year the aboveground organ mass greatly increased. The underground organs grew more intensively during a hot and dry year. The underground organs apparently develop more strongly both in unfavorable locations (desert and semi-desert) and unfavorable years, although these results could have been due to the periodic growth exhibited by perennials.--Copyright 1975, Biological Abstracts, Inc.
W76-09817

HYDRATABILITY AS A PARAMETER OF PLANT WATER POTENTIAL, (IN FRENCH),
Louvain Univ. (Belgium). Laboratoire d'Ecologie Vegetale.
R. Iserentant.
Bull Soc R Bot Belg. 107(2), p 305-322, 1974.

Descriptors: *Hydration, *Turgidity, Plant physiology, Calibration, Saturation.
Identifiers: *Hydratability, Dry matter, *Water potential(Plants), *Plant water content.

Various expressions of plant water content-water content as a percentage of fresh weight or dry weight, water saturation deficit (WSD) and relative turgidity (RT), hydratability (H)-are critically examined, chiefly as parameters of the water potential (WP), the latter being much more difficult to measure. WSD (or RT) is widely used as a parameter of WP, but the relation WSD (or RT)/WP is specific and calibration is needed for any studied species. Hydratability, which clearly takes into account the ratio of dry matter, displays in terms of WSD a pattern which is similar to that of the WP. The relation H/WP is fairly independent with respect to the specific diversity:hydratability seems thereby a better parameter of the WP than WSD or RT.--Copyright 1975, Biological Abstracts, Inc.
W76-09918

SALINITY TOLERANCE OF INLAND HALOPHYTIC VEGETATION OF NORTH AMERICA,
Caen Univ. (France). Laboratoire de Physiologie Vegetale.
For primary bibliographic entry see Field 3C.
W76-09988

CHANGES IN THE POPULATION OF CLADOCERA AND COPEPODA IN THREE FISHPONDS OF THE DOMBES, (IN FRENCH),
Lyon-1 Univ., Villeurbanne (France). Departement de Biologie Animaux et Zoologie.
C. Amoros.
Ann Limnol. 9(2), p 135-155, 1973.

Descriptors: *Crustaceans, *Copepods, Europe, Carp, Ponds, Climates, Fish, Soils, Fish populations.
Identifiers: *France(Dombes).

Populations of Cladocera and Copepoda were studied in 3 fishponds (in the Dombes, France) of which 1 was refilled with water after 1 yr of culture while empty. The physical-chemial characteristics of the biotope varied with a marked regularity which was a function of climatic factors. Several associations of Cladocera and Copepoda succeeded one another during an annual period after filling with water. The ageing of the pond with reference to its last dry period was shown by a modification of the structure of the crustacean population. Certain species consumed by the carp had a benthic ecophase which enabled them to resist the drainage, the laboring and the cultivation of the soil of the pond; this ensured a rapid repopulation of the pond when it was refilled.--Copyright 1974, Biological Abstracts, Inc.
W76-09995

2J. Erosion and Sedimentation

THE RELATIONSHIP OF THE NEARSHORE LONGSHORE BAR AND SAND WAVES AT OCEAN CITY, MARYLAND,
Geological Survey Baltimore, Maryland.
For primary bibliographic entry see Field 2L.
W76-09569

VISUAL OBSERVATION OF THE SUSPENDED SEDIMENTS AND NEARSHORE ICE SIGNATURES IN CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W76-09571

A PROCEDURE FOR ESTIMATING OFF-SITE SEDIMENT DAMAGE COSTS AND AN EMPIRICAL TEST,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4A.
W76-09632

OVERVIEW OF THE URBAN EROSION AND SEDIMENTATION PROCESSES,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 4C.
W76-09731

EVALUATION AND CONTROL OF SOIL EROSION IN URBANIZING WATERSHEDS,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 4D.
W76-09742

EROSION CONTROL DURING PIPELINE CONSTRUCTION,
Yule, Jordan and Associates, Camp Hill, Pa.
For primary bibliographic entry see Field 5G.
W76-09743

THE INFLUENCE OF URBANIZATION ON STREAM CHANNEL BEHAVIOR,
State Univ. of New York at Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W76-09744

CHANGES IN THE SEDIMENTATION CHARACTERISTICS OF AN URBANIZING WATERSHED, DALLAS AND COLLIN COUNTIES, TEXAS,
Texas Dept. of Community Affairs, Austin.
For primary bibliographic entry see Field 4C.
W76-09745

PREDICTING SEDIMENT YIELD IN URBAN AREAS,
Soil Conservation Service, College Park, Md.
For primary bibliographic entry see Field 4D.
W76-09746

WATERSHED MANAGEMENT AND SEDIMENT CONTROL IN MONTGOMERY COUNTY,
Environmental Protection Agency, Montgomery County, Md. Storm Water Management Section.
For primary bibliographic entry see Field 4D.
W76-09748

CONCENTRATION OF HEAVY METALS IN SEDIMENTS OF A HYDROELECTRIC IMPOUNDMENT,
Montana Univ., Missoula, Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W76-09755

SEDIMENTATION RATES AND SEDIMENT THICKNESS IN LAKE CHAMPLAIN,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. J. Dowling.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 561, $3.50 in paper copy, $2.25 in microfiche. Research Project Technical Completion Report, 1976. 12 p, 4 fig. OWRT A-066-CONN(1), 14-31-0001-6007.

Descriptors: *Lake basins, *Lake beds, *Bedrock, *Sedimentation rates, *Seismic studies, Erosion, Geophysics, *Lake sediments, Lakes.
Identifiers: *Seismic reflection, Unconsolidated sediment thickness, *Refraction measurements, Air gun, *Lake Champlain.

Geophysical investigations were made in Lake Champlain in order to determine the shape of the bedrock surface underlying the lake and to deter-

ine the total sediment thickness overlying the edrock. Combined with previous work, these ata allowed a determination of a sedimentation ate for the lake. Seismic reflection and refraction ieasurements were made using a high frequency ransducer and a lower frequency high energy air un system. The results will provide baseline data or shoreline erosion studies associated with roposed lake-level lowering. In addition, nowledge of unconsolidated sediments near hore is of immediate use in siting municipal ef-luent pipelines. (de Lara-Connecticut)
W76-09759

EDIMENT PROPERTIES, LAKE CHAM-PLAIN: 1971-1975,
Vermont Univ., Burlington. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-09763

THE ERODIBILITY OF PUMICE SOILS OF THE NORTH ISLAND, NEW ZEALAND,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
For primary bibliographic entry see Field 4D.
W76-09787

METHOD OF EVALUATING THE EFFECTIVE-NESS OF TECHNIQUES FOR INCREASING THE RESISTANCE OF SOILS TO EROSION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
For primary bibliographic entry see Field 4D.
W76-09805

RELATIONSHIP OF HEAVY RAINFALL TO SOIL EROSION IN VIEW OF ITS FORECAST-ING, (IN BULGARIAN),
Afforestn. Erosion Control Experimental Station, Sandanski (Bulgaria).
A. Mandev.
Groskostop Nauka. 11(1), p 51-58, 1974.

Descriptors: *Soil erosion, Rainfall, *Forecasting, *Rainfall intensity, *Excessive precipitation, Measurement.

Results were obtained from the measurement of the amount of eroded soil from a permanent plot, 25 m long and 4 m wide, under cultivation, with a slope of 25 degree. Out of the 17 indices of torrential rainfall studied, the most suitable ones proved to be the indices of Wischmeier and Smith, 1958 (W30) and of Stanescu et al., 1968 (R2). Owing to the considerably smaller volume of calculations, the R2 = QI30 index, suggested by Stanescu et al. is recommended. The regression equation of that relationship is Y = 407.91R2 + 881.32, with a correlation coefficient of 0.971 and a variance coefficient of 0.167. In the case of heavy rainfall with a duration of less than 30 min, the R6 = QI30 index is recommended for use with an equation Y = 202.78R6 + 210.37 correlation coefficient 0.972 and 0.21 variance coefficient.--Copyright 1975, Biological Abstracts, Inc.
W76-09807

HYDROLOGY AND SEDIMENTATION OF BIXLER RUN BASIN, CENTRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
L. A. Reed.
Water-Supply Paper 1798-N, 1976. 20 p, 11 fig, 3 tab, 11 ref.

Descriptors: *Sediment transport, *Streamflow, Hydrologic data, *Surface-groundwater relationships, *Water quality, Sediment control, Evaluation, Hydrology, Topography, Geology, Agriculture, Sediment discharge, Particle size, Water chemistry, *Pennsylvania.
Identifiers: *Bixler Run basin(Pa).

Rainfall, streamflow, water quality, and sediment discharge data were collected from Bixler Run near Loysville, Pa., from February 1954 to September 1969 to evaluate sediment discharge from an agricultural area in which soil-conservation techniques were being adopted at a moderate rate. The study was conducted by the U. S. Geological Survey in cooperation with the Pennsylvania Department of Environmental Resources, State Conservation Commission. Sediment yields from the basin averaged 64 tons per square mile (22 tonnes per square kilometre) per year, approximately 25 percent less than yields from the surrounding area. The relation between water discharge and suspended-sediment discharge remained constant during the study. Suspended-sediment concentration of chloride ions in the streamflow increased from 1959 to 1969. Groundwater maintained flow at the gaging location at a rate of 1.9 cubic feet per second (0.054 cubic metres per second) during the period of data collection. (Woodard-USGS)
W76-09830

A PRIMER ON FLOODPLAIN DYNAMICS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-09831

CENOZOIC DEPOSITS OF SOUTHEASTERN NEW MEXICO AND AN OUTLINE OF THE HISTORY OF EVAPORITE DISSOLUTION,
Geological Survey, Colo.
G. O. Bachman.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 135-149, March-April 1976. 8 fig, 2 tab 34 ref.

Descriptors: *Fluvial sediments, *Sediment transport, *Sedimentology, *Geologic formations, *New Mexico, Geologic history, Erosion, Evaporation, Sediments.
Identifiers: *Evaporite dissolution.

Sedimentary records of Cenozoic history in southeastern New Mexico begin with the Ogallala Formation of Miocene and Pliocene age. Later records include the Gatuna Formation of early or middle Pleistocene age, Mescalero caliche, an informal term, of middle Pleistocene age, and fluvial deposits of late Pleistocene age but there are many gaps in the record. The modern landscape is the result of erosion and deposition in climates that have ranged from semihumid to semiarid as well as dissolution of soluble rocks in Permian formations in the subsurface. This dissolution may have begun as early as Jurassic time and has continued intermittently to the present. (Woodard-USGS)
W76-09837

VARIATION AND CAUSATIVE FACTORS OF SEDIMENT YIELDS IN THE ARKANSAS RIVER BASIN, KANSAS,
Geological Survey, Lawrence, Kans.
W. R. Osterkamp.
Available from the National Technical Information Service, Springfield Va. 22161, as PB-245-100/3GI (Proceedings) Printed copy $23.75 Microfiche $15.00. Reprint from Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 1-59 - 1-70, 1975. 7 fig, 1 tab, 7 ref.

Descriptors: *Sediment transport, *Sediment yield, *River basins, Arkansas, Forecasting, Data collections, Streamflow, Flow rates, Curves, Equations, *Kansas.
Identifiers: *Arkansas River basin(Kan).

Measured sediment yields in the Arkansas River basin of Kansas range from about 10 to 500 tonnes per year per square kilometre (30 to 1,430 tons per year per square mile); highest yields occur in the eastern third of the basin and low yields occur in various parts of the western two-thirds. Yields predicted from general curves based on climate (Schumm, 1965) agree poorly with measured yields. To improve the correlation between calculated (predicted) and measured yields, the climate-dependent curves are converted to a single curve dependent on runoff. The yields predicted by this curve for specific areas are adjusted by applying a power function of average slope. Where other determinants of sediment discharge do not increase or decrease yields significantly, adjusted yields agree with those measured. Discrepancies between the calculated and measured yields generally are inferred to be a result of geologic influences. Calculation of the adjusted yields permits a refined delineation of areal variations in sediment yields based on sample data, and provides a means of estimating yields from unsampled basins. (Woodard-USGS)
W76-09839

STORM-PERIOD VARIABLES AFFECTING SEDIMENT TRANSPORT FROM URBAN CONSTRUCTION AREAS,
Geological Survey, Parkville, Md.
W. J. Herb, and T. H. Yorke.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 100/3GI (Proceedings). Printed copy $23.75, Microfiche $15.00. Reprint from Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council Sedimentation Committee, p 1-181 - 192, 1975. 13 p, 1 fig, 2 tab, 1 ref.

Descriptors: *Sediment transport, *Small watersheds, *Construction, *Urbanization, *Maryland, Effects, Peak discharge, Storm runoff, Data collections, Equations, Correlation analysis, District of Columbia.
Identifiers: *District of Columbia area.

Eight small drainage basins, ranging in size from 0.91 to 25.2 square kilometres (0.35 to 9.73 square miles), located in the suburbs of Washington, D. C., were studied between 1963 and 1974 to determine sediment transport characteristics of streams draining urban construction areas. Annual construction ranged from less than 1 percent of basin area to more than 15 percent. Five hundred and twenty-four storms were analyzed to determine the effects of 14 storm-period variables on sediment load. Factors found to be most significant were storm runoff and peak discharge. Multiple correlation coefficients for best regression equations with four independent variables ranged from 0.85 to 0.96, and standard errors ranged from 0.300 to 0.221 log units. The equations reflect the significant impact of both construction activities and summer storms on the sediment discharge of urban streams. (Woodard-USGS)
W76-09840

URBAN-AREA SEDIMENT YIELD--EFFECTS OF CONSTRUCTION-SITE CONDITIONS AND SEDIMENT-CONTROL METHODS,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4D.
W76-09841

PROPOSED REVISION TO THE MODIFIED EINSTEIN METHOD OF COMPUTING TOTAL SEDIMENT DISCHARGE,
Geological Survey, Menlo Park, Calif.
D. E. Burkham, and D. R. Dawdy.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 100/3GI (Proceedings). Printed copy $23.75, Microfiche $15.00. Reprint from Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 4-37 4-49, 1975. 2 fig, 1 tab, 7 ref.

LIBRARY U. OF I. Urbana-Champaign

Descriptors: *Sediment discharge, *Open channels, *Equations, *Computer programs, Methodology, Correlation analysis, Channel morphology, Sediment yield, Sediment load.
Identifiers: *Einstein method(Modified).

Corrections are applied to four equations used in the modified Einstein method of computing total sediment discharge in open channels. The corrections eliminate some of the empiricism in the procedure. The revised modified procedure gives computed sediment discharges that apparently are as accurate as the modified procedure. (Woodard-USGS)
W76-09842

TEN YEARS OF EXPERIENCE WITH AUTOMATIC PUMPING-SEDIMENT SAMPLERS,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 7B.
W76-09843

ORIGIN, EFFECT AND SUPPRESSION OF SECONDARY WAVES,
Waterloopkundig Laboratorium, Delft (Netherlands).
C. H. Hulsbergen.
Available from the National Technical Information Service, Springfield, Va., 22161, as N75-20968 H2/E, $3.50 in paper copy, $2.25 in microfiche.
Presented at: International Conference on Coastal Engineering, 14th, Copenhagen, June 24-28, 1974.
Reprint, Publication No. 132, September 1974. 21 p, 28 fig, 35 ref.

Descriptors: *Waves(Water), *Beach erosion, *Sediment transport, Movement, Sand bars.
Identifiers: Secondary waves, Wave action.

Beach profile formation may be severely affected by secondary waves which, together with the basic wave, always originate from a sinusoidally-moving wave board. The ascertainment of this experimental fact is followed by an investigation of the behaviour of the generated waves and their interactions. It was concluded that: secondary waves may be generated by the wave board, or may be provoked by a sill, bar, slope, or by breaking waves; secondary waves, generated by the wave board, may adequately be described by combining the theories of Fontanet (1961), and Dravtchenko and Santon (1957); secondary waves may have a very pronounced influence on beach profile formation, although this influence may be quite difficult to recognize as such; the rate and the direction of the transverse sand transport under waves is very delicately dependent of the wave form, i.e. the form of the orbital velocity field; and an adequately designed sill of rectangular cross-section may be used to suppress the Fontanet wave. (Sinha-OEIS)
W76-09878

INVESTIGATIONS ON THE ERODIBILITY OF A DEEPLY PLOWED GRAY-BROWN PODZOLIC SOIL FROM LOESS ON A SLOPE BY MEANS OF SIMULATED RAIN, (IN GERMAN),
Niedersaechsisches Landesamt fuer Bodenforschung, Hanover (West Germany).
B. Grosse, and M. Renger.
Z Pflanzenernaehr Bodenkd. 137(2), p 86-94, 1974.

Descriptors: *Erosion, Loess, *Podzols, Slopes, *Gray-brown podzolic soils, Simulated rainfall, Infiltration, Cultivation, Soil horizons, Soil types.

Simulated rain of about 45 mm (intensity = 0.16 mm/min) on deeply plowed soil with a 4% slope caused light puddling so that neither soil removal nor run-off occurred. A normally plowed plot of the same size (150 m2) showed heavy puddling and a low run-off after a sprinkling time of 20 min. After 120 min the run-off amounted to about 2.5 mm (= 20% of the rain quantity) and the soil removal was measured at 3 kg (=200 kg/ha). Soil removal by rain storms from normally plowed gray-brown podzolic soil is mainly effected by the decrease of the infiltration rate due to the puddling of the upper layers of the Ap-horizon.--Copyright 1975, Biological Abstracts, Inc.
W76-09917

MATHEMATICAL MODELING OF ALLUVIAL CHANNELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09968

MOVABLE-BED RIVER-MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2E.
W76-09969

SEDIMENT DEPOSITION MODEL FOR TARBELA RESERVOIR,
Gilbert Associates, Inc., Reading, Pa.
A. J. Hurst, and P. C. Chao.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 501-520, 1975. 10 fig, 11 ref.

Descriptors: *Model studies, *Sedimentation, *Rivers, *Reservoirs, Erosion, Suspended solids, Sediments, Sediment transport, Mathematical models, Computer models, Reservoir operation.
Identifiers: *India, *Tarbela Reservoir(India), *Indus River(India).

In an average year, the Indus River will carry over 400 million tons of sediment into Tarbela Reservoir. It was determined that analysis of the reservoir operating criteria could provide for optimization of the natural impermeable blanketing immediately upstream of the main dam. Suspended sediment deposition was investigated using a computer program based on the Sundborg and Camp solutions. Both are exponential decay functions; the first was designed for reservoirs, the second for desilting basins. The model was designed for an 18-month simulation on a daily flow basis and uses 200 K bytes of memory on an IBM 360/370 computer. It is basically two-dimensional, in that velocity distributions across the sections were not accounted for. Twenty eight sections comprised the model reservoir, stretching back 50 miles. A flow routing was performed, with velocities, shear velocities, and water levels determined at each section. Each days' sediment inflow load was tracked entirely through the reservoir; the objective was the determination of the probable location, extent, and grading of sediment deposition. There was an excellent correlation between the two methods of analysis, and a desirable means of operating the reservoir to induce sedimentation in predetermined reaches was established. (See also W76-09941) (Sims - ISWS)
W76-09970

UNDISTORTED MOVABLE-BED MODEL STUDY FOR A RIVER AND POWER PLANT INTAKE SYSTEM,
Battelle Memorial Inst., Richland, Wash.
For primary bibliographic entry see Field 8B.
W76-09971

MODELING OF MEANDERING AND BRAIDING IN RIVERS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
G. Parker, and A. G. Anderson.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 575-591, 1975. 6 fig, 1 tab, 24 ref. NSF ENG74-02777.

Descriptors: *Model studies, *Rivers, *Meanders, *Braiding, Alluvial channels, Sediments, Sediment transport, Streamflow, Erosion, Sedimentation, Channel morphology, Hydraulics, Hydraulic models.
Identifiers: *River models, Modeling techniques.

The results of stability analyses of meander- and braid-like perturbations in straight rivers were used to construct a diagram dividing rivers into straight, meandering, and braided regimes. The same analysis provided order-of-magnitude estimates of meander and braid longitudinal wavelength and braid number. The relations indicated that if the geometric and Froude criteria are applied to river models, and if sediment transport exists in both the model and the prototype, the occurrence of meandering and braiding and incipient meander and braid wavelengths are modelled to the correct order of magnitude. Sediment transport itself need not be modelled as long as it exists. The analysis justified the use of light bed material such as coal or plastic rather than sand in river models as a means of ensuring the existence of sediment transport, in that the initial tendencies toward meandering or braiding are not greatly altered. The modeling method is useful for testing the erosive tendencies of streams that have been channelized in a straight alignment; such streams often show a tendency to return to the original meandering or braiding state. (See also W76-09941) (Sims - ISWS)
W76-09974

MODELING SEDIMENT TRANSPORT IN HYDRAULIC STRUCTURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
K. Mahmood.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 592-604, 1975. 8 fig, 9 ref, 1 append. NSF ENG72-00274 A01.

Descriptors: *Model studies, *Alluvial channels, *Sediment transport, *Hydraulic structures, Mathematical models, Sediments, Sedimentation, Sands, Canals, Irrigation, Bed load, Suspended solids, Rivers, Hydraulics.
Identifiers: Vortex tube sand traps, Irrigation turnouts, Sand-bed canals.

Water resource developments on alluvial streams often involve sediment loads that need to be routed through the systems. This routing depends on the sediment transport characteristics of the constituent hydraulic structures. Small scale physical modeling of sediment transport through structures is difficult because it is generally impossible to simultaneously satisfy the governing equations for the hydraulic and sedimentation phenomena. Mathematical models are being increasingly developed for these studies. Where possible, the mathematical models have the advantages of low cost, increased generality, and economy of time. Development of three mathematical models of sediment transport in hydraulic structures were presented here. These models were developed in the context of sediment routing in surface irrigation systems. Specifically the models related to vortex tube sand traps, irrigation turnouts, and bed level transients in sand-bed canals. (See also W76-09941) (Sims - ISWS)
W76-09975

2K. Chemical Processes

CHANGES IN WATER CHEMISTRY RESULTING FROM SURFACE-MINING OF COAL ON FOUR WEST VIRGINIA WATERSHEDS,
Forest Service (USDA), Berea, Ky. Northeast Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W76-09470

FOREST MANAGEMENT PRACTICES AS RELATED TO NUTRIENT LEACHING AND WATER QUALITY,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 4C.
W76-09471

EXPLORATION ROCK GEOCHEMISTRY-DETECTION OF TRACE ELEMENT HALO AT HEATH STEELE MINES (N. B., CANADA) BY DISCRIMINANT ANALYSIS,
New Brunswick Univ., Fredericton, Dept. of Geology.
R. E. S. Whitehead, and G. J. S. Govett.
Journal of Geochemical Exploration, Vol 3, No. 4, p. 371-386, November, 1974, 9 fig, 1 tab, 21 ref.

Descriptors: *Geochemistry, *Sulfides, *Trace element, *Minerology, Zinc, Lead, Copper, Canada, *Pollutant identification.
Identifiers: *Geochemical exploration.

The Heath Steele massive sulphide deposit in Northern New Brunswick lies conformably within a sedimentary-volcanic sequence of probable Ordovician age which has been metamorphosed to the greenschist stage. The dominant sulphide mineral is pyrite, and the main economic minerals are sphalerite, galena, and chalcopyrite; the general grade of the ore is 5% Zn, 2% Pb, and 1% Cu. The results demonstrate the use of discriminant analysis in defining a trace element halo which is of considerable size in rocks which overlie mineralization at Heath Steele Mines and is spatially associated with the sulfides. The halos are faint and can only be reliably recognized through a multielement statistical classification of samples. (Hoyle-Vanderbilt)
W76-09473

REDOX POTENTIAL IN IRRIGATED DESERT SOILS AS AN INDICATOR OF AERATION STATUS,
Imperial Valley Conservation Research Center, Brawley, California.
For primary bibliographic entry see Field 2G.
W76-09488

WATER CHEMISTRY OF THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 5A.
W76-09581

CHEMISTRY OF DISSOLVED INORGANIC CARBON IN ESTUARINE AND COASTAL BRACKISH WATERS,
Groningen Rijksuniversiteit (Netherlands). Environmental Isotopes Lab.
For primary bibliographic entry see Field 2L.
W76-09597

DISSOLVED OXYGEN ANALYZER T-01 ANALYZER. A SIMPLE APPARATUS FOR ELECTROCHEMICAL DETERMINATION OF DISSOLVED OXYGEN IN WATER (TLENOMIERZ T-01 UPROSZCZONY PRZYRZAD ELEKTROCHEMICZNEGO OZNACZANIA TLEUNU ROXPUSZCZOMEGO W ROZTWORACH WODNYCH),
For primary bibliographic entry see Field 5A.
W76-09688

REMOVAL OF DISSOLVED BORON AND SILICON DURING ESTUARINE MIXING OF SEA AND RIVER WATERS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
P. S. Liss, and M. J. Pointon.
Geochim Cosmochim Acta. 37(6), p 1493-1498, 1973.

Descriptors: *Boron, Sea water, Mixing, Estuaries, Water chemistry.
Identifiers: England, *Silicon, Alde River.

The behavior of dissolved B and S: during mixing of sea and river waters was studied in 2 surveys of the estuary of the River Alde in Suffolk, England. Removal of approximately 25-30% was found for both elements. This appears to be the 1st report of estuarine removal of dissolved B. The extent of removal of Si in the Alde was somewhat higher than that found in other estuaries.--Copyright 1974, Biological Abstracts, Inc.
W76-09725

CHARACTERIZATION OF NITROGEN SOURCES CONTAMINATING SHALLOW GROUND WATER IN AN ARID BASIN. LAS VEGAS AREA, NEVADA,
Nevada Univ., Reno. Center for Water Resources Research; and Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5B.
W76-09762

LEAD ORTHOPHOSPHATES: III. STABILITIES OF FLUOROPHYROMORPHITE AND BROMOPYROMORPHITE AT 25 C,
Canada Centre for Inland Waters, Burlington (Ontario).
J. O. Nriagu.
Geochim Cosmochim Acta. Vol 37, No 7, p 1735-1743, 1973.

Descriptors: *Lead, Phosphates, Chemical reactions, Water chemistry.
Identifiers: Lead orthophosphate, Fluoropyromorphite, Bromopyromorphite.

The reactions of secondary lead orthophosphate with approximately 10-1 M NaF fluoride and NaBr solutions were investigated at 25 C. Interpretation of the solubility data resulted in solubility product constants for fluoropyromorphite and bromopyromorphite of 10-71.6 and 10-78.1, respectively. According to these constants, the stability sequence for lead pyromorphites is Pb5(PO4)3C1>Pb5(PO4)3Br>Pb5(PO4)3OH>Pb5(PO4)3F. The derived free energy data were used to evaluate the respective stabilities of fluoropyromorphite and bromopyromorphite within the systems PbF2-PbO-P2O5-H2O and PbBr2-PbO-P2O5-H2O and to predict the equilibrium behavior of the Pb5(PO4)3F - Pb5(PO4)3OH solid solution under aqueous conditions. (These studies are relevant to Pb in aqueous solution and under physiological conditions.)(See also W75-06303)--Copyright 1974, Biological Abstracts, Inc.
W76-09820

APPRAISAL OF WATER RESOURCES OF NORTHWESTERN EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W76-09828

DETERMINATION, STORAGE, AND PRESERVATION OF LOW MOLECULAR WEIGHT HYDROCARBON GASES IN AQUEOUS SOLUTION,
Geological Survey, Bay Saint Louis, Miss.
D. J. Shultz, J. F. Pankow, D. Y. Tai, D. W. Stephens, and R. E. Rathbun.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 247-251, March-April 1976. 3 fig, 4 tab, 4 ref.

Descriptors: *Gases, *Organic compounds, *Aqueous solutions, *Analytical techniques, Gas chromatography, Ionization, Sampling, Preservation, Storage, Methodology, Water analysis, Reaeration, Preservation.
Identifiers: *Hydrocarbon gases.

A gas chromatograph with a flame ionization detector was used in conjunction with a stripping chamber and cold trap apparatus to measure microgram-per-litre quantities of low molecular weight hydrocarbon gases in water samples. Glass bottles with ground-glass stoppers were used to store the samples. Formalin was added to stop bacterial activity and preserve samples with no measurable losses for as much as 7 days. (Woodard-USGS)
W76-09834

GEOCHEMICAL AND ISOTOPIC ANALYSES OF WATERS ASSOCIATED WITH THE EDWARDS LIMESTONE AQUIFER, CENTRAL TEXAS,
Geological Survey, Reston, Va.
F. J. Pearson, Jr., and P. L. Rettman.
Geological Survey Report, February 1976. 35 p, 3 fig, 5 tab, 25 ref.

Descriptors: *Chemical analysis, *Groundwater, *Water chemistry, *Geochemistry, *Texas, *Water analysis, Data collections, Sampling, Isotope studies, Analytical techniques, Chemical reactions, Aquifers.
Identifiers: *Edwards Limestone aquifer(Tex).

The results of analyses of 14 common chemical species dissolved in 92 samples of waters from the Edwards Limestone aquifer in central Texas are tabulated. Additional analyses for stable carbon and radiocarbon and stable sulfur isotopes on 34 of these samples are included. Field collection and field and laboratory analytical techniques were designed to make these analyses useful for geochemical studies. Edwards waters can be grouped into five chemical types--recharge, main fresh water, varied, and two types of transitional and saline waters. All types are saturated with calcite and all transitional and saline waters are saturated with dolomite as well. Some saline samples are also saturated with gypsum, celestite, strontianite, and fluorite. (Woodard-USGS)
W76-09836

TECHNIQUE OF WATER SAMPLING IN SANITARY INVESTIGATIONS OF LARGE BODIES OF WATER, (IN RUSSIAN),
Kazan Inst. of Postgraduate Medicine (USSR).
For primary bibliographic entry see Field 5A.
W76-09928

2L. Estuaries

STUDIES OF PHYTOPLANKTON ECOLOGY IN THE BAY OF VALPARAISO: II. PHYTOPLANKTON 1970-1971, (IN SPANISH),
Chile Univ., Vina del Mar. Departamento de Oceanologia.
For primary bibliographic entry see Field 5A.
W76-09408

LIBRARY U. OF F. WATER RESOURCES ARCH.

A SITE STUDY OF THE MULTIPLE EFFECTS OF THERMAL RELEASES ON THE AQUATIC LIFE IN AN ESTUARINE AREA,
Ente Nazionale per l'Energia Elettrica, Milan (Italy).
For primary bibliographic entry see Field 5C.
W76-09505

ISLAND BARRIER EFFECTS ON SEA STATE AS REVEALED BY A NUMERICAL WAVE MODEL AND DMSP SATELLITE DATA,
Environmental Prediction Research Facility, Monterey, Calif.
R. W. Fett, and K. M. Rabe.
Journal of Physical Oceanography, Vol. 6, No. 3, p 324-334, May 1976. 14 fig, 15 ref.

Descriptors: *Remote sensing, *Model studies, *Islands, *Ocean waves, Satellites(Artificial), Mathematical models, Waves(Water), Eddies, Oceans, Winds, Meteorology, Oceanography.
Identifiers: *Sea state, Sunglints.

Island barrier effects on the state of the sea in the lee of islands have been studied by means of a numerical wave prediction model and by examination of data from sensors of the Defense Meteorological Satellite Program (DMSP), the Synchronous Meteorological Satellite (SMS), and the Earth Resources Technology Satellite (ERTS). Visual indications of calm areas in the lee of the Lesser Antilles, evidenced by a marked reduction in the satellite-observed sunglint at selected sun angles, were verified by the results from the numerical wave model; other lee reflective patterns correspond to areas of changed sea state. These results indicated that a reduction in the swell height, alteration of the period, and reorientation of the swell direction, in many instances long distances to the island's lee, are responsible for the satellite-observed reflective patterns noted. The additional phenomena of bow waves and wind-induced oceanographic eddies were also examined, and some evidence of their occurrence and detection was presented. (Sims - ISWS)
W76-09559

FINITE-AMPLITUDE BAROCLINIC DISTURBANCES IN DOWNSTREAM VARYING CURRENTS,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
J. Pedlosky.
Journal of Physical Oceanography, Vol. 6, No. 3, p 335-344, May 1976. 4 fig, 2 ref.

Descriptors: *Ocean currents, *Currents(Water), *Model studies, Mathematical models, Circulation, Downstream, Water circulation, Fluid mechanics, Oceanography.
Identifiers: *Baroclinic disturbances.

The finite-amplitude dynamics of baroclinic disturbances in currents whose cross-stream structure varies in the downstream direction was investigated. It was first shown under what circumstances downstream variations of the current properties influence the local stability of the current. For flows near the neutral curve only the potential vorticity in one of the fluid layers is significant in determining the local stability. For currents which are locally stable at some downstream locations and unstable at others, it was shown that the disturbance amplitude depends on the entire upstream structure of the current. In particular, simple examples illustrated the lack of a local relationship between 'local' stability characteristics and the disturbance intensity. The linear initial value problem for uniform (in the downstream) direction) currents was also discussed to elucidate the relation between the temporal and spatial stability problems. (Sims - ISWS)
W76-09560

VELOCITY OBSERVATIONS IN THE WEST PASSAGE OF NARRAGANSETT BAY: A PARTIALLY MIXED ESTUARY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
R. H. Weisberg, and W. Sturges.
Journal of Physical Oceanography, Vol. 6, No. 3, p 345-354, May 1976. 10 fig, 4 tab, 15 ref. ONR N00014-68-A-0215-0003.

Descriptors: *Estuaries, *Currents(Water), *Tides, *Rhode Island, Winds, Tidal waters, Flow, On-site investigations, Water circulation, Velocity, Current meters, Wind velocity, Wind tides, Water, Rivers, Coasts, Data processing, Oceanography, Mixing.
Identifiers: *Narragansett Bay(RI).

Narragansett Bay is a weakly stratified estuary comprised of three connecting passages of varying depths. The vertical distribution of horizontal velocity was observed in the West Passage using moored current meters. The instantaneous motion was characterized by semi-diurnal tidal currents of amplitude 25-60 cm/s. The net current time series obtained by filtering out motions at tidal and higher frequencies were found to be an order of magnitude less than the instantaneous motion and well correlated to the prevailing 2-10 m/s winds. For periodicities of 2-3 days, the coherence between the longitudinal components of wind and net near surface current was as high as 0.8 with the current lagging the wind by about 3 h. The mean near surface speed, obtained by averaging over one month, was 1.2 + or - 1.6 cm/s. The large error bounds were a result of the large variability of the net current time series. The net transport of water through the West Passage was observed to be seaward or landward over the entire water column for several days duration, with typical wind induced transport fluctuation of + or - 500 cu m/s. Hence, a net communication of water exists between the East and West Passages with water flowing either way in response to the wind. Wind was concluded to be the dominant mechanism driving the net circulation in the West Passage of Narragansett Bay. This is in contrast with the classical views of gravitationally convected net estuarine circulation. (Sims - ISWS)
W76-09561

RESEARCH AND INVESTIGATION OF GEOLOGY, MINERAL, AND WATER RESOURCES OF MARYLAND.
Geological Survey, Baltimore. Maryland
For primary bibliographic entry see Field 4A.
W76-09565

MARYLAND CHESAPEAKE BAY BEACHES - GENERAL DISTRIBUTION AND CLASSIFICATION,
Geological Survey, Baltimore, Maryland.
R. T. Kerhin, and T. H. Slaughter.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 3-1 to 3-29, September 1974. 6 fig, 2 tab. NASA NAS5-21848.

Descriptors: *Remote sensing, *Beaches, *Chesapeake Bay, *Maryland, Satellites(Artificial), Aircraft, Photography, Data processing, Aerial photography, Shores, Bays, Classification, Mapping.
Identifiers: *ERTS, Broad beaches, Narrow beaches, Data misinterpretation.

The effectiveness of ERTS-1 multispectral imagery to detect small-scaled beach features with strict manual image interpretations is dependent on two factors: the contrast at the land/water interface and the linearity of the beach system. Through ground truth verification, four misinterpretations were recognized. The most common condition for misinterpretation of the beach signature is fill material behind a bulkhead. The other misinterpretations are nearshore turbidity, vertical sedimentary cliffs, and shoreline erosion control structures. Based on ERTS-1 imagery and aircraft support data, beaches of Chesapeake Bay were classified as broad and narrow beaches based on the width of the backshore zone. The predominate beach type is narrow beaches existing throughout the Bay while the broad beaches are confined to the western shore. The broad beaches accounted for 121 Km of beach length and are dominate in Calvert and St. Mary's counties. With the use of ERTS-1 imagery, actual ground truth mapping is not needed for a major beach system and ground truth observations can be concentrated in areas of misinterpretation. (See also W76-09565) (Sims - ISWS)
W76-09568

THE RELATIONSHIP OF THE NEARSHORE LONGSHORE BAR AND SAND WAVES AT OCEAN CITY, MARYLAND,
Geological Survey Baltimore, Maryland.
T. H. Slaughter.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 4-1 to 4-16, September 1974. 7 fig. NASA NAS5-21848.

Descriptors: *Sand waves, *Coasts, *Atlantic Ocean, *Maryland, *Remote sensing, On-site investigations, Satellites(Artificial), Aircraft, Beaches, Erosion, Beach erosion, Sedimentation, Sediments, Deposition(Sediments).
Identifiers: *ERTS, *Ocean City(Md), Longshore bars, Reversal zones.

By comparing historical shorelines of Ocean City, from the inlet to the Maryland-Delaware line, it was shown that reversal zones of erosion and accretion occur at different locations for different periods. The Atlantic Ocean coastline assumes at times a crescentic form called sand waves whose existence is related to shape and location of the nearshore bar. Because of climatic and wave conditions, the offshore bar is changed causing obliteration of the sand waves. The sand waves in response to bar metamorphosis change size, location, and existence. (See also W76-09565) (Sims - ISWS)
W76-09569

LINEAR DISTRIBUTION OF THE HIGH MARSH VEGETATION COMMUNITIES OF THE LOWER EASTERN SHORE AND ITS GEOLOGICAL SIGNIFICANCE,
Geological Survey, Baltimore, Maryland.
R. T. Kerhin.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 5-1 to 5-19, September 1974. 5 fig, 1 tab. NASA NAS5-21848.

Descriptors: *Remote sensing, *Coastal marshes, *Vegetation, *Topography, *Maryland, Coasts, Geomorphology, Satellites(Artificial), Wetlands, Marshes, Soils, Sands, Sand waves, Shores.
Identifiers: *ERTS, *Janes Island(Md), Linear ridges, High marsh vegetation.

Using ERTS-1 multispectral imagery and aircraft support, the distribution of the high reflectance levels (high marsh-high topographic areas) for the Lower Eastern Shore were distributed as two distinct trending linear ridge systems. On the western side of Tangier Sound the linear ridges trend in a northwest-southeast pattern and on the eastern side the linear ridges trend in a northeast-southwest pattern with a projected convergence at the Maryland-Virginia line. The northeast-southwest trending linear ridges on Janes Island were selected as a ground truth site for signature return and vegetation type correlation. The linear ridges correlated with high marsh/upland vegetation and appeared on the aircraft support and

ERTS-1 imagery as high reflectance levels. A shallow stratigraphic section of a linear ridge displayed 10-20 cm root zone followed by a brown-tan to gray clay layer to 89 cm overlying a red-stained medium sand. The intersection of the linear ridge with the shoreline exposed a wave-cut bench of the root zone and brown-tan clay found in the cross-section. (See also W76-09565) (Sims - ISWS)
W76-09570

VISUAL OBSERVATION OF THE SUSPENDED SEDIMENTS AND NEARSHORE ICE SIGNATURES IN CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
R. T. Kerhin.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 6-1 to 6-10, September 1974. 5 fig. NASA NAS5-21848.

Descriptors: *Remote sensing, *Suspended solids, *Ice, *Chesapeake Bay, Sediments, Turbidity, Sediment transport, Sediment load, Rivers, Beaches, Satellites(Artificial).
Identifiers: *ERTS, Beach ice, Nearshore ice.

Observations of MSS band 5 dated April 9, 1974 exhibited an unique sedimentation pattern for Chesapeake Bay. Following a 1.5 inch rainfall, heavy concentration of suspended sediments was observed on the imagery, particularly in the area of the turbidity maximum. At some of the major tributaries, a suspended sediment wedge was observed showing an upstream transportation direction. During January and February, 1973, a freeze-thaw-freeze condition existed with beach and nearshore ice observed on ERTS-1 imagery. Beach ice can be mistaken for a beach signature on MSS band 7 and nearshore ice can be misinterpreted as nearshore turbidity on MSS band 5. (See also W76-09565) (Sims-ISWS)
W76-09571

WATER CHEMISTRY OF THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 5A.
W76-09581

ENERGY DISSIPATION ON A ROUGH SLOPE,
Massachusetts Inst. of Tech., Cambridge Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 8B.
W76-09582

OBSERVATIONS OF THE CALIFORNIA UNDERCURRENT OFF WASHINGTON AND VANCOUVER ISLAND,
National Oceanic and Atmospheric Administration, Seattle, Wash., Pacific Marine Environmental Lab.
R. K. Reed, and D. Halpern.
Limnology and Oceanography, Vol. 21, No. 3, p 389-398, May 1976. 7 fig, 27 ref.

Descriptors: *Oceans, *Ocean currents, *Pacific Ocean, *Washington, *Canada, Continental shelf, On-site investigations, Measurement, Internal waves, Salinity, Temperature, Currents(Water), Flow, Coasts, Oceanography.
Identifiers: *Vancouver Island(BC).

A detailed oceanographic survey was conducted in the Pacific off the coast of Washington and Vancouver Island in September 1973, and 12-h time-series measurements were made at eight sites. Data from the time-series stations suggested the presence of semi-diurnal internal tidal waves seaward of the continental shelf. The resulting disturbances to the geopotential anomalies, however, had little effect on the derived patterns of geostrophic flow. During this survey, the surface flow relative to 1000 db was generally southward, but a northward flow was present at intermediate depths along the continental slope. This northward flow appeared to be an extension of the California Undercurrent, which remains an identifiable feature to at least 49 deg N but weakens along its path by mixing with adjacent water. An additional northward flow in the northern part of the area resulted from a cyclonic eddy-like feature. (Sims - ISWS)
W76-09584

UPWELLING NEAR SAMALGA PASS,
Washington Univ., Seattle. Dept. of Oceanography.
J. H. Swift, and K. Aagaard.
Limnology and Oceanography, Vol. 21, No. 3, p 399-408, May 1976. 9 fig, 8 ref. NSF GA11147A3.

Descriptors: *Upwelling, *Oceans, *Pacific Ocean, *Alaska, Circulation, Ocean circulation, Oxygen, Nutrients, Density, Salinity, On-site investigations, Ocean currents, Winds, Subsurface flow, Euphotic zone, Oceanography.
Identifiers: *Aleutian Islands(Alas), *Samalga Pass(Alas).

Recent summer hydrographic data from the vicinity of Samalga Pass in the eastern Aleutians showed upwelling of relatively saline water, poor in oxygen and rich in nutrients. A steady state oxygen model in which the photosynthetic production of oxygen in the euphotic zone is balanced by an upwelling of low-oxygen water yields an upper bound on the vertical velocity of 0.007 cm/s. Examination of various possible driving mechanisms for the upwelling, including winds and entrainment, suggested that the upwelling is driven by subsurface convergence. (Sims - ISWS)
W76-09585

MODELING THE CHESAPEAKE BAY AND TRIBUTARIES: A SYNOPSIS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
R. E. Ulanowicz.
Chesapeake Science, Vol. 17, No. 2, p 114-122, June 1976. 49 ref.

Descriptors: *Chesapeake Bay, *Model studies, *Estuaries, *Tributaries, Hydraulic models, Mathematical models, Computer models, Reviews, Bays, Rivers, Circulation, Water circulation, Flow, Currents(Water), Pollutants, Path of pollutants, Simulation analysis, Analytical techniques.

The last decade has seen the development and application of a spectrum of physical and numerical hydrographic models of the Chesapeake Bay and its tributaries. The success of the James River Hydraulic Model has initiated the construction of an estuarine hydraulic model of the entire Chesapeake System. Numerical analogues for hydrographic behavior and contaminant dispersion in one-, two-, and three-dimensional model estuaries exist for various regions of the Bay. From an engineering viewpoint, one-dimensional models are sufficiently advanced to be routinely employed in aiding management decisions. Bay investigators are playing leading roles in the development of two- and three-dimensional models of estuarine flows. (Sims-ISWS)
W76-09587

MYXOBACTERIA OF THE MYXOCOCCUS GROUP AS INDIRECT INDICATORS OF FECAL MATTER IN SURFACE WATER: 1. COMMUNICATION, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W76-09591

INTERSTITIAL PROTOZOA AND ALGAE OF LOUISIANA SALT MARSHES,
Tulane Univ., New Orleans, La. Newcomb Coll.
For primary bibliographic entry see Field 5C.
W76-09593

AN ASSESSMENT OF POSSIBLE POLLUTION EFFECTS OVER A CENTURY OF THE BENTHIC MARINE ALGAE OF CO. DURHAM, ENGLAND,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-09595

CHEMISTRY OF DISSOLVED INORGANIC CARBON IN ESTUARINE AND COASTAL BRACKISH WATERS,
Groningen Rijksuniversiteit (Netherlands). Environmental Isotopes Lab.
W. G. Mook, and B. K. S. Koene.
Estuarine and Coastal Marine Science, Vol. 3, No. 3, p. 325-336, 1975. 7 fig., 18 ref.

Descriptors: *Carbon, *Estuaries, *Brackish water, *Salinity, *Hydrogen ion concentration, Carbonates, Chemical reactions, Carbon dioxide, Bicarbonates, Ions, Alkalinity, Stable isotopes, Mollusks.
Identifiers: Inorganic carbon.

When fresh and sea water are mixed, chemical rearrangement occurs in the dissociation equilibria. The shifts are complex, and the first and second dissociation constants are functions of ion activities which depend on the water's ionic strength and composition. Fresh waters are considered dilute solutions, but the salt content of sea water affects activity coefficients more than is theoretically predicted due to formation of ion pairs and complexes. When fresh and sea waters are mixed, acidity shows a maximum (pH minimum) at a specific mixing ratio. The first and second apparent dissociation constants of carbonic acid increases rapidly with increased salinity, causing a remarkable pH distribution in an estuary. Downstream, instead of gradual continuous increases in pH from fresh water (7.0-7.5) to ocean values (8.2), the pH showed minimal values at low salinities. With high pH fresh water, a sharp decrease was observed at low salinity. Depending on the alkalinity ratio of fresh river water and sea water, estuarine carbonate ion concentrations could remain very low up to relatively high salinities and may affect shell growth of some mollusks. To obtain dissociation constants for brackish waters with low chlorinities, adjustments of data for pure water and sea water are made by mathematical equations. (Buchanan-Davidson--Wisconsin)
W76-09597

UNDERWATER OBSERVATIONS OF GELATINOUS ZOOPLANKTON: SAMPLING PROBLEMS, FEEDING BIOLOGY, LAND BEHAVIOR,
California Univ., Davis. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-09598

ON THE ECOLOGY OF COLLEMBOLA AND ORIBATIDS IN A LANDSEA TRANSITION ZONE (COLLEMBOLA, INSECTA-ORIBATEI, ACARI) (IN GERMAN),
Kiel Univ. (West Germany). Zoologisches Institut.
G. Weigmann.
Z Wiss Zool 186(3/4), p 295-391, 1973.

Descriptors: *Grasslands, Tidal waters, *Soil-water-plant relationships, Salinity, Ecology, Moisture content.
Identifiers: Acari, Collembola, Festuca, Germany, Insecta-oribatei, Orbatids, Protura, Puccinellia, Salt meadows, West Germany, North Sea.

LIBRARY U. OF F. Environmental Engr.

The localities studied are situated along the shore of the North Sea in Schleswig-Holstein (West Germany). Three of these are salt meadows differently influenced by tidal activity. They are compared with salt-free meadows behind and on dikes and with salt meadows in other regions. Specimens (84,000) of 103 spp. were studied: 41 spp. of Collembola, 61 of Oribatid mites and 1 of Protura. The samples were taken monthly during 2 yr. There is a distinct zonation of the fauna, caused by environmental gradients at the shore. Species with similar ecological valence are grouped together. These groups are based on the sensitiveness of the species to overflow by seawater and the salinity and wetness of the soil. The faunal differences between the Puccinellia zone and the lower Festuca zone are caused by different wetness and by tidal influence, not by different salinities. Acidity is similar in all areas and has no influence on the zonation. The abundance of euedaphic Collembola is not correlated to one single environmental factor. Experiments on the resistance against water of different salinities and on osmoregulation of the blood were also carried out.--Copyright 1975, Biological Abstracts, Inc.
W76-09635

SCOPE OF TIDAL POWER FROM INDIAN ESTUARIES,
Irrigation and Power Research Station, Amritsar (India).
G. S. Dillon.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 8, p 245-252, August 1975. 1 fig, 3 tab, 8 ref, append.

Descriptors: *Tidal waters, *Estuaries, Shores, Oceans, Coriolis force, Effects, Flow Sites, Obstruction to flow, Tides.
Identifiers: *Power generation, *India, Geometry, Tidal data, Gulf of Kutch(India), Gulf of Cambay(India).

The traditional sources of power generation, i.e., hydro and thermal, will soon be exploited fully. The development of nuclear power is limited by indigenous availability of nuclear fuel. To meet the keen demand of power, attention needs now to be focussed on non traditional sources of energy--solar and oceanic tides. This paper presents a preliminary review of the phenomenon of tide generation in open seas and its propagation into estuaries. The study also identifies promising sites in the Gulf of Kutch and Gulf of Cambay. Necessity for keeping these sites under observation so as to assess their power potential by harnessing the tides, as done in the case of 'La Rance Tidal Scheme,' has been stressed. (Bell-Cornell)
W76-09639

EFFECTS OF DISCHARGE FROM A DREDGE SPOILS SITE ON CARROLL ISLAND, MARYLAND,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Lab.
For primary bibliographic entry see Field 5C.
W76-09647

MICROBIAL DEGRADATION OF MODEL PETROLEUM AT LOW TEMPERATURES,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-09648

SPECIES COMPOSITION AND DIVERSITY OF POLYCHAETES IN THE NEW YORK BIGHT,
Pacific Northwest Environmental Research Lab., Newport, Oreg. Marine Science Center.
For primary bibliographic entry see Field 5C.
W76-09650

ENVIRONMENTAL RESPONSES TO THERMAL DISCHARGES FROM THE CHESTERFIELD STATION, JAMES RIVER, VIRGINIA,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-09652

THE MICROBIOLOGICAL POLLUTION OF NORTH SEA AND ENGLISH CHANNEL SHORE, (IN FRENCH),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 5C.
W76-09657

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 6G.
W76-09665

EVALUATION OF COMBINED APPLICATIONS OF ULTRAFILTRATION AND COMPLEXATION CAPACITY TECHNIQUES TO NATURAL WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5A.
W76-09690

ACID-IRON WASTE AS A FACTOR AFFECTING THE DISTRIBUTION AND ABUNDANCE OF ZOOPLANKTON IN THE NEW YORK BIGHT: I. LABORATORY STUDIES ON THE EFFECTS OF ACID WASTE ON COPEPODS,
Harvard Univ., Cambridge, Mass. Biological Labs.
For primary bibliographic entry see Field 5C.
W76-09700

DEVELOPMENT OF EDINBURGH'S SEWAGE DISPOSAL SCHEME,
Lothian Regional Council (Scotland).
For primary bibliographic entry see Field 5D.
W76-09707

DIAGNOSTIC MODEL STUDY OF MIXED-LAYER DEPTHS IN THE SUMMER NORTH PACIFIC,
Rand Corp., Santa Monica, Calif.
R. C. Alexander, and J-W. Kim.
Journal of Physical Oceanography, Vol. 6, No. 3, p 293-298, May 1976. 8 fig, 1 tab, 13 ref. ARPA DAHC15-73-C-0181.

Descriptors: *Model studies, *Pacific Ocean, *Oceans, Mathematical models, Temperature, Radiation, Solar radiation, Winds, Mixing, Oceanography, Depth.
Identifiers: *Mixed-layer depths, Mixed layers.

The Kraus-Turner one-dimensional diagnostic model for calculating oceanic mixed layer depths gave realistic results for the summer North Pacific provided the effect of dissipation was appropriately included to limit mixed layer depth, particularly in regions where heating was weak. Sensitivity of the results to the radiation extinction coefficient beta was reduced by the new degrees of freedom provided by dissipation. Mixed-layer depths calculated with the present model over the summer North Pacific were within a factor of 2 of observed depths for reasonable values of beta, background dissipation, and coefficients of order unity. (Sims - ISWS)
W76-09719

THE ROLE OF VERTICAL MOTION IN THE HEAT BUDGET OF THE UPPER NORTHEASTERN PACIFIC OCEAN,
Hawaii Inst. of Geophysics, Honolulu; and Hawaii Univ., Honolulu. Dept. of Oceanography.
W. J. Emery.
Journal of Physical Oceanography, Vol. 6, No. 3, p 299-305, May 1976. 2 fig, 4 tab, 11 ref.

Descriptors: *Oceans, *Pacific Ocean, *Heat budget, Temperature, Thermal properties, Heat flow, Heat transfer, Mathematical studies, Correlation analysis, Heat, Energy, Oceanography.
Identifiers: *Vertical motion.

A study of the heat budget of the upper northeastern Pacific Ocean demonstrated the importance of heat changes due to vertical motion. Bathythermograph observations were used to form time series of monthly average thermal structure at ocean weather station November (30 deg N, 140 deg W) and various 5 deg and 2 deg quadrangles between California and Hawaii. These time series were first used to explore correlations between heat content in a 250 m thick layer and the depth of the 14C isotherm. High negative correlations between these quantities suggested that vertical motion at 250 m, indicated by the fluctuations of the 14C isotherm, must play a significant role in altering the heat content of the upper layer. A heat budget equation was derived that includes the heat changes due to vertical motion. At all test locations, correlations between terms showed that a stronger relationship exists between surface heat exchange and heat content change when the heat changes due to vertical motion are included. The mean square difference between surface heat exchange and heat content change was computed with and without heat changes due to vertical motion. The ratio of these differences showed about a 50% improvement when heat changes due to vertical motion are included. (Sims - ISWS)
W76-09720

PROBABILITY DISTRIBUTIONS OF BREAKING WAVE HEIGHTS EMPHASIZING THE UTILIZATION OF THE JONSWAP SPECTRUM,
Oregon State Univ., Corvallis.
J. H. Nath, and F. L. Ramsey.
Journal of Physical Oceanography, Vol. 6, No. 3, p 316-323, May 1976. 9 fig, 16 ref, 1 append. ONR N00014-67-A-0369-0007.

Descriptors: *Ocean waves, *Waves(Water), *Model studies, *Pacific Ocean, Winds, Weather, Fetch, Storms, Wavelenghs, Mathematical studies, Mathematical models, Oceans, Meteorology, Oceanography.
Identifiers: *Breaking waves, Wave height distributions.

An approximate determination has been made of the probability distribution function for breaking wave heights in the deep ocean. It was necessary to make simplifying assumptions of the joint distribution of wave height and wave period so that a semi-closed mathematical solution could be obtained as an illustration of the total processes that actually occur. These assumptions lead one to a calculation which predicts more and larger breaking waves than those which actually occur. Thus, for the design of structures in the deep ocean which are sensitive to breaking waves, a conservative determination of the probability distribution function is obtained. The distributions can be obtained for any location in the deep ocean given a sufficient history of surface meteorological data on wind speed and fetch. The joint distribution of wind speed and fetch for station PAPA in the North Pacific Ocean proved to be independent of storm duration. Thus, 6 h unit storms were considered to be independent in the computations. (Sims - ISWS)
W76-09721

ON ENTRAINMENT AND DIFFUSION IN A GULF OF MEXICO ANTICYCLONIC RING,
Texas A and M Univ., College Station. Dept. of Oceanography.
J. E. Schmitz, and A. C. Vastano.

ournal of Physical Oceanography, Vol. 6, No. 3, p 99-402, May 1976. 4 fig, 2 tab, 3 ref. ONR N00014-68y0308-0002.

Descriptors: *Water circulation, *Gulf of Mexico, Model studies, Mathematical models, Circulation, Currents(Water), Temperature, Flow, Diffusion, Entrainment, Gulfs, Oceanography.
Identifiers: *Gulf of Mexico anticyclonic ring, Gulf Loop Current, *Gulf Stream, Gulf Stream cyclonic ring.

The parametric model used by Schmitz and Vastano (1975) to investigate a Gulf Stream cyclonic ring has been applied to successive observations of a Gulf of Mexico anticyclonic ring. Coefficients for a polynomial representation of the transverse streamfunction were determined for pairs of eddy diffusivity coefficients. Using the minimum least-squares error residual as a criterion, the best flow pattern for the ring occurred for K sub h = 0 sq cm/s. The total transverse transport through the ring was found to be an order of magnitude larger than that found in the Gulf Stream cyclonic ring. (Sims - ISWS)
W76-09723

THE WIND DRIFT AND WAVE BREAKING,
Naval Research Lab., Washington, D.C. Ocean Sciences Div.
J. W. Wright.
Journal of Physical Oceanography, Vol. 6, No. 3, p 402-405, May 1976. 6 fig, 1 tab, 6 ref. NESS NA-756-73.

Descriptors: *Waves(Water), *Winds, *Model studies, Mathematical models, Hydraulic models, Gravity waves, Fluid mechanics, Fetch, Currents(Water), Oceans, Oceanography.
Identifiers: *Wind drift, Wave breaking.

When the wind blows across the water, a highly sheared current develops which extends a few millimeters into the water and amounts, at the surface, to 3-4% of the wind speed. Banner and Phillips have pointed out that the wind drift, as this thin surface current layer is called, may be sufficiently augmented by interaction with the orbital velocity field of the wave that the maximum particle speed may exceed the phase speed and the wave breaks. If a longer gravity wave is also present, the wind drift may be further augmented and the short gravity wave may break prematurely. Both the basic breaking condition and the diminution (straining) of the short gravity waves by longer waves were examined experimentally in wave tanks. It was found that actual wave breaking occurs at substantially higher winds than predicted and that the diminution is substantially less at the higher winds. The observed wind speed dependence of this diminution appears to be contrary to prediction and points to direct coupling between wind and short gravity waves as an important factor in the response of these waves to straining. (Sims - ISWS)
W76-09724

REMOVAL OF DISSOLVED BORON AND SILICON DURING ESTUARINE MIXING OF SEA AND RIVER WATERS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 2K.
W76-09725

MARINE SOIL POLLUTION AND SELF-PURIFICATION, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5A.
W76-09789

THE HEAVY METAL CONCENTRATIONS IN THE WATERS ALONG THE COAST OF FUKUYAMA, (IN JAPANESE),
Kagoshima Univ. (Japan). Lab of Marine Botany and Environmental Sciences.
For primary bibliographic entry see Field 5A.
W76-09815

BALANIDAE AS POLLUTION INDICATORS IN THE BAY OF GUANABARA, (IN PORTUGUESE),
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil).
For primary bibliographic entry see Field 5A.
W76-09823

WAVE BREAKING IN THE PRESENCE OF WIND DRIFT AND SWELL,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
O. M. Phillips, and M. L. Banner.
Available from National Technical Information Service, Springfield, Va 22161 as AD-A012 788, $3.50 in paper copy, $2.25 in microfiche. Reprint, Journal Fluid Mechanics, Vol 66, Part 4, p 625-640, 1974. 8 fig, 1 tab, 7 ref.

Descriptors: *Waves(Water), *Ocean waves, *Winds, *Air-water interfaces, Velocity, Energy gradient, Currents(Water), Fetch, Energy equation.
Identifiers: Wave action, Surface drift.

Wind, blowing over a water surface, induces a thin layer of high vorticity in which the wind stress is supported by molecular viscosity; the magnitude of the surface drift, the velocity difference across the layer, being of the order of 3% of the wind speed. When long waves move across the surface, there is a nonlinear augmentation of the surface drift near the long-wave crests, so that short waves, superimposed on the longer ones, experience an augmented drift in these regions. This is shown to reduce the maximum amplitude that the short waves can attain when they are at the point of incipient breaking. Theoretical estimates of the reduction are compared with measurements in wind-wave tanks by the authors and by Mitsuyasu (1966) in which long mechanically generated waves are superimposed on short waves by increasing the slope of the longer ones at constant wind speed are generally consistent with the predictions of the theory in a variety of cases. (Sinha-OEIS)
W76-09874

ASSESSING POTENTIAL OCEAN POLLUTANTS,
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-09889

OFFSHORE PETROLEUM AND NEW ENGLAND - A STUDY OF THE REGIONAL ECONOMIC CONSEQUENCES OF POTENTIAL OFFSHORE OIL AND GAS DEVELOPMENT,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 6B.
W76-09893

OIL SPILL AND OIL POLLUTION REPORTS, NOVEMBER 1974 - FEBRUARY 1975,
California Univ., Santa Barbara, Marine Science Inst.
For primary bibliographic entry see Field 5A.
W76-09896

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM, FINAL REPORT,
Aerojet Electrosystems Co., Azusa, Calif.
For primary bibliographic entry see Field 5A.
W76-09898

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1975,
Southern California Coastal Water Research Project, El Segundo, Calif.
For primary bibliographic entry see Field 5B.
W76-09899

ENGINEERING AND ECOLOGICAL EVALUATION OF ARTIFICIAL-ISLAND DESIGN, RINCON ISLAND, PUNTA GORDA, CALIFORNIA,
Blume (John A.) and Associates Research Div., San Francisco, Calif.
J. M. Keith, and R. E. Skjei.
U. S. Army Corps of Engineers, Coastal Engineering Research Center Technical Memorandum No. 43, March 1974. 76 p, 16 fig, 10 tab, 27 ref, append. Appendix - 'The Biota of Rincon Island,' by Brisby, W. L.; Moorpark Colege, California. DACW72-73-C-0004.

Descriptors: *Environmental effects, *Resources development, Water resources, *Water quality control, Continental Shelf, Islands, Ecology, Assessment, California, Bathymetry, Sediments, Bottom sediments, Biota, Design, Engineering structures.
Identifiers: *Artificial island, Revetments, Causeways, Littoral transport, Rincon Island(CA), Environmental impact.

Rincon Island, Punta Gorda, California, is an offshore island manmade in 1958. It was the first such island to be built with an ocean exposure. The island, located in a depth of about 45 feet, is composed of armor rock and tetrapod revetments enclosing a sand core. A pile-supported cayseway about 2,700 feet along connects the island to the shore. Major findings of an evaluation of the islands performance in the more than 14 years of its existence show: that the revetment has not been damaged by wave attack; that subsidence ranging from about 3 inches to 1.5 feet has occurred, mainly due to the deterioration of some inferior material in the revetment; that littoral transport has been almost unaffected; that adjacent bottom topography shows minor changes; and that a large, thriving community of marine organisms has developed in the environment created by the island. The report includes recommendations for instrumentation to provide measurement of waves and nearby bottom sedimentation. (Sinha - OEIS)
W76-09903

RECOMMENDED PROCEDURE FOR DEVELOPING DEEPWATER PORTS DESIGN CRITERIA,
Coast Guard, Washington, D.C. Office of Marine Environment and Systems.
For primary bibliographic entry see Field 5G.
W76-09907

OPERATIONAL MODEL FOR PREDICTING THE MOVEMENT OF OIL IN CANADIAN NAVIGABLE WATERS,
Canada Centre for inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-09908

EFFECTS OF PETROLEUM POLLUTANTS ON ARCTIC MICROBIAL POPULATIONS,
Louisville Univ., Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-09909

A POST CONSTRUCTION SURVEY OF SEVERAL MANMADE ISLANDS OFF THE COAST OF CALIFORNIA,
Dames and Moore, Los Angeles, Calif.
S. Noble, and R. Dornhelm.
Shore and Beach, Vol 43, No 1, p 21-26, April 1975. 8 fig, 5 ref.

LIBRARY U. OF I. Urbana-Champaign

Descriptors: *Environmental effects, Water resources, *Resources development, *California, Continental Shelf, Coasts, Engineering structures, Waves(Water), Littoral, Scour, Barrier islands.
Identifiers: Outer Continental Shelf, *Artificial islands, Coastal processes, Shorelines, Environmental impact, Thums Islands(CA), Island Esther(CA), Rincon Island(CA).

Several offshore island structures have been constructed on the west coast of the United States; they are Thums Islands, Island Esther, and Rincon Island. A description is presented of the impacts these islands have had on coastal processes in their vicinity, and the response of particular structural features to the stresses they have undergone. Of the islands studied, two of the Thums Islands (islands A and C) were the only structures that appeared to have had an effect on the shoreline. Advancement of the shoreline was observed in the wave shadow behind both of these islands. Island Esther and Rincon Island appear to have produced no change in the shoreline. Rincon Island provides clear evidence that an offshore island can be constructed so as not to cause detectable changes in the adjacent shoreline. Island Esther and Rincon Island have both produced changes in the bathymetry in their immediate vicinity. Conclusions concerning scour and accretion at the offshore islands examined in this study are: the changes in bathymetry have been observed to water depths of about 50 feet; the changes observed did not adversely affect the stability of the structure, and the measurable changes in bathymetry were confined to an area within approximately 2 to 3 island diameters of the island's toe. The findings of this study indicate that artificial islands can be designed to withstand the environmental stresses within the specification of the design, and can be located so as to minimize the environmental impact on coastal processes and the shoreline.
W76-09911

AN ENVIRONMENTAL RESEARCH PROGRAM FOR DRILLING IN THE CANADIAN BEAUFORT SEA,
Gulf Oil Canada Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 5G.
W76-09912

ACADEMIC DATA-NEEDS FOR ENVIRONMENTAL ASSESSMENTS OF OFFSHORE TECHNOLOGICAL OPERATIONS,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 6G.
W76-09914

COAST GUARD'S RESPONSE TO SPILLED OIL,
Coast Guard Reserve, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-09915

BOTTOM DEPOSITS OF THE KUBAN DELTAIC LIMANS, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
V. T. Bogucharskov.
Izv Sev-Kavk Nauch Tsentra Vyssh Shk Estestv Nauki. 1, p 100-101, 1974.

Descriptors: *Bottom sediments, *Deltas, Sediment transport, *Sediment discharge, Vegetation, *Salinity.
Identifiers: *Cardium, *Limans, *USSR(Kuban River).

Data are presented on the formation of the sediment discharge in the delta of the Kuban River, which empties into the Azov Sea (USSR) forming the system of deltaic lakes (limans). In the past, the accumulation of river sediments or Cardium valves during the period of salinization of the limans constituted the basis of the bottom sediments. At present, the decay products of vegetation comprise the basis of the bottom deposits. The fractional composition of the surface layer of bottom deposits are given.--Copyright 1975, Biological Abstracts, Inc.
W76-09935

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME I.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 2A.
W76-09941

HYBRID-ELEMENT METHOD FOR WATER WAVES,
Massachusetts Inst. of Tech., Cambridge, Dept. of Civil Engineering
For primary bibliographic entry see Field 8B.
W76-09945

LARGE WAVE CHANNEL FOR 'FULL SCALE-MODELING' OF WAVE DYNAMICS IN SURF ZONES,
Technische Hochschule, Hanover (West Germany). Franzius-Institut fuer Grund und Wasserbau.
For primary bibliographic entry see Field 8B.
W76-09946

MODELING OF WIND-WAVES WITH JONSWAP SPECTRA,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
For primary bibliographic entry see Field 8B.
W76-09948

USE OF MATHEMATICAL MODELS IN THE PALO ALTO MARSHLAND REHABILITATION PROJECT,
Water Resources Engineers, Walnut Creek, Calif
For primary bibliographic entry see Field 8B
W76-09949

ESTUARINE ECOLOGIC SIMULATIONS,
Water Resources Engineers, Inc., Austin, Tex.
R. J. Brandes, and F. D. Masch
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 159-178, 1975. 7 fig, 12 ref.

Descriptors: *Model studies, *Estuaries, *Texas, *Gulf of Mexico, Ecology, Mathematical models, Ecosystems, Water quality, Nutrients, Aquatic life, Fish, Aquatic plants, Phytoplankton, Algae, Zooplankton, Estuarine environment.

A numerical technique for simulating the ecological behavior of large, shallow estuaries typical of those along the coast of the Gulf of Mexico was presented. Originally developed to assess the effects of proposed upstream water resource development projects on the existing aquatic ecosystems in Texas estuaries, the ESTECO model has broad application to a variety of problems related to management of coastal waters. The model has been applied to the San Antonio Bay system on the Texas Coast, and calibration of the model has been undertaken to the extent possible using available water quality and biological data. The estuarine ecologic model utilizes a two-dimensional (area-wise) Eulerian mesh of square cells to describe the physical character of a prototype system and to facilitate the model's alternating-direction implicit numerical solution scheme. A computational grid composed of one square-mile cells was used for the model of San Antonio Bay. A similarly-structured and compatible tidal hydrodynamics model first must be applied to a bay system to generate a matrix of tidal net flows (across each cell boundary) which in turn, are used in the ecologic model to describe the convective transport of constituents. Hence, the estuarine ecologic model is considered a long-term dynamic model with respect to tidal effects, and its primary application is to those problems requiring simulation of ecologic changes which are likely to accur over a period of several months, or even years, rather than during a given tidal cycle. (See also W76-09941) (Sims - ISWS)
W76-09950

ORGANIC SEDIMENT MODEL FOR WASTEWATER OUTFALL,
Tetra Tech, Inc., Lafayette, Calif.
For primary bibliographic entry see Field 5B.
W76-09951

SIMULATION OF TIDAL HYDRODYNAMICS - MASONBORO INLET,
Water Resources Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 8B.
W76-09953

RIVER DELTA COMPUTER SIMULATION MODEL (SIMUDELT),
North Carolina State Univ., Raleigh. Dept. of Civil Engineering
K. K. Shearin, and J. L. Machemehl.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 240-253, 1975. 5 fig, 5 ref.

Descriptors: *Deltas, *Sedimentation, *River flow, *Tides, *Alluvial fans, Interfaces, Sediment load, Diffusion, Computer models, On-site investigations.
Identifiers: *Longshore transport, Tidal fluctuation, Jet flow.

The depth of fresh water is modeled as a sine wave with amplitude of one half the tidal range and period of one tidal cycle. The cycle is partitioned and the discharge evaluated at the midpoint of each subinterval; the sum is taken over one tidal cycle and used as the unit of sediment discharge. The longshore transport is described by a Gaussian distribution with mean of one half the distance from the shoreline to the breaker line. The fraction of the deposited sediment to be transported is calculated from the ordinate of the normal curve; appropriate shifts of sediment are made at the end of each interval of deposition. The functions used to describe the tides and the longshore transport were assumed as examples for modeling. Other functions more descriptive of a given situation could be substituted and treated by the same methods. (See also W76-09941) (Singh - ISWS)
W76-09954

ANISOTROPIC SAND TRANSPORT IN TIDAL INLETS,
Foundation for Ocean Research, San Diego, Calif.
S. L. Costa, and J. D. Isaacs.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 254-273, 1975. 11 fig, 1 tab, 10 ref.

Descriptors: *Inlets(Waterways), *Sediment transport, *Hydraulic models, *Tides, *Computer models, Harbors, Dredging, Hydraulics, Turbulence, Sediment control, Model studies.
Identifiers: *Tidal inlets, Unidirectional secondary flow, Sediment transport theory.

The occurrence of natural flushing action in tidal inlets has long been recognized. The traditional

solutions of dredging or the erection of sediment barriers are expensive, of short term usefulness, and engender a degree of environmental shock. This investigation involved redirecting a small part of the power in tidal flows in a manner as to greatly modify sediment deposition in such inlets. A small unidirectional secondary flow from ocean to bay disproportionately reduces power available to transport sediment into the channel and similarly increases the power available to transport sediment seaward. The results from hydraulic and computer models indicated that small perturbations to the inlet dynamics achieved in this manner have a large non-linear effect on the overall transport of sediments in the channel. The amount of change is much greater than might be expected from such small changes in the tidal flow. Recent studies have indicated that model and field data seem to be governed by the same law relating tidal flow and equilibrium channel geometry. Since these are the primary agents governing the results of our experiments, it may be possible to extend the results to real size harbors. (See also W76-09941) (Singh - ISWS)
W76-09955

MODELING SEDIMENT MOVEMENT FOR MASONBORO INLET,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Sager, and W. C. Seabergh.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 274-293, 1975. 13 fig, 7 ref.

Descriptors: *Model studies, *Inlets(Waterways), *Hydraulic models, *Sedimentation, Estuaries, Coasts, Beaches, Sediments, Sands, Tidal effects, Waves(Water), Ocean waves, Sediment transport, Scour, Erosion, Channels, Jetties, Hydraulics.
Identifiers: *Masonboro Inlet(NC).

As part of a U. S. Army Corps of Engineers research program, the General Investigation of Tidal Inlets, a study of Masonboro Inlet is being conducted in a distorted scale, fixed-bed model at the U. S. Army Engineer Waterways Experiment Station in Vicksburg Mississippi. The study involves an examination of fixed bed modeling techniques for inlets. One phase of the Masonboro Inlet study is to determine methods of simulating sand movement in and around the inlet. Effective procedures for predicting sand movement would provide a valuable aid in considering the effects of planned improvements to an inlet. Masonboro Inlet is a naturally occurring entrance through a sandy barrier beach along the North Carolina coast. It has a single weir-type jetty constructed in 1965-1966 with a deposition basin dredged adjacent to the weir and a navigation channel dredged through the ocean bar. The project functioned effectively for a year, then the channel relocated near the jetty and cut through the deposition basin. In 1969, velocities, tidal heights, and other data were collected from the prototype in order to verify a fixed-bed model. After hydraulic verification, the model was verified for shoaling patterns. The shoaling trends were verified for the 1969-1971 period using a light-weight plastic cube, 3mm on a side, and with a specific gravity of 1.18. After verification the model bed was molded to conform to the 1964 preproject conditions and a test was made to see if the model would predict the shoaling trends that occurred in the prototype after construction of the project. Results of the model tests compared to prototype data showed a good agreement between the model and prototype. (See also W76-09941) (Sims-ISWS)
W76-09956

MASONBORO INLET FIXED-BED MODEL EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-09957

PRINCIPLE OF MANAGEMENT OF DEGENERATED INLETS AND ESTUARIES,
Laval Univ., Quebec. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09958

TEMPERATURE PREDICTIONS FOR OFFSHORE POWER PLANTS,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
For primary bibliographic entry see Field 5B.
W76-09960

SAMPLING NETWORK DESIGN FOR DISPERSION VERIFICATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09961

FORECASTS FOR THE SACREMENTO RIVER SYSTEM,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 2E.
W76-09967

SYSTEMS MODELING OF STRATIFIED FLUIDS,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
For primary bibliographic entry see Field 8B.
W76-09976

MODELING OF THREE-DIMENSIONAL FLOWS IN ESTUARIES,
Rand Corp., Santa Monica, Calif.
J. J. Leendertse, and S-K. Liu.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 625-642, 1975. 9 fig, 11 ref. OWRT C-4261(No. 9040) (3).

Descriptors: *Model studies, *Estuaries, *Flow, *Chesapeake Bay, Tides, Storm surge, Circulation, Water circulation, Bays, Mathematical models, Turbulent flow, Hydraulics.
Identifiers: *San Francisco Bay, *Three-dimensional flows, Modeling techniques, Boundary conditions.

The paper described the computational principles of simulating three-dimensional flows in estuaries, bays, and coastal seas in which nonisotropic density conditions may exist. Numerical integration of the finite difference equations for motion, continuity, and for the transport of salt and heat were used. With this model, the computed salinity and temperature distributions were coupled to the flow computation by a nonlinear equation of state. An approximation for the sub-gridscale effect was introduced by use of mass heat and momentum exchange coefficients. The vertical exchanges for stable or unstable vertical stratification were estimated according to the local Richardson number. (See also W76-09941) (Sims - ISWS)
W76-09977

RESULTS OF SALINITY TESTS ON THE SAN FRANCISCO BAY-DELTA HYDRAULIC MODEL,
Army Engineer District, San Francisco, Calif.
M. A. Blank.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 663-674, 1975. 3 fig, 6 ref, 1 append.

Descriptors: *Model studies, *Estuaries, *Deltas, *California, Tidal marshes, Rivers, Bays, Coasts, Coastal plains, Salinity, Water quality, Hydraulic models, Sampling, Data processing.
Identifiers: *San Francisco Bay, *Sacramento-San Joaquin Delta(Calif).

As part of the San Francisco Bay and Sacramento-San Joaquin Delta Water Quality and Waste Disposal Investigation of the Corps of Engineers, U.S. Army Engineer District, San Francisco, hydraulic model tests were conducted at the Corps' fixed bed hydraulic (physical) model in Sausalito, California. These tests included: verification for tidal elevations, velocities and salinities; model sensitivity; base and plan conditions. Steady state tests were found satisfactory for measuring tidal elevations and velocities. Dynamic tests were required to obtain salinity results for comparison of base and plan conditions. The specific problem addressed was the effect that channel deepening would have on salinity at selected stations in the estuarine system. While in general deepening of navigation channels increased salinities, there were cases where deepening of the upper reaches of the channel caused small changes in salinity throughtout the system. It may be that the location of a critical mixing zone determines the influence of channel deepening on salinities. Regardless of what theories are used to explain phenomena the model test results indicated what will occur in the prototype for each of the plans tested. Results could then be used by specialist to determine the impact on the estuarine environment. (See also W76-09941) (Sims - ISWS)
W76-09978

EXPERIENCE WITH A SMALL SCALE, HIGHLY DISTORTED FIXED BED MODEL OF THE LAGO MARACAIBO ESTUARY,
Laboratorio National de Hidraulica, Caracas (Venezuela).
J. Brezina.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 675-689, 1975. 9 fig.

Descriptors: *Model studies, *Hydraulic models, *Estuaries, *Tidal waters, Tides, Bays, Tidal effects, Water circulation, Bodies of water, Lakes, Shoals, Roughness(Hydraulic), Saline water intrusion, Hydraulics.
Identifiers: *Lago Maracaibo estuary(Venezuela), *Venezuela.

The construction of a 13.50 m deep navigation channel through the shallow parts of the Gulf of Venezuela and Lago Maracaibo estuary was completed in 1963. The channel was built principally for the tankers which are used to transport crude oil from the fields located in the land enclosed body of water, commonly called Lago de Maracaibo. The field surveys made periodically after the channel was built have shown an increase in the salinity of the Lago de Maracaibo and the formation of shoals in various parts of the channel. To control the shoaling it was necessary to dredge the channel frequently. This operation, which later became continuous, required heavy financing for the maintenance of the channel. In 1968 the situation in the estuary of the Lago de Maracaibo was critically analyzed. It was concluded that the hydrodynamics of the estuary was not well understood, mainly because of limited field data, inadequate to shed light upon the highly complicated condition of the estuary. A 1:100 in vertical and 1:6000 in horizontal fixed bed model of the Lago de Maracaibo estuary reproduced adequately the tidal current patterns which, as it is believed,

LIBRARY U. OF I. Urbana-Champaign

hardly could be found by other means under the given condition. The results obtained from the tests have shown that the tidal current patterns are highly complicated and thus any intervention in the existing hydraulic conditions should be considered very carefully. (See also W76-09941) (Sims - ISWS)
W76-09979

HYDRODYNAMIC TRANSPORT PHENOMENA IN ESTUARIES AND COASTAL WATERS: SCOPE OF MATHEMATICAL MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 5B.
W76-09980

APPLICATION OF WATER QUALITY MODELS TO FINGER FILL CANALS,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-09981

RIVER AND ESTUARY MODELING WITH THE SIVA SYSTEM,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Centre.
For primary bibliographic entry see Field 2A.
W76-09982

HYDRODYNAMIC AND MATERIAL TRANSPORT MODEL FOR MOBILE BAY, ALABAMA,
Alabama University, University. Department of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-09983

APPLICATION OF PHYSICAL TIDAL MODELS IN HARBOR AND MARINA DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09984

QUANTITATIVE ASPECT OF THE PHYTOPLANKTON OF THE BAY DU LEVRIER (MAURITANIA), (IN FRENCH),
Museum National d'Histoire Naturelle, Paris (France). Laboratoire des Peches Outre-Mer.
For primary bibliographic entry see Field 5C.
W76-09987

THE ERADICATION OF THE SEAWEED SARGASSUM MUTICUM FROM BRITAIN,
Portsmouth Polytechnic (England). Dept of Biological Sciences.
For primary bibliographic entry see Field 5G.
W76-09989

WATER TRANSPORT IN THE SILL AREA OF BALSFJORD NORTH NORWAY, DURING VERNAL MELTWATER DISCHARGE,
Tromsoe Univ. (Norway). Inst. of Biology and Geology.
S. Skreslet.
Astarte. 6(1), p 1-8, 1973.

Descriptors: *Melt water, *Melting, *Fjords, Europe, Tidal waters, Bathythermograph, *Water temperature.
Identifiers: *Norway(Balsfjord), Periodicity, Sill, Vernal meltwater discharge.

From May to July 1971, Aanderaa recorders and a bathythermograph, which was mounted in a sledge, were used to record changes in current and temperature at the bottom inside the sill. Coastal water flowing into the area during high tide was found to restrict surface outflow, especially at spring tides. It also suppressed the basin water during high tide, and probably induced a standing tidal wave at the boundary between the basin water and the upper layers. The water movements caused large-scale temperature variations along the bottom profile. During early July, at both 30 and 39 m depth, short-period temperature variations developed, while variations with tidal periodicity vanished. This was probably related to maximum freshwater discharge.--Copyright 1974, Biological Abstracts, Inc.
W76-09999

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

NEW TECHNOLOGIES IN WATER PURIFICATION AND THEIR APPLICATION TO ARID LANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
R. F. Probstein.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 18 p, 4 fig, 1 tab, 6 ref.

Descriptors: *Arid lands, *Brackish water, *Water purification, *Desalination, *Water quality, Water resources development, Membrane processes, Electrodialysis, Ion exchange, Reverse osmosis, Freezing, Vapor compression distillation, Evaporation, Economic efficiency, Arizona, Groundwater, Technology, Water supply.

New water purification technologies, especially those appropriate for treating brackish waters, are described. Various desalting techniques are analyzed for range of usefulness and economic viability, including ion exchange, electrodialysis, reverse osmosis, freezing, and evaporation. Evaporation and freezing are most suitable for desalinating seawater, but these systems are complex and costly. Ion exchange, electrodialysis and reverse osmosis are best for purifying brackish waters, being simple and less expensive operations. Reverse osmosis involves a pressure driven membrane process which is a viable means of purification for municipal and industrial water needs in arid regions but not yet for general large-scale agriculture. The technique is most advantageous when there are high levels of dissolved solids and where mechanical power is a desired energy source. Ion exchange also uses a membrane and works best when dissolved solids content is relatively low and a simple operation is desired. Worldwide brackish groundwater supply locations, quantities and quality are described, with details given of U.S. studies. (Jahns-Arizona)
W76-09481

ON THE CAPACITY-EXPANSION OF DESALINATION PLANTS AND STORAGE TANKS,
California Univ., Davis. Dept. of Water Science and Engineering.
H. N. Rajhi, and M. A. Marino.
Water Resources Bulletin, Vol. 12, No. 3, p 481-500, June 1976. 1 fig, 4 tab, 17 ref.

Descriptors: *Desalination plants, *Storage tanks, *Optimization, *Economics, Water supply, *Size, Economies of scale, Population, Water demand, Interest rates, Computer programs, Constraints, Municipal water, Equations, Nonlinear programming, Sea water, Capital costs, Operating costs, Planning, Algorithms, Mathematical models.
Identifiers: *Capacity expansion, *Cost minimization, Coastal cities.

A mathematical programming model is structured to find the optimal time and capacity expansion path of desalination plants and storage tanks for a hypothetical community which depends on desalination as its sole, or major, water supply source. The objective is to determine the least costly combination of sizes and times of installation (of both desalting plants and storage tanks) which can meet a rising water demand over a finite planning horizon. The optimality criterion used in the model is based on two major economic elements: the economies of scale inherent in such facilities and the time-value of money represented by the interest rate, the former favoring large capacities and the latter small capacities. The model is applied using three population growth patterns and two interest rates. The water demand components for every year in the planning period are computed using empirical formulas which are based on population and other basic data. The model is solved for each of the above cases with the aid of a nonlinear programming computer package, based on the method of feasible conjugate directions. The results clearly reflect the balance between the economies of scale and the time-value of money under every demand growth function. (Bell-Cornell)
W76-09618

REVERSE OSMOSIS -- CAN IT REPLACE DISTILLATION,
For primary bibliographic entry see Field 5D.
W76-09667

THE DESERT WAR ON POLLUTION,
For primary bibliographic entry see Field 5D.
W76-09711

INVESTMENT SEQUENCING, ALLOCATION, AND LEARNING IN THE DESIGN OF WATER RESOURCES SYSTEMS: AN EMPIRICAL APPLICATION,
Harvard Univ., Boston, Mass. Graduate School of Business Administration.
For primary bibliographic entry see Field 6A.
W76-09846

SUPPORTED SEMI-PERMEABLE MEMBRANES,
Daicel Ltd., Osaka (Japan). (Assignee).
K. Ishii, and S. Konomi.
U.S. Patent No. 3,950,255, 3 p, 5 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 826, April 13, 1976.

Descriptors: *Patents, *Reverse osmosis, *Membranes, *Semipermeable membranes, Membrane processes, Separation techniques, Water purification, *Desalination processes, Water quality control, Water treatment, *Waste water treatment, Strength of materials.
Identifiers: Membrane support.

Supported semi-permeable membranes are prepared by coating a membrane-forming solution directly on a membrane support. The membrane support is a woven fabric selected from the group consisting of: a woven fabric made of mixed yarns and formed by employing as a part of the weft and/or warp yarns a yarn composed of a component soluble in a solvent used for forming the membrane-forming solution; a woven fabric composed of a blended yarn including as one blend component fibers composed of a component soluble in a solvent used for forming the membrane-forming solution; and a woven fabric having its surface coated with a polymer soluble in a solvent used for forming the membrane-forming solution. The supported semi-permeable prepared according to the process of this invention has a much improved resistance to repetitions of compression and pressure reduction, and simultaneously, the general mechanical strength is increased. (Sinha - OEIS)
W76-09863

SEMIPERMEABLE MEMBRANE AND PROCESS FOR THE PREPARATION THEREOF,
Daicel Ltd., Osaka (Japan). (Assignee).
K. Ishii, and Z. Honda.
U.S. Patent No. 3,950,257, 8 p, 2 fig, 4 tab, 13 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 827, April 13, 1976.

Descriptors: *Patents, *Reverse osmosis, *Membranes, *Semipermeable membranes, Membrane processes, Filtration, Separation techniques, Water purification, Desalination processes, Water quality control, *Waste water treatment, Polymers, Organic compounds.

A process for preparing a semipermeable membrane for ultrafiltration is characterized in that a copolymer of 90 to 60 molar percent of acrylonitrile and 40 to 10 molar percent of at least one non-electrolytic, water-soluble monomer is dissolved in a solvent, and the solution is spread upon a surface such as a glass or cloth surface to form a film and then the film is immersed in water to form a semipermeable membrane. The copolymer of acrylonitrile and the non-electrolytic, water-soluble monomer can be prepared easily by the mass polymerization process. (Sinha-OEIS)
W76-09864

METHOD AND APPARATUS FOR CONVERTING SALINE WATER TO FRESH WATER,
P. S. Roller.
U.S. Patent No. 3,951,752, 6 p, 1 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1331, April 20, 1976.

Descriptors: *Waste water treatment, *Patents, *Saline water, *Sea water, *Brackish water, *Desalination, *Water purification, Desalination apparatus, Scaling, Demineralization, Separation techniques, Condensation, Condensers, Flash distillation.

Saline water, typically sea water or brackish water, after deaeration and deoxygenation is preheated, then further heated by steam condensing with the preheated saline water. By the further heating, bicarbonates are thermally decomposed, forming carbon dioxide, while scale compounds, comprising magnesium hydroxide, anhydrite and minor compounds containing silica, iron, alumina, phosphate, etc., are thermally precipitated. Some of the steam is uncondensed and issues from the further heated saline water with included, evolved carbon dioxide. It is condensed in pre-heating saline water; evolved carbon dioxide is separated from the condensate and recycled to the saline water to prevent alkaline scale in preheating, while condensate is combined with the further heated saline water, forming post-thermal saline water. This is flash vaporized while cooling and the steam is regenerated by compressing the flashed vapors. Cooled, post-thermal saline water is evaporated preferably in a vapor compression evaporator to form fresh water and saline water residuum. (Sinha-OEIS)
W76-09871

METHOD AND APPARATUS FOR THE CONVERSION OF AN AQUEOUS SCALE-FORMED LIQUID,
P. S. Roller.
U.S. Patent No. 3,951,753, 10 p, 11 fig, 2 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1331, April 20, 1976.

Descriptors: *Waste water treatment, *Patents, Saline water, *Sea water, *Brackish water, *Scaling, *Desalination, Water purification, Water treatment, Desalination apparatus, Demineralization, Separation techniques, Evaporation, Condensation, Condensers, Flash distillation, Carbon dioxide, *Corrosion.

The invention relates to converting an aqueous scale-forming liquid to distillate and liquid residuum, and in particular to processing the liquid to avoid scale and minimize corrosion while evaporating it to a high degree. Saline water is preheated by the hot discharges of a vapor compression evaporator, forming distillate and concentrated brine. Carbon dioxide that has been recycled to saline water prevents alkaline scale during the preheat. The saline water is thence further heated by steam which is condensed in it; scale compounds are precipitated and carbon dioxide formed and expelled for recycle. Mother liquor which is separated is flash vaporized, forming cooled mother liquor and vapor. The mother liquor is further cooled while preheating saline water, and is then evaporated. The vapor is compressed to form steam for use in the further heating. (Sinha-OEIS)
W76-09872

PREPARATION OF REVERSE OSMOSIS MEMBRANES BY COMPLETE EVAPORATION OF THE SOLVENT SYSTEM,
Dept. of the Interior, Washington, D. C.
R. E. Kesting.
Patent Application No. 401,003, September 26, 1973. 22 p, 2 tab.

Descriptors: *Patents, *Desalination, *Separation techniques, *Waste water treatment, *Water purification, Membranes, Reverse osmosis, Membrane processes, Water quality control, Seawater, Brackish water, Acid mine water.
Identifiers: Asymmetric reverse osmosis membranes, Cellulose acetate.

An asymmetric reverse osmosis membrane can be prepared by forming a dilute solution of cellulose acetate in a solvent system consisting of a volatile true solvent for the polymer and at least one nonsolvent which acts as a pore-forming material. The solution is cast into a thin film and allowed to dry completely. The membranes formed by this process are wet-dry reversible, i.e., they can be wet and dried numerous times without any special treatments and without any impairment of the membrane properties. Asymmetric cellulose acetate membranes consist of two separate layers: a thin dense skin layer which is the effective resistance to solute transport and a thick porous substratum which acts as a mechanical support for the skin but exhibits little or no resistance to the transport of either solute or solvent. The porous support layer consists of an open cell structure which freely permits permeation through the channel in the cells. (Sinha-OEIS)
W76-09876

REVERSE OSMOSIS PROCESS USING CROSSLINKED AROMATIC POLYAMIDE MEMBRANES,
Department of the Interior, Washington, D. C.
R. McKinney, Jr., and W. L. Hofferbert.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-241 675, $3.50 in paper copy, $2.25 in microfiche. U. S. Patent Application, Serial Number 616,441, Filed February 13, 1976. 15 p, 1 tab.

Descriptors: *Patents, *Reverse osmosis, *Membranes, *Waste water treatment, *Desalination, *Water quality control, Saline water, Chemical reactions, Irradiation.
Identifiers: *Crosslinked aromatic polyamide membranes, Ionic crosslinking.

Reverse osmosis membranes of improved flux or flux stability are prepared by crosslinking aromatic polyamide membranes. Crosslinking may be achieved by reaction with crosslinking reagents such as aldehydes, polyamines, polycarboxylic acids, polyisocyanates, oxidizing agents, peroxides, etc. Optimum proportions of crosslinking reagent and catalyst, as well as temperature and reaction time, will vary considerably with the specific polyamide and the specific crosslinking reagent and best determined experimentally. A second means of achieving crosslinking is by means of irradiation. According to this method, the finished, i.e., coagulated and extracted, membrane is exposed to radiation such as ultra-violet, x-rays, gamma rays, and high energy electrons, with the preferred form of radiation being gamma radiation. In addition, the irradiation may be carried out in the presence of monomers capable of undergoing free radical polymerization. A particularly effective means of crosslinking has been found to be that of ionic crosslinking. According to this procedure, a hydrophilic or polar group is introduced into the linear polyamide chain by including reactants containing the polar group in preparation of the linear polyamide. Suitable polar groups include carboxyl, amine, amic acid, etc. Ionic crosslinking results in substantial improvement in flux stability, as well as flux. (Sinha-OEIS)
W76-09877

3B. Water Yield Improvement

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: PENN STATE EXPERIMENTAL WATERSHEDS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 4D.
W76-09463

WATER CONSERVATION IN ARID-ZONE SOILS,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
D. Hillel.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 18 p, 6 fig, 1 tab, 12 ref.

Descriptors: *Water conservation, *Evaporation control, *Induced infiltration, *Soil treatment, *Chemcontrol, Infiltration, Arid lands, Soil moisture, Soil erosion, Mulching, Wettability, Rainfall-runoff relationships, Capillary conductivity, Runoff, Absorption.

A new method is described and analyzed for treating the soil surface mechanically and chemically to increase water absorption and retention. The method, which may alleviate drought conditions and increase usable cropland in semiarid regions, involves spraying hydrophobic chemicals to waterproof surface-zone soil clods, creating a cover (or 'mulch') of dry clods. Hydrophobic agents prevent clods from slaking-down in water or clogging surface cavities, thereby helping to maintain a high infiltration rate for maximal rain absorption. Other benefits include prevention of runoff, scouring, and erosion due to intense rainfall; excess water can be held temporarily in the inter-clod cavities of the surface-zone for eventual infiltration. This process is even more valuable during dry spells in semiarid and arid regions because it inhibits capillary conduction from the underlying moist soil; moisture can escape only through relatively slow vapor diffusion. Effects on runoff, evaporation, and crop seed germination are described. A mechanistic numerical simulation model is developed to evaluate the dynamic balance and storage of soil moisture through repeated cycles of rain and evaporation. (Jahns-Arizona)
W76-09478

THE OVER-EXPLOITATION OF GROUNDWATER RESOURCES IN DRY REGIONS,
Hebrew Univ., Jerusalem (Israel). Graduate School of Applied Science and Technology.
For primary bibliographic entry see Field 4B.
W76-09479

LIBRARY U. OF I. URBANA-CHAMP.

MICRO-CLIMATE EFFECTS ON WATER USE EFFICIENCY BY PLANTS IN AN ARID CLIMATE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
M. Fuchs.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 15 p, 6 fig, 19 ref.

Descriptors: *Microclimatology, *Canopy, *Arid climates, *Transpiration control, *Water utilization, *Xerophytes, Photosynthesis, Stomata, Drought tolerance, Solar radiation, Plant physiology, Plant groupings.

This research describes how microclimate changes due to physical and physiological characteristics of the plant canopy affect the transpirational water loss, productivity, and water use efficiency of plant communities. Equations demonstrate that a plant community creates its own specific microclimate according to the radiation balance, which depends upon the geometrical properties and density of the foliage. Stomatal resistance modifications cause further adjustment of the canopy's heat budget, and consequently of the microclimate. Transpiration is most controlled at the low end of the stomatal resistance scale, especially for plants with horizontal foliage. Transpiration flux is barely influenced by increased foliage density of the horizontal canopy, proving it to be best suited for drought conditions. Randomly inclined and vertical canopies involve rapid transpiration increases with foliage density, and stomatal control of transpiration becomes largely ineffective. Dense vegetation of these types in an arid climate requires irrigation, and natural survival of such canopies depends on reduced leaf area index. Plants with a C-4 photosynthetic mechanism appear to use more efficiently the high insolation of an arid environment. Water use efficiency is lower in C-3 plants; efficiency for C-4 plants increases systematically with stomatal resistance for all canopy structures and densities, indicating the highest efficiency is reached when plants are water stressed. (Jahns-Arizona)
W76-09480

SIOUX FALLS RESTORES FOUR WELLS WITH COLLECTOR PIPE,
Sioux Falls Water Dept. S. Dak.
D. Moberly.
Op Flow, Vol. 2, No. 3, p. 1, 7, March, 1976, 6 fig.

Descriptors: *Water wells, *Maintenance, *Estimated costs, *Cost comparisons, *South Dakota.
Identifiers: *Ranney horizontal collector well, *Production decline, *Rejuvenating techniques, *Hydraulic blasting unit, Drastic cost reduction.

The Sioux Falls Water Department encounted the problem of rejuvenating four Ranney horizontal collector wells which had declined in production 60 percent from their original capacity of 1,400 gallons per minute. An informal estimate of $17,000 for one well was suggested by a well-cleaning contractor. The well-field foreman found that he could fabricate a hydraulic 'blasting unit' for less than $10,000 using an air compressor, a submersible pump and 120 feet of steel pipe with threaded connections. The blasting unit was jacked into the collector pipe. A shot of compressed air and water was jetted into the pipe to loosen the fine sand that had accumulated around it. The pressure was released with quick-acting gate valves and the fine material was flushed back through the unit into the well caisson. The same procedure was followed in each of the collector pipes. When completed, the rejuvenated well produced in excess of 1,400 gallons per minute. When this process was refined, the job took less than two weeks with a cost of $3,000 per well. (Heiss-NWWA)
W76-09510

INFLUENCE OF HYDRAULIC TROUGH AND LATERAL JOINTS ON THE GROUNDWATER POTENTIAL OF THE MASSIVE TRAP UNIT AT TANORIA IN SHAJAPUR DISTRICT (MP),
Central Ground water Board, Nagpur (India).
For primary bibliographic entry see Field 4B.
W76-09614

INVESTIGATIONS INTO THE YIELD OF AN EXISTING SURFACE RESERVOIR AND AQUIFER SYSTEM,
Lancashire River Authority (England).
P. D. Walsh.
*Water yield, *Reservoirs, *Aquifers, *Surface waters, Water storage, Water distribution(Applied), Water supply, Simulation analysis, Reliability, Size, Operations, Monthly, Failures, Systems analysis.
Identifiers: *England.

Stocks reservoir and the Fylde Bunter sandstone aquifer of North-West England have been used conjunctively for public water supply for some years. A description has been given of early investigations into its operation. Engineering studies have shown that the capacity of the reservoir may be increased, and detailed studies using a digital model to examine the drawdown which would result from various demand patterns on the aquifer have shown that a maximum abstraction rate of 215x10 cu m/cu/day from the aquifer may be sustained over short periods subject to certain limitations for periods of 60, 90 and 180 days and an abstraction of not more than 29,150 10 cu m cu over 1 year and an average withdrawal over 3 years not greater than the average recharge rate assessed at 50.8x10 cu m cu/days. It is shown that the use of monthly data to size the reservoir may underestimate the storage requirement by 15% for a 2% probability of failure, which is shown to be equivalent to a Deficit Day Index (Storage) of 0.06% when using a 6-day period between operating decisions. Using a control curve to determine the rate of abstraction from the reservoir, enables a very high proportion of the reservoir inflow to be taken into supply and reduces the use of the aquifer. (Bell-Cornell)
W76-09631

GRAVITY GEOPHYSICS FOR GROUNDWATER EXPLORATION IN GLACIATED AREAS,
Michigan State University, East Lansing. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W76-09758

THE EFFECT OF SILICON OILS ON THE WATER LOSS OF HORDEUM VULGARE L, (IN GERMAN),
Leipzig Univ. (East Germany). Bereich Pflanzenphysiologische Mikrobiologie.
I. Frommhold.
Biol Zentralbl. 94(1), p 63-74, 1975.

Descriptors: *Antitranspirants, Oil, *Barley, *Water loss, Soil water, Water supply, Sprays, Transpiration control.
Identifiers: *Silicon oils.

Several silicon oils were investigated in order to test their usefulness for application as antitranspirants. The water loss of barley was diminished by spraying with Silicon spray 50. When the soil water supply was restricted, the water loss of the treated plants decreased for several days. The production of dry matter was not influenced. Silicon spray 50 may be considered an antitranspirant.--Copyright 1975, Biological Abstracts, Inc.
W76-09806

3C. Use Of Water Of Impaired Quality

WATER UTILIZATION AND SOIL SALINITY: CONTROL IN ARID ZONE AGRICULTURE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
E. Bresler.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 20 p, 7 fig, 25 ref.

Descriptors: *Arid lands, *Saline soils, *Water management(Applied), *Saline water, *Desalination, Irrigation effects, Soil-water-plant relationships, Crop response, Salt tolerance, Surface irrigation, Water quality, Crop production, Soil management, Cost analysis, Computer models, Leaching.
Identifiers: *Trickle irrigation, *Soil desalination.

The only effective method for soil desalinization in arid zones is the application of irrigation water exceeding crop requirements for optimum yield. Under certain arid conditions, irrigation water may be better used for changing the soil-water-salt regime instead of leaching. When the arid soil solution is derived from irrigation water salinity, salt concentrations in the soil solution are always greater than or equal to that of the water used. Permanent irrigation causes increased soil solution concentration regardless of water quality; additionally, irrigation water quality tends to deteriorate, necessitating the use of poorer quality water for irrigation and soil salinity control. The acceptable soil salinity level is basically determined by crop sensitivity. Growth reduction in most crops is controlled primarily by the total salt concentration of the soil solution. Effects on plant growth and crop yield are described, along with the dynamics of water and salt in irrigated soils. The short-run and long-run implications of water utilization for soil salinity control are also discussed, including those of reclamation of saline soils by leaching. (Jahns-Arizona)
W76-09482

WATER SYSTEM BEHAVIOR: DETERMINANTS IN AN ARID REGION,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-09483

EFFECTS OF FLOODING AND OF IRRIGATION WATER SALINITY ON EUCALYPTUS CAMALDULENSIS DEHN. FROM THREE SEED SOURCES,
Volcani Inst. of Agricultural Research, Ilanot (Israel). Forestry Div.
R. Karschon, and Y. Zohar.
Leaflet No. 54, November, 1975 (presented at the Physiological Genetics Conference, Edinburgh July 13-21, 1975). 7 p, 3 fig, 1 tab, 11 ref.

Descriptors: *Plant growth, *Irrigation effects, *Salt tolerance, *Trees, *Provenance, *Australia, Water management(Applied), Root development, *Flooding, Saline water, Salinity.
Identifiers: *Eucalyptus camaldulensis.

Differences in flooding and salinity tolerance in Eucalyptus camaldulensis appear related to contrasting ecological conditions at the seed source. This study of flooding and irrigation water salinity effects on the plant in three Australian locations revealed a high salinity tolerance for the Lake Albacutya, Victoria, population. After one year provenance 6845 in that dry lake location had increased leaf size and dry weights of stem, leaves and roots; in contrast to the other seed sources tested, taproots were well-developed with few adventitious roots floating near the water surface. Irrigation for one year with water containing up

00 ppm NaCl did not markedly impair growth, t flooding for 2 or 4 months with water having 00 and 15,000 ppm, respectively, caused growth luction. Provenance 6869 trees along the levee nks of the Katherine River tolerate seasonal riations in stream level but are less adapted to longed anerobic conditions and exposure to inity. Provenance 8409 trees from around ndham, W. A., were even less salt-tolerant nough their tapwater flooding tolerance was ilar to that of the Katherine trees. Flooding h non-saline water for 4 months is tolerated al- st equally by the three seed sources, suggesting ay be a species trait. (Jahns-Arizona)
6-09664

NTRIBUTION OF SALTS TO THE WATER TENTIAL OF WOODY PLANTS,
lifornia Univ., Los Angeles. Lab. of Nuclear dicine and Radiation Biology.
Wallace, and G. E. Kleinkopf.
nt Sci Lett. 3(4), p 251-257, 1974.

scriptors: *Salts, *California, Arid lands, Plant upings, *Halophytes, Leaves, Cations, Brush, lt tolerance, Plant growth.
ntifiers: *Atriplex-Canescens, *Atriplex-Con- tifolia, Krameria-Parvifolia, Larrea-Tridentata, nhalophytes, Plants, Potential, Salts, Water, ody, *Water potential(Plants), Mojave sert(Calif), Woody plants.

ter potentials of a wide variety of desert and ndesert plant species grown in a glasshouse re measured with a pressure bomb and com- red with cation concentrations in leaves. Only 1 of the variation in water potential among all species was due to salt present in plants (as asured as meq total cations or as % Cl), ereas most of the water potential within some ophyte species was due to the salt present in the nts. Water potentials of 2 Atriplex spp. (A. nescens, A. confertifolia) which are halophytes creased considerably with increased applica- ns of NaCl. For 2 of the most successful non- ophyte species in the Northern Mojave Desert lifornia), (Larrea tridentata and Krameria par- olia) their low negative water potentials were caused by their cation concentration which are atively low, but by unknown factors associated h resistance to water loss.--Copyright 1975, logical Abstracts, Inc.
6-09691

FECT OF WATER QUALITY AND MANAGE- NT PRACTICES ON SOME CHEMICAL OPERTIES OF SOILS,
st Pakistan Agricultural Univ., Lyallpur. Dept. Soil Sciences.
A. Khalid, S. Muhammed, and A. K. Hashmi.
J Sci Res. 24(1/2), p 43-49, 1972.

scriptors: *Soil chemical properties, Water lity, Irrigation water, Wheat, Clays, Leaching, ls, *Salt tolerance.
ntifiers: Alfalfa, Pakistan.

experiment was conducted on 3 soils packed formly in cement pipes to study the effect of lying inferior quality irrigation water over and ve the crop requirement. Wheat and alfalfa re grown as a mixture. The salt accumulation reased as the amount of water applied at irriga- time increased, because a part of the water ched the salts below the root zone. Salt accu- lation increased with increase in clay content of soil and salt content of the irrigation water. expected sodium hazard of irrigation waters be estimated by using the equation developed Bower, Ogata and Tucker.--Copyright 1974, logical Abstracts, Inc.
6-09926

SALINITY TOLERANCE OF INLAND HALOPHYTIC VEGETATION OF NORTH AMERICA,
Caen Univ. (France). Laboratoire de Physiologie Vegetale.
I. A. Ungar.
Bull Soc Bot Fr. 120(5/6), p 217-222, 1973.

Descriptors: *Salt tolerance, Vegetation, Distribution, *Halophytes, *North America, Salinity, Soil moisture, Saline soils.

The distribution of inland halophytic species of North America is chiefly affected by 2 environmental factors, soil moisture and soil salinity which interact to determine the soil water potential. Seasonal changes in soil moisture and soil salinity have a marked effect on halophyte seedling establishment and this leads to a great decrease in the number of plants surviving to maturity on the salt pans. Zonation in these environments is controlled by plant species tolerance to salinity and their ability to compete with other species under more moderate conditions.--Copyright 1974, Biological Abstracts, Inc.
W76-09988

3D. Conservation In Domestic and Municipal Use

URBAN DRAINAGE STUDIES,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5B.
W76-09402

GIVE STORMWATER POLLUTANTS THE SPIN,
Municipal Environmental Research Lab., Edison, N.J. Storm and Combined Sewer Section.
For primary bibliographic entry see Field 5D.
W76-09461

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: BALTIMORE, MARYLAND, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
For primary bibliographic entry see Field 4D.
W76-09464

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: NEWARK, NEW JERSEY, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
For primary bibliographic entry see Field 4D.
W76-09465

SUMMARY OF MUNICIPAL WATERSHED MANAGEMENT SURVEYS IN EASTERN UNITED STATES,
Southeastern Area State and Private Forestry, Atlanta, Ga.
For primary bibliographic entry see Field 4D.
W76-09466

MUNICIPAL WATERSHED MANAGEMENT: WHAT ARE THE OPPORTUNITIES,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 4D.
W76-09472

MODERN TECHNIQUES OF WASTE DETECTION,
East Worcestershire Waterworks Co., Bromsgrove (England).
For primary bibliographic entry see Field 5F.
W76-09685

ILLUDAS - THE ILLINOIS URBAN DRAINAGE AREA SIMULATOR,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W76-09735

SECONDARY EFFECTS OF PUBLIC INVESTMENTS IN HIGHWAYS AND SEWERS.
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5G.
W76-09778

A LINEAR PROGRAMMING MODEL FOR USE IN GUIDING URBAN FLOODPLAIN MANAGEMENT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W76-09849

3E. Conservation In Industry

POWER GENERATION IN ARIZONA AND ITS ENVIRONMENTAL IMPLICATIONS,
Arizona Univ., Tucson. College of Engineering, Engineering Experiment Station.
For primary bibliographic entry see Field 6D.
W76-09485

RADIATION FOR A CLEAN ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5D.
W76-09512

RADIATION RECYCLING PROCESS OF WASTE POLY(TETRAFLUORETHYLENE) SCRAP,
Kyoto Univ., (Japan). Faculty of Engineering.
For primary bibliographic entry see Field 5D.
W76-09556

ENERGY MODELING AND FORECASTING.
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 6A.
W76-09602

A PROBABILISTIC MODEL OF THE OIL AND GAS DISCOVERY PROCESS,
Alfred P. Sloan School of Management, Cambridge, Cambridge Mass.
For primary bibliographic entry see Field 6A.
W76-09604

COUPLED ENERGY SYSTEM-ECONOMIC MODELS,
Brookhaven National Lab., Upton, N.Y. Energy Systems Analysis Group.
For primary bibliographic entry see Field 6A.
W76-09605

METHDOLOGICAL ISSUES IN THE ECONOMETRIC ESTIMATION OF ENERGY DEMAND ELASTICITIES,
Wharton School of Finance and Commerce, Philadelphia, Pa. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W76-09607

ENERGY SYSTEMS: MODELING AND POLICY PLANNING,
Massachusetts Inst. of Tech. Cambridge. Energy Lab.

LIBRARY U. OF I. URBANA-CHAMPAIGN

For primary bibliographic entry see Field 6A.
W76-09608

ENERGY CONSUMPTION AND FUEL CHOICE BY RESIDENTIAL AND COMMERCIAL CONSUMERS IN THE UNITED STATES,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
For primary bibliographic entry see Field 6A.
W76-09609

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Exxon Corp., New York. Corporate Planning Dept.
For primary bibliographic entry see Field 6A.
W76-09612

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Pacific Gas and Electric Co., San Francisco, Calif.
For primary bibliographic entry see Field 6A.
W76-09613

MODERN TECHNIQUES OF WASTE DETECTION,
East Worcestershire Waterworks Co., Bromsgrove (England).
For primary bibliographic entry see Field 5F.
W76-09685

HYDROLOGY OF THE MADISON FORMATION AND ITS POTENTIAL USE FOR WATER SUPPLY FOR ENERGY DEVELOPMENT,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2F.
W76-09757

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: GRAIN PROCESSING SEGMENT OF THE GRAIN MILLS INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09775

WATER USE POLICIES AND POWER PLANT ECONOMICS,
Houston Univ., Tex.
For primary bibliographic entry see Field 5G.
W76-09776

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: FERTILIZER INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09777

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: APPLE, CITRUS AND POTATO PROCESSING SEGMENTS OF THE CANNED AND PRESERVED FRUITS AND VEGETABLE INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09779

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: INSULATION FIBERGLASS INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5G.
W76-09780

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE MAJOR COAL AND OIL SHALE AREAS OF WYOMING, 1975-76,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4A.
W76-09833

OFFSHORE PETROLEUM AND NEW ENGLAND - A STUDY OF THE REGIONAL ECONOMIC CONSEQUENCES OF POTENTIAL OFFSHORE OIL AND GAS DEVELOPMENT,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 6B.
W76-09893

3F. Conservation In Agriculture

EFFECT OF DIFFERENT SPRING SOIL MOISTURE LEVELS ON MOISTURE STRESS,
National Weather Service, Cincinnati, Ohio. River Forecast Center.
D. Zanzalari, and R. H. Shaw.
Iowa State J Res. 49(1); p 23-38, 1974.

Descriptors: *Soil moisture, *Moisture tension, *Corn(Field), *Crop yield.

A program for predicting soil moisture and a stress index for corn was used to measure the effect of different levels of spring soil moisture on corn yields. A regression equation using the stress index was used to estimate corn yields. Three spring-moisture starting levels were used: 20%, 60% and 100% of field capacity. Actual weather data for each year for the 20-yr period, 1951-1970, were used to compute an estimated yield for each year for each starting level of spring moisture. When the 100% start was compared to the 20% start, the average yield reduction ranged from 3750 kg/ha in northwestern Iowa (USA) to near 1800 kg/ha in central and eastern Iowa. A greater reduction in yield occurred when the starting soil moisture dropped from 60-20% of field capacity, compared with a drop from 100-60%. The value of the field capacity also affected this difference, with higher capacity soils showing a greater decrease in yield than did lower capacity soils when starting soil moisture dropped from 60-20%.--Copyright 1975, Biological Abstracts, Inc.
W76-09412

COST OF PRODUCING CROPS IN THE IRRIGATED SOUTHWEST, PART II: NEW MEXICO,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
N. G. Wright, T. M. Stubblefield, G. O. Ott, W. D. Gorman, and R. R. Lansford.
Arizona Agricultural Experiment Station, Technical Bulletin 222. 1976. 30 p, 1 fig, 26 tab, 26 append.

Descriptors: *Cost analysis, Water resources development, *Crop production, *Planning, *Cultivated land, *Irrigated land, Economic feasibility, Cost comparison, Water utilization, Land development, Agriculture, Irrigation programs, *New Mexico, Marketing, *Budgeting.
Identifiers: Synthetic budgeting method.

This study is part of a project designed to supply information necessary to maximize the agricultural base in southwestern states and to aid realistic planning of profitable agri-businesses using irrigated land. Some southwestern lands are now under irrigated cultivation and use; additional acreage could be irrigated wherever such utilization would have economic advantages over alternative uses for the land and water. Water resources in eight New Mexico regions were assessed, crop marketing procedures described and production costs estimated for the major irrigated crops. Slightly more than 1 million acres were irrigated for crop production in 1970 and 1971. The only surplus of surface water is in San Juan County. Work is progressing on the Navajo Irrigation Project which aims to develop 110,000 acres of irrigated land using surface water from the San Juan River. Water will be available for the first 10,000 acre block of farm land in 1976. Costs were computed using a synthetic budgeting method and in such a manner as to be comparable with similar costs in other states. (See also W76-00383) (Jahns-Arizona)
W76-09475

REDOX POTENTIAL IN IRRIGATED DESERT SOILS AS AN INDICATOR OF AERATION STATUS,
Imperial Valley Conservation Research Center, Brawley, California.
For primary bibliographic entry see Field 2G.
W76-09488

A QUANTITATIVE ANALYSIS OF THE FACTORS AFFECTING PLANT NUTRIENT UPTAKE FROM SOME SOILS,
University of Oxford, Oxford, England, Soil Science Laboratory.
For primary bibliographic entry see Field 2G.
W76-09489

FIELD DRAINAGE WITH MANIFOLD WELL POINTS,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 5G.
W76-09586

HOWELL BUNGER VALVES AS IRRIGATION OUTLETS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
M. C. Goel.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 3, p 90-94, March 1975. 1 fig, 3 tab.

Descriptors: *Irrigation, *Rivers, *Projects, Behavior, Performance, Valves.
Identifiers: *Bunger valves, India(Ram Ganga Project).

While making choices for irrigation outlets for Ram Ganga Project, a multipurpose scheme seeking to provide irrigation, hydro-electric power, and flood benefits in Uttar Pradesh, extensive studies were made concerning behavior and performance of Howell bunger valves provided at other projects. Considered is the performance of these valves and the reasons for adopting them for Ram Ganga Project. From the study of causes of failures of various Howell bunger valves in the past, the design practice regarding the thickness of valve body and cylinderical cover, the thickness and number of radial vanes, and the diameter of central hub has been considerably improved. After incorporating these improvements for Ramganga it is felt that the Howell bunger valves will work satisfactorily. (Bell-Cornell)
W76-09615

A COMBINED MODEL FOR OPERATING IRRIGATED AGRICULTURAL SYSTEMS UNDER UNCERTAINTIES,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
I. Amir, Y. Friedman, S. Sharon, and A. Ben-David.
Transactions of the ASAE, Vol. 19, No. 2, p 299-304, Mar./Apr. 1976. 2 fig, 5 tab, 9 ref.

Descriptors: *Irrigation systems, Agriculture, *Planning, *Operations research, *Linear programming, *Simulation analysis, *Computer programs, Optimization, Decision making, Monitor

, Cotton, Queueing theory, Hydraulics, ieduling, Constraints, Equations, Systems anal-s, Mathematical models, *Risks.

gation is a well-defined sub-system in a com-hensive agricultural production system. Both hese systems are interrelated. An adaptable ad linear model has been found to be suitable for nning and operating the entire system under un-ainties. This model is the framework of the ir-tion sub-system. Unfortunately, many of the tors involved in irrigation create nonlinear ctions and thus cannot be directly included in linear model. This paper suggests using a linear del to (1) solve the overall system for optimali-(2) to check by a simulation technique whether solution is feasible and meets the irrigation tem set-up and requirements, and (3) to change, ecessary, one or both of the systems in order to ieve the best feasible comprehensive solution. combined model has been carried out for 89 sible different cotton activities of 430 ha, ecting various irrigation equipment and hods. The outcome provides a detailed irriga-timetable and a list of the required parameters ssure heads and discharges) for controlling the raulic network as well as the optimal overall tion. (Bell-Cornell)
6-09634

UEDUCT OPTIMIZATION WITH INTER-DIATE STORAGE,
ifornia Univ., Berkeley. Lawrence Berkeley .; and California Energy and Environment

primary bibliographic entry see Field 4A.
6-09636

BSTITUTE CHEMICAL PROGRAM - INI-L SCIENTIFIC AND MINIECONOMIC VIEW OF CAPTAN.
lwest Research Inst. Kansas City, Mo.
primary bibliographic entry see Field 5C.
6-09651

WARD WATER MOVEMENT IN FIELD RES,
ntucky Univ., Lexington. Dept. of Agricultural ineering.
G. Wells, and R. W. Skaggs.
nsactions of the American Society of Agricul-l Engineers, Vol. 19, No. 2, p 275-283, March-il, 1976. 12 fig, 3 tab, 29 ref.

criptors: *Groundwater movement, bsurface irrigation, *Cores, *Model studies, oratory tests, Theoretical analysis, Hydraulic perties, Soil properties, Soil profiles, Soil er movement, Design, Water table, Equations, gation, Pressure head, Moisture content, Boun-es(Surface), Tensiometers, Hydraulic lient, Hysteresis.
ntifiers: *Upward water movement, *Richards ation, *Imbibition, Desorption.

irrigation experiments were conducted under ous initial and boundary conditions using e, undisturbed cores from two field soils. The sure head distribution and flow volume were sured continuously, and the desorption and ibition character of the soil water were deter-ed using pressure plates. The effect of air en-ment on water content was determined imetrically, while the hydraulic conductivity-sure head relationship was determined for soil from transient pressure head measure-ts during a drainage event. An approximate el was developed to describe vertical water ement during subirrigation. This model as well he Richards equation were tested against ex-mental results from both soils. Substantial ability was evident in both measured soil pro-ies and in water movement phenomena. The roximate subirrigation model provided ac-able agreement with the observations. Con-sideration of soil stratification generally improved model accuracy. For engineering design the added time and expense of sophisticated models are not justified in comparison to the approximate model. Determination of the total volume of stored water in a profile under specified boundary conditions is essential to predictions of water movement. (Visocky-ISWS)
W76-09726

THE LEACHING BEHAVIOR OF DIFFERENT NITROGEN SOURCES IN LYSIMETER EXPERIMENTS, (IN GERMAN),
Badische Anilin- und Soda-Fabrik A. G., Ludwigshafen am Rhein (West Germany). Landwirtschaftliche Versuchsstation.
For primary bibliographic entry see Field 2G.
W76-09793

THE WATER SUPPLY SYSTEM OF SOIL AND NITROGEN LOSS WITH RUNOFF WATERS IN NONCHERNOZEM AREAS, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR).
For primary bibliographic entry see Field 2G.
W76-09794

THE EFFECT OF SILICON OILS ON THE WATER LOSS OF HORDEUM VULGARE L, (IN GERMAN),
Leipzig Univ. (East Germany). Bereich Pflanzenphysiologische Mikrobiologie.
For primary bibliographic entry see Field 3B.
W76-09806

EFFECTIVENESS OF WATER UTILIZATION BY PLANTS, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii and Agrokhimii.
For primary bibliographic entry see Field 2D.
W76-09809

SUGAR BEET PHOTOSYNTHESIS AND PRODUCTIVITY CULTIVATED BY IRRIGATED FARMING IN THE KIRGIZ SSR, (IN RUSSIAN),
Kirghiz State Univ., Frunze (USSR).
V. A. Pechenov, and A. S. Okanenko.
Fiziol Biokhim Kul't Rast. 6(3), p 227-231, 1974.

Descriptors: *Photosynthesis, *Sugar beets, *Productivity, Irrigation, Seasonal, Farm management, Crop production.
Identifiers: USSR(Kirgiz-SSR), Mineral nutrition(Plants).

The data are presented on intensity of sugar beet photosynthesis and productivity under irrigation. Regularities in daily and seasonal dynamics of the photosynthesis intensity were established as dependent on meteorological factors and on the level of mineral nutrition and water supply of plants.--Copyright 1975, Biological Abstracts, Inc.
W76-09810

A WATER-LAND USE MANAGEMENT MODEL FOR THE SEVIER RIVER BASIN PHASES I AND II,
Utah State Univ., Logan.
For primary bibliographic entry see Field 4A.
W76-09844

IRRIGATION SYSTEMS IN TAIWAN: MANAGEMENT OF A DECENTRALIZED PUBLIC ENTERPRISE,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
M. E. Abel.
Water Resources Research, Vol. 12, No. 3, p 341-348, June 1976. 1 fig, 1 tab, 22 ref.

Descriptors: *Irrigation systems, *Canals, *Management, *Irrigation efficiency, Water resources, Planning, Operations, Agriculture, Water policy, Engineering, Agronomy, Legal aspects, Administration, Rice, Water utilization.
Identifiers: *Taiwan.

The efficiency of the management of irrigation systems in Taiwan, viewed as decentralized public enterprises, depends on four interrelated factors: (1) the recognition that water is a scarce factor in agricultural production; (2) the legal administrative basis for centralized planning of irrigation investments but decentralized management of irrigation systems; (3) the information systems which permit the exchange of agronomic and engineering information between the users of water and the managers of irrigation systems; and (4) the use of incentive structures for both the managers of irrigation systems and the users of water that appear to be compatible with the efficient use of water within the irrigation system. Discussed also is the true complexity of irrigation systems and irrigated crop production found in Taiwan today with which the management of these systems must contend. (Bell-Cornell)
W76-09848

IRRIGATION SYSTEM PIVOT SWIVEL,
G. V. Seger, and W. E. Fluhr.
U.S. Patent No. 3,951,165, 3 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1142, April 20, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Distribution systems, *Irrigation efficiency, Water distribution(Applied), Water delivery, Irrigation practices.

The invention relates to center pivot irrigation systems of the type where a long water distribution pipe is supported by a number of wheeled towers for rotation over the ground and around a central pivot point to which the main distribution pipe is attached and from which the irrigation water is supplied. A free standing swivel pipe connector for a center pivot irrigation system has a vertical water carrying conduit with pipe elbows attached to the upper and lower ends. The upper portion of the pipe, including the upper elbow is rotatable around the longitudinal axis of the vertically standing conduit while the lower portion of the vertical pipe and lower elbow are fixed. The swivel joint between the fixed and rotatable pipe portions acts with an associated brace member which interconnects the two portions of the pipe to provide an articulating joint permitting it a single degree of freedom in a plane coincident with the main distribution pipe to which the upper elbow is attached. The articulating brace member placed bilaterally of the vertical pipe, is connected to the lower chord of the pipe truss in the irrigation system to reduce bending moments in the vertical swivel pipe. (Sinha - OEIS)
W76-09866

LIQUID DISTRIBUTION SYSTEM FOR IRRIGATION AND THE LIKE,
A. F. DuFresne.
U.S. Patent No. 3,951,339, 5 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1202, April 20, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, *Remote control, Automatic control, Control systems, Electronic equipment.

An electrically controlled liquid distribution system for irrigation and the like comprises a central sequencing control station for controlling a remote valve station. The valve station provides local fault-sensing feedback control over actuation current supplied to a remote control valve. Conductor means, preferably comprising a single pair of conductors, connect the central station to the

LIBRARY U. OF I. URBANA-CHAMPAIGN

remote valve station. In one embodiment, the feedback control results in a change in current level flowing in the conductors after the remote control valve opens, and circuitry in the central station detects this change in current level to control an indicator. (Sinha - OEIS)
W76-09868

IRRIGATION VEHICLE,
E. E. Jenkins.
U.S. Patent No. 3,951,341, 4 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1202, April 20, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Conveyance structures, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Water distribution(Applied), Pipes.
Identifiers: Irrigation pipes.

A motorized tubular frame four-wheeled irrigation vehicle is adapted to straddle a row of crops without damage to the row. The vehicle has swivel wheels at the back end and carries a horizontal bar across the front end. The carrying bar is mounted so that it can swivel and is adapted to carry a length of irrigation piping in a horizontal position. The piping has a row of longitudinaly aligned and spaced apart sprinkling openings positioned so as to only sprinkle towards the rear of the vehicle to avoid forming mud in front of the vehicle's wheels. The vehicle can be used either individually or in combination with other identical vehicles placed side-by side. (Sinha - OEIS)
W76-09869

DRIP LEVEL IRRIGATION,
R. Mehoudar.
U.S. Patent No. 3,951,345, 5 p, 14 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1204, April 20, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation systems, *Irrigation efficiency, Distribution systems, Water distribution(Applied), Water pressure.
Identifiers: *Drip level irrigation.

An elongated dripper unit is comprised of an enclosure sealed at either end and formed with a liquid inlet and outlet, at least one longitudinal partition formed in the enclosure so as to divide the enclosure into at least two sub-enclosures, and a plurality of lateral partitions each of which extends laterally across the other enclosure from the enclosure wall to an inner longitudinal partition so as to subdivide each sub-enclosure into a number of cells which connect with each other through reduced-diameter apertures formed in the longitudinal partitions. The cells include an input cell connected with the inlet, an output cell connected with the outlet and a number of intermediate cells. The flow path extends from the input cell to the output cell via the intermediate cells. The pressure of the water is progressively reduced as a result of passage through connecting apertures and as a result of repeated abrupt directional changes. (Sinha - OEIS)
W76-09870

EFFICIENCY OF IRRIGATION METHODS FOR STRAWBERRIES,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
J. M. Myers, and S. J. Locascio.
Proc Fla State Hortic Soc. 85, p 114-117, 1972.

Descriptors: *Irrigation efficiency, *Sprinkler irrigation, *Furrow irrigation, Irrigation practices, Salinity, Soils, Strawberries.
Identifiers: *Trickle irrigation.

Trickle, overhead sprinkler and furrow irrigation methods were compared in a strawberry production experiment. Rainfall during the season was above normal. Yield and size of fruit were not affected by irrigation method. Irrigation method was a significant factor with regards to movement of soluble salts in the bed. Movement of salts was towards the upper center part of the bed for the sprinkler and furrow methods, while significant movement was not detected for the trickle method. Soil moisture content in the rooting zone was maintained near field capacity on a continous basis by the trickle method, while the sprinkler and furrow methods were effective in returning the soil moisture content to field capacity when applications were made; but this was followed by a gradual depletion to almost the soil moisture level of the unirrigated treatment before the next application. Approximately 1/2 the quantity of water was used for the trickle method as compared to the sprinkler and furrow methods.--Copyright 1974, Biological Abstracts, Inc.
W76-09897

EFFECT OF EXCESS SOIL MOISTURE ON THE CONTENT OF PHOSPHORUS COMPOUNDS IN BARLEY, (IN RUSSIAN),
Leningrad State Pedagogical Inst. (USSR). Dept. of Botany.
V. V. Anikiev, and N. M. Gorbushina.
Biol Nauki. 17(2), p 88-91, 1974.

Descriptors: *Soil moisture, *Barley, *Phosphorus, Metabolism, Soils, Crop production.
Identifiers: ADP, ATP, Organogenesis.

The nucleic acid and lipid P in barley was studied under optimal and excess soil moisture conditions. Excess soil moisture had an adverse effect on P metabolism. The content of all P fractions decreased with excess soil moisture. The change in the quantity of the acid-soluble fraction of P, which includes substances playing a leading role in energy metabolism (ATP, ADP, adenylic acid, etc.) was noted. Under optimal soil moisture conditions the accumulation of organic forms of P was observed before crucial stages of organogenesis and their breakdown during the formation of generative organs. Excess soil moisture disrupted normal development, which adversely affected general metabolism and yield.--Copyright 1975, Biological Abstracts, Inc.
W76-09913

METEOROLOGICAL FACTORS AND DISEASE EXPRESSIONS IN JUTE,
Jute Agricultural Research Inst., Barrackpore (India). Mycology and Plant Pathology Div.
N. Mukerjee.
Proc Indian Natl Sci Acad Part B Biol Sci. 37(6), p 384-393, 1971(1973).

Descriptors: Meteorology, Rainfall, Asia, *Plant diseases.
Identifiers: Corchorus-capsularis, Corchorus-olitorius, *Jute, India.

In a bid to forecast diseases of jute, microclimatic and meterological factors were assessed under identical cultural conditions for 3 yr on 6 varieties of jute belonging to Corchorus capsularis and C. olitorius at Nilganj, Barrackpore, West Bengal (India). Irrespective of species, diseases in general were more in 1st date of sowing (22nd March), lesser in 2nd (10th April) and the least in 3rd date (1st May). The disease expressions were ascribed to rainfall after 10-11 wk crop-growth in 1st date, 9 wk in 2nd date and 5-6 wk in the 3rd date of sowing in a yr. The pattern of rainfall, though remained same in the 3 dates of sowing in a year, differed from year to year accounting yearly variations of diseases in the varieties. The total rainfall in 3 dates of sowing separately was almost same in a year. The percentage of total crop-period receiving rainfall, in different dates of sowing, differed. This was minimum in 1st date (43%) more in 2nd (48%) and maximum in the 3rd date (54%). The soil and air temperature and humidity inside the crop in any date of sowing in a year differed negligibly after the crop attained a height of 2 ft to influence the disease percentage reasonably. C. olitorius was affected more than C. capsularis, in general, in 2 yr.--Copyright 1974, Biological Abstracts, Inc.
W76-09931

CROP RESPONSE TO CHISELING AND IRRIGATION IN SOILS WITH A COMPACT A2 HORIZON,
Agricultural Research Service, Florence, S. C. Coastal Plains Soil and Water Conservation Research Center.
C. W. Doty, R. B. Campbell, and D. C. Reicosky.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 4, p 668-672, July-August 1975, 7 fig, 4 tab, 14 ref.

Descriptors: *Crop response, *Chiseling, *Irrigation, *Irrigation effects, *Crop production, *Corn(Field), Furrow irrigation, Soil compaction, Soil profiles.
Identifiers: Millet, Sweet corn.

The objective was to determine the yield of millet and sweet corn under four soil-water management regimes and to evaluate yield differences in terms of oxygen stress, depth of rooting, and soil water status in a coarse-textured soil with a compact A2 Horizon. The experiment was conducted on a Varina sandy loam soil with a slope of less than 1 percent. Millet was grown as a test crop in 1969 and 1970 and sweet corn was grown in 1972 and 1973. The split-plot experiment consisted of two primary tillage treatments as main plots, with and without furrow irrigation. Irrigation increased yields during drought periods, but yields were less on irrigated than on nonirrigated plots during periods when the rainfall exceeded pan evaporation. The irrigated plants showed greater oxygen stress when heavy rains followed an irrigation, than those on nonirrigated plots. The probability of receiving enough rainfall to saturate the top 30 cm of soil several times during the growing season is high, and this excess soil-water causes poor root aeration, and plant growth may decrease significantly from the resulting low soil aeration. Chiseling the compact A2 Horizon increased the rooting depth and plant water availability in the soil profile. During dry periods chiseling provided a soil environment in which roots proliferated to a greater depth and extracted enough water to eliminate or minimize water stress. During wet periods, the chiseled soil permitted water to infiltrate and percolate to greater depths, thus avoiding saturated conditions in the root zone. Chiseling the soil to a 38-cm depth provided a rooting environment which produced significantly more dry matter and larger net crop values. (Skogerboe-Colorado State)
W76-09985

PLANTING PATTERN, PLANT POPULATION, IRRIGATION, AND INSECT INTERACTIONS IN COTTON.
California Univ., Riverside. Dept. of Entomology.
T. F. Leigh, D. W. Grimes, W. L. Dickens, and C. E. Jackson.
Environ Entomol. 3(3), p 492-496, 1974.

Descriptors: *Cotton, Farm management, *Irrigation, *Insects, *Plant populations, *Planting management.
Identifiers: Empoasca-Sp, Geocoris-Pallens, Lygus-Hesperus, Orius-Tristicolor.

Cotton was planted in a factorial combination of 3 irrigation schedules and 4 plant populations in a randomized complete block design. Each treatment combination was sampled on 3 dates with a vacuum insect sampler. Lygus hesperus Knight, a complex of leafhoppers (Empoasca), Geocoris pallens Stal, and Orius tristicolor White were present in large numbers. Significant differences in insect numbers between plant populations and/or between irrigation regimens were deter

ned for each species or species group on 1 or re of the 3 sampling dates. Generally, insect pulations were greatest at higher plant densities d with more frequent irrigation, factors which reased the density of plant canopies.--Copyht 1974, Biological Abstracts, Inc.
6-09998

WATER QUANTITY MANAGEMENT AND CONTROL

. Control Of Water On The Surface

FECTS OF STORM DISCHARGES ON RIVER ATER QUALITY,
ter Pollution Research Lab., Stevenage gland).
primary bibliographic entry see Field 5B.
6-09401

BAN DRAINAGE STUDIES,
vironmental Protection Service, Ottawa ntario).
primary bibliographic entry see Field 5B.
6-09402

FECT OF THINNING ON THE FOLIAGE D FOREST FLOOR PROPERTIES OF PONROSA PINE STANDS,
rth Carolina State Univ., Raleigh. Dept. of Soil ence.
G. Wollum, and G. H. Schubert.
l Science Society of America Proceedings, Vol. No. p 968-972 , Sept.-Oct., 1975. 6 fig, 2 tab, 18

scriptors: *Ponderosa pine trees, *Forest nagement, *Forest soils, *Soil moisture, utrient, *Soil-water-plant relationship, Plant wth, Water requirements, Soil temperature, l horizons, Coniferous forests, Foliar, izona.
ntifiers: *Growing stock level(GSL), inning, Taylor Woods(Ariz).

tudy at the Taylor Woods site near Flagstaff, zona documents nutrient levels in the foliage ponderosa pine (Pinus ponderosa Laws.) nds of different densities and the effect of stand sity on growth. The longest and heaviest nee- fascicles were associated with greater pine d thinning intensities 8 year after treatment. iar nutrient concentrations did not change sigcantly with different thinning regimes; total rients in the forest floor were inversely proporal to the degree of thinning. Since there were tatistical differences in needle length or weight he four heaviest thinning levels, it was conled that foliage development is not markedly cted by growing stock levels (GSL) from 6.9 to n2/ha. Thinning results in improved soil water nutrient supplies and increased soil temperas. Moisture use is even less after removal of erstory vegetation. At this site trees are growfaster at lower GSL, and the limited moisture hared by fewer trees. The increased soil temture aids nutrient mineralization. (Jahnszona)
5-09474

OUGHT ADAPTATIONS IN TWO CALIFORN EVERGREEN SCLEROPHYLLS,
tralian National Univ., Canberra. Dept. of Enmental Biology; and Australian National v., Canberra. Research School of Biological nces.
primary bibliographic entry see Field 2I.
-09476

DISTRIBUTION OF PONDEROSA PINE FOREST DENSITIES ON THE SALT-VERDE RIVER BASIN,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. F. Ffolliott, and M. S. Rhey.
Agricultural Experiment Station Technical Bulletin 227, 1976. 10 p, 1 fig, 37 tab, 4 ref.

Descriptors: *Forest management, *Ponderosa pine trees, *Natural resources, *Spatial distribution, *Forests, Planning, Surveys, Canopy, Land management, *Arizona.
Identifiers: *Salt-Verde River Basin(Ariz).

Information is provided for land management planning on the proportions of the Salt-Verde River Basin of north-central Arizona that support given minimum densities of ponderosa pine. The information will supplement previous descriptions of the Basin's ponderosa pine forests. Survey data are presented in 37 tables on the proportions of national forest and Indian tribal lands within the basin that support minimum timber basal area levels. Basal area is defined as the total cross-sectional area in square feet of all tree boles measured 4 1/2 feet above ground, expressed on a per unit-area basis. This measurement was selected as the expression of timber overstory density because it is readily determined in the field, easily converted to other expressions of forest density, and has already been used as an independent variable to develop many multiple use relationships. The basic information presented can be used in the assessment of potential productivities and natural resources utilization. (Jahns-Arizona)
W76-09477

WATER SYSTEM BEHAVIOR: DETERMINANTS IN AN ARID REGION,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
M. G. Wolman.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 20 p, 3 tab, 33 ref.

Descriptors: *Arid lands, *River basin development, *River systems, *Ephemeral streams, *Water utilization, Discharge(Water), Sedimentation, Surface runoff, Irrigation effects, Humid areas, Saline water, Watershed management, Crop production, River basins, River flow, Drainage systems.

Some characteristics of arid or semi-arid rivers in arid regions and the resultant forms of water-utilization are described, comparing these with perennial rivers which flow through arid regions. There is a direct relationship between the river system in a humid region and the drainage area as a whole. In contrast, the river system in many arid regions responds to drainage basin inputs but is ephemeral and lacks continuity in space and time. A continuous river system within an arid region owes its origin and much of its behavior to sources outside the region. Land and water use in the closed or arid system may have different consequences than those in the humid system. The most likely measures of efficiency in such a system are those related to relative inputs and outputs of water and energy to produce food. Common patterns of land and water management are discussed, along with questions of agriculture and other productivity. Evapotranspiration, runoff, stream flow, sedimentation and salinity changes with irrigation relating to such river systems are also discussed. (Jahns-Arizona)
W76-09483

HYDROLOGIC SYSTEMS ANALYSIS MODEL FOR GENERATING RUNOFF TIME SERIES (HIDROLOGIAI) RENDSZERVIZSGALATI MODELL VIZHOZAMIDOSER ELOALLITASARA (II. RESZ),
BME Institute for Water Resources and Hydraulics, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W76-09557

RESEARCH AND INVESTIGATION OF GEOLOGY, MINERAL, AND WATER RESOURCES OF MARYLAND.
Geological Survey, Baltimore. Maryland
Available from the National Technical Information Service, Springfield, VA 22161, as N75 26458, $5.50 in paper copy, $2.25 in microfiche. Final Report, Maryland Geological Survey, September 1974. 90 p, 22 ref. Weaver, K. N., principal investigator. NASA NAS5-21848.

Descriptors: *Remote sensing, *Geologic formations, *Beaches, *Chesapeake Bay, *Maryland, Geology, Rocks, Coasts, Bays, Geomorphology, Vegetation, Sediments, Marshes, Ice, Satellites(Artificial), Aircraft, Photography, *Mapping.
Identifiers: *ERTS.

For Western Maryland Piedmont, the major application of ERTS-1 imagery is detection of regional structural features such as fold culminations and lineaments. These structural features are important from the aspect of mineralization and mineral resources. Generalized mapping and detection of coastal geomorphic forms has been successfully applied to the Chesapeake Bay region. Through the primary use of MSS band 7 and MSS color composite, beach distribution maps for Chesapeake Bay and linear ridge distribution maps for the tidal salt marshes for the Lower Eastern Shore have been produced. Attempts to map nearshore bedforms proved unsuccessful from ERTS-1 imagery due to the small-scaled nature of the bedforms and interference of scan lines and nearshore turbidity. Small-scaled sand waves along the Atlantic Ocean coastline were mapped primarily by low-level aircraft support. Some observations were made on suspended sediment pattern but because of lack of technical experience, facilities and adequate ground truth, these observations need further investigation for any conclusive interpretation. Six papers are included in this report. Conclusions, recommendations, and references for all papers are grouped at the end of the report. (See W76-09571) (Sims - ISWS)
W76-09565

DIFFERENTIATION OF SERPENTINITIC FROM NON-SERPENTINITIC ULTRAMAFIC ROCKS IN ERTS-1 MSS IMAGERY,
Geological Survey, Baltimore, Maryland.
W. P. Crowley.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 1-1 to 1-5, September 1974. 1 fig. NASA NAS5-21848.

Descriptors: *Remote sensing, *Rocks, *Maryland, Satellites(Artificial), *Land use, *Vegetation, Forests, Trees, Agriculture, Geology.
Identifiers: *ERTS, Serpentinitic rocks, Non-serpentinitic rocks.

Recent field work in Baltimore County revealed that the signature returns of serpentinitic and non-serpentinitic rocks correlates with the vegetation cover and land-use pattern. Non-serpentinitic supports a vigorous hardwood flora and some farming practices with a red signature return whereas serpentinitic rocks have stands of Virginia Pine and greenbriar with little land-use development. In Maryland Piedmont, bedrock lithology and structure are enhanced only to the extent that land-use is geologically dictated. (See also W76-09565) (Sims - ISWS)
W76-09566

OBSERVATION OF LINEAR FEATURES IN THE MARYLAND PIEDMONT AS SHOWN ON

LIBRARY U. S. Bureau of Mines

ERTS-1 MSS IMAGERY AND AIRCRAFT SUPPORT PHOTOGRAPHY,
Geological Survey, Baltimore, Maryland.
J. Edwards, Jr.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 2-1 to 2-3, September 1974.

Descriptors: *Remote sensing, *Geologic formations, *Maryland, Satellites(Artificial), Photography, Aircraft, Surveys, Geological surveys, Rocks, Geology, *Aerial photography.
Identifiers: *ERTS, Linear features.

Two prominent sets of linear features were detected on ERTS-1 imagery. One set was comprised of two belts trending N45 deg E and are composed of Sam's Creek Metabasalt (western belt) and quartzose facies of the Wissahickon Schist (eastern belt). The second set of linear features was detected between the western and eastern belts of the first set and trend N 20 deg E. These subtle features, such as lineaments, may be of significance in the interpretation of the regional geology and also may have practical importance in environmental geology, such as indicating zones of high groundwater yields, mineralization, or shattered and deeply weathered bedrocks. (See also W76-09565) (Sims - ISWS)
W76-09567

ACCURACY OF RESERVOIR INFLOW FORECASTS BASED ON RADAR RAINFALL MEASUREMENTS,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 2B.
W76-09574

IDENTIFICATION OF LINEAR SYSTEMS RESPONSE BY PARAMETRIC PROGRAMING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2E.
W76-09575

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGED-SIZED CATCHMENT AREA, I. CONCEPTS AND RELATIONSHIPS,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
For primary bibliographic entry see Field 2A.
W76-09579

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGE-SIZED CATCHMENT AREA, II. ESTIMATE OF PARAMETERS, VALIDITY OF MODEL, APPLICATION,
Institut Royal Meteorologique de Belgique (Brussels). Hydrology Section.
For primary bibliographic entry see Field 2A.
W76-09580

FIELD DRAINAGE WITH MANIFOLD WELL POINTS,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 5G.
W76-09586

THE COST ASSIGNMENT OF THE COOPERATIVE WATER RESOURCE DEVELOPMENT: A GAME THEORETICAL APPROACH,
Tokyo Inst. of Tech. (Japan).
For primary bibliographic entry see Field 6A.
W76-09619

DESIGN OF WATER RESOURCES PROJECT WITH INADEQUATE DATA IN INDIA - GENERAL AND PARTICULAR CASE STUDIES,
International Hydrological Decade, New Delhi (India). Indian National Committee.
S. Banerji, and V. B. Lal.
In: Design of Water Resources Projects with Inadequate Data. Proceedings of the Madrid Symposium, June 1973, Vol. 2; Unesco - WMO - IAHS, Unesco - OMM - Aish, 1974, p 323-334. 1 tab, 8 ref, append.

Descriptors: *Water resources, *Projects, *Design, *Rainfall-runoff relationships, *Hydrology, Reservoirs, Monsoons, Flood frequency, Meteorology, Hydrographs, Dams, Estimating, Equations, International Hydrological Decade.
Identifiers: *Inadequate data, *India.

India has rich experience in successful construction of water resources projects with inadequate data. While rainfall data of considerable length are available in or around the catchment, runoff observations are usually available for 10 years or less. Commonly, some gauge site some distance away from the dam site may be available. Data on soil moisture, infiltration, and evapotranspiration are almost non-existent. This paper, based on a study of several important reports relating to many projects situated in different climatological, topographical and geological regimes, describes the practices followed in: (1) transferring rainfall data from a hydrologically similar region to the reservoir catchment by short term correlation; (2) establishing correspondence between rainfall and runoff by applying a regional empirical formula, or by first deriving a regression equation for rainfall vs. runoff for the small period for which simultaneous records of both parameters are available and then applying it to longer rainfall records for getting the discharge series; and (3) transferring gauge discharge relationship of a distant site to the dam site to work out time distribution of inflows, and the peak flow. For the later, a method evolved for estimating maximum flood in the Narmada and Mahanadi rivers, principally based on assessing the contribution due to different zones of catchment each extending to one day's flow time, has been described for the benefit of monsoon regions. (Bell-Cornell)
W76-09621

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Washington, D. C.
I. C. James, II.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS, Unesco - OMM - AISH, 1974, p 335-347. 2 fig, 1 tab, 16 ref.

Descriptors: *Multipurpose reservoirs, *Design, *Reservoir operation, *Optimization, *Projects, Irrigation, Reservoir storage, Reservoir releases, Economic efficiency, Data collection, Streamflow, Benefits, Decision making, Size, Gaging stations, Systems analysis, Estimating, *Reservoir design.
Identifiers: *Operating rules, *Data requirements.

Approaches to the design of multipurpose reservoirs have usually assumed a given set of operating rules. Conversely, studies of operating rules have often taken reservoir size as fixed. In only the former case have estimates of the optimal data requirements been made. This paper gives the estimates of and compares the optimal length of data sequences for reservoir design where operating rules are fixed, for operating rule determination where reservoir design is fixed, and for the combined determination of operating rules and reservoir size for a multipurpose reservoir where the benefit is a piecewise-linear function of storage and release. A strategy is developed for the data collection and project deferment. The shape of the benefits foregone versus time function is such that project deferment is usually optimal only where very short hydrologic records exist, and the effect of an uncertain project inception date is to increase the optimal-length of the data sequence. (Bell-Cornell)
W76-09622

IMPROVED TECHNIQUES FOR WATER RESOURCE SYSTEMS DESIGN,
Water Resources Board, Reading (England).
J. R. Sexton, and D. G. Jamieson.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS, Unesco - OMM - AISH, 1974, p 383-399. 7 fig, 1 tab, 3 ref.

Descriptors: *Water resources, *Design, *Reliability, *Simulation analysis, Hydrology, Frequency, Failures, Reservoirs, Pumped storage, Evaluation, Planning, Projects, Systems analysis, Mathematical models.
Identifiers: *Inadequate data, Flow data, Record length.

Flow data inadequacy can take different forms. One extreme is the complete lack of any information, but the more usual case is insufficient length of record since very long sequences of flow data are required to evaluate the yield and reliability of water resource systems with confidence. Using traditional concepts of failure and reliability, all water resource systems are being designed on inadequate data with only the degree of inadequacy varying between schemes. The use of simulation as a design technique has necessitated a more rigorous definition of reliability which accepts the lack of data yet maintains a means of comparing the reliability of different schemes both in terms of frequency and magnitude of failure. A new definition of reservoir reliability has been used for the hydrological design of the Wash Estuary Storage a proposed series of pumped-storage reservoirs in south-east England. (Bell-Cornell)
W76-09624

MAXIMUM INFORMATION OBTAINABLE FROM INADEQUATE DESIGN DATA: FROM MULTIVARIATE TO BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Management.
J. Weber, C. C. Kisiel, and L. Duckstein.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS, Unesco - OMM - AISH, 1974, p 401-417. 1 tab, 4 ref.

Descriptors: *Water resources development, *Design data, *Hydrologic aspects, Forecasting, Projects, Economics, Decision making, Mathematical models, Systems analysis.
Identifiers: *Inadequate data, *Bayesian decision analysis, Multivariate analysis, Uncertainty, Economic losses.

An overview is given of some theoretical and empirical issues involved in designing water resource projects in the face of inadequate data. The primary focus is on multivariate analysis of samples whose properties are not consistent with the assumptions of the analysis. The multivariate models discussed include multiple linear regression, discriminant functions, canonical correlation, principal components, and factor and cluster analysis. Each of these models is discussed in terms of its assumptions, data requirements and application in hydrologic research. The Bayesian approach to parameter estimation and decision making is introduced for the purpose of considering both the uncertainty due to inadequate data and economic losses. It is concluded that, in contrast to the current tactic of using multivariate models without considering the assumptions involved, the use of Bayesian decision analysis, while not the final

nswer, may be a viable alternative for anticipat-
g poor design. It offers flexibility in incorporat-
g prior (subjective) knowledge about probability
stributions on design parameters and it en-
ourages the design engineer to invoke his general
eas of loss functions associated with inaccurate
timation in many specific design problems.
ell-Cornell)
76-09625

HE COST-EFFECTIVENESS OF WATER ESOURCES SYSTEMS CONSIDERING IN-DEQUATE HYDROLOGICAL DATA,
echnion - Israel Inst. of Tech., Haifa. Low-
rmilk Faculty of Agricultural Engineering.
or primary bibliographic entry see Field 6A.
76-09626

PTIMAL OPERATION OF THE PUMPING TATIONS IN THE KINNERETH-ESHKOL ECTION OF THE NATIONAL WATER CARRI-R,
ekoroth Water Co. Ltd., (Israel). Research and
esalting Div.; and Technion - Israel Inst. of
ech., Haifa.
Damelin, and U. Shamir.
ournal of Hydrology (Amsterdam), Vol. 28, No.
4, p 271-288, February, 1976. 9 fig, 2 tab.

escriptors: *Pumping plants, *Operations,
imulation analysis, Hydraulics, Pumps, Reser-
oirs, Mathematical models, Flow, Optimal
evelopment plans, Decision making, Computer
ograms, Constraints, Economics, Hydraulics,
quations, Waves(Water), Economics, Hydraulic
achinery.
entifiers: Israel.

Water is pumped from the Kinnereth through the
shed-Kinrot penstock into the Jordan Canal by
eans of three pumps arranged in series in the
shed-Kinrot pumping station. The water is
mped out of Zalmon Reservoir by means of
ree vertical pumps operated by synchronous mo-
rs. Certain hydralic limitations on the activation
pumps are applied when the elevations in the
nals reach specified values. This paper con-
ders Eshkol reservoir as the terminus of the
stem being examined. Objectives are to: devise
logical model for simulating system operation
d an economic model which considers operating
sts; determine the best operating regime for
th normal and exceptional conditions; and
nerate a large number of solutions for any condi-
ns that may arise in future. Described is the
draulic simulator which faithfully represents the
havior of the total system. Empirical concepts--
, distortion, and dispersion--are discussed, as
ell as the effectiveness of policies. (Bell-Cornell)
76-09629

VALUATION OF FLOOD CONTROL UNDER HANGING CONDITIONS,
kyo Univ. (Japan). Dept. of Civil Engineering.
Takahasi.
ournal of Hydrology (Amsterdam), Vol. 28, No.
4, p 265-270, Feb. 1976.

escriptors: *Flood control, *Evaluation, Effects,
vers, Multiple-purpose reservoirs, Human
opulation, River basin development, Flood pro-
ction, Projects, Peak discharge, Historic floods.
entifiers: *River Tone(Japan).

order to make a profound evaluation of the ef-
ctiveness of flood control works, many factors
lating to the human society must be considered.
e effects upon river regimes and the effective-
ss on flood damage reduction by the flood con-
l works since the beginning of the 20th century
e discussed, taking the River Tone as an exam-
e. Early flood control works of the Tone River
re mainly river channel improvement, levees,
od detention yards, cutoff channels, and flood-
ys to the sea. Basic flood control policy was to let waters flow into the inside of the longitudinal continuous levees system and let them dash into the sea as quickly as possible. Current flood control works employ multiple purpose reservoirs together with conventional techniques, such as channel regulation and flood-ways. The evaluation of flood control projects should consider the passage of time in relation to human activities. The expression of magnitude of floods in terms of return periods has limited significance. Also, it is difficult to evaluate the net effect of flood control measures, because they are often executed for other purposes as well. Finally, the influence of flood control works on the regional environment and development should be considered in the evaluation of the flood control project. (Bell-Cornell)
W76-09630

INVESTIGATIONS INTO THE YIELD OF AN EXISTING SURFACE RESERVOIR AND AQUIFER SYSTEM,
Lancashire River Authority (England).
For primary bibliographic entry see Field 3B.
W76-09631

A PROCEDURE FOR ESTIMATING OFF-SITE SEDIMENT DAMAGE COSTS AND AN EMPIRICAL TEST,
Illinois State Water Survey, Urbana.
M. T. Lee, and K. L. Guntermann.
Water Resources Bulletin, Vol. 12, No. 3, p 561-575, June 1976. 5 fig, 3 tab, 22 ref.

Descriptors: *Agricultural watersheds, *Damages, *Costs, *Estimating, *Erosion, *Reservoirs, Methodology, Equations, Recreation, Benefits, Flood damage, Drainage, Storage, *Illinois, *Sediments.
Identifiers: Damage function.

Research was conducted to develop a methodology for estimating agricultural off-site sediment damage costs and an empirical estimate of such damages for a watershed is included. The economics of off-site sediment damage costs are discussed as a theoretical basis for the procedures developed. A detailed methodology is described for estimating five different types of off-site sediment damages commonly associated with rural watersheds. The methodology is then applied to a central Illinois watershed and estimates of individual types of damage are made. The estimates are combined into an off-site sediment damage function for the watershed, and the usefulness of the damage function for analyzing off-site sediment damages and achieving a reduction in those costs is discussed. (Bell-Cornell)
W76-09632

AQUEDUCT OPTIMIZATION WITH INTERMEDIATE STORAGE,
California Univ., Berkeley. Lawrence Berkeley Lab.; and California Energy and Environment Div.
J. Sathaye, and W. A. Hall.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. IR2, Proceedings paper No. 12180, p 249-264, June 1976. 3 fig, 4 tab, 4 ref.

Descriptors: *Aqueducts, *Irrigation, *Reservoirs, *Dynamic programming, Optimization, Mathematical models, Design, Planning, Systems analysis, Equations, Constraints, *Methodology, Size, Reservoir storage.
Identifiers: Benefit maximization, Cost function, Demand function.

A new method utilizing dynamic programming is presented for determining optimum aqueduct capacity with intermediate storage along the aqueduct. The method maximizes the net benefits and determines the optimum reservoir size once the reservoir has been selected by the planner. The model has been designed for development planning purposes, and it is presented in two sections. In the first section, the reservoir is located at the last downstream turnout. In the second section, a more general model is presented and the reservoir may be located at any one of the turnouts. A reduction in aqueduct capacity is achieved through storage regulation. Data for the model are only a 'test' data representative of existing water resources projects. The results indicate only the nature of the benefits and aqueduct reservoir capacities that may be achieved and are not applicable to any particular water resources project. (Bell-Cornell)
W76-09636

FLOOD PROBLEMS IN UTTAR PRADESH,
Uttar Pradesh Irrigation Dept., Lucknow (India).
A. C. Chaturvedi.
The Civil Engineer in South Africa, Vol. 17, No. 10, p 267-269, October 1975.

Descriptors: *Flood control, Rainfall, Drainage, Forecasting, Costs, Financing, Floods, Embankments, Flood protection, Erosion control, Reservoirs.
Identifiers: *Uttar Pradesh(India).

Uttar Pradesh, with a population of 95 million, is the largest state in India. Certain areas suffer from floods, while some others are hit by drought. Out of 55 districts, 11 districts were affected by floods and 30 districts by drought in 1974. The three dominant river systems, Ganga, Ghagra and Rapti, cause immense flooding in the plains. The Watal Committee 1939, the Inter-Provincial Flood Conference of 1939, and the U.P. Flood Committee 1948 have made very valuable suggestions. The State Flood Control Board was set up in 1964 for detailed examination of the flood problem and to devise measures for flood protection works, including marginal embankments, town protection schemes, raising of villages and antierosion works; flood forecasting is highly important. (Bell-Cornell)
W76-09640

HYDROLOGY FOR ENGINEERS, SECOND EDITION,
Stanford Univ., Calif.
For primary bibliographic entry see Field 8B.
W76-09661

METHODOLOGIES FOR THE DETERMINATION OF STREAM RESOURCE FLOW REQUIREMENTS: AN ASSESSMENT,
Utah State Univ., Logan. Dept. of Wildlife Science.
For primary bibliographic entry see Field 6G.
W76-09666

A REVIEW AND ANALYSIS OF SELECTED HYDROLOGIC MODELING CONCEPTS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W76-09718

EFFECTS OF LAND USE AND RIVER SEEPAGE ON GROUNDWATER QUALITY IN HALL COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Inst. of Agriculture; and Nebraska Univ., Lincoln. Div. of Natural Resources, Conservation and Survey.
For primary bibliographic entry see Field 5B.
W76-09728

OVERVIEW OF RAINFALL-RUNOFF PROCESS IN URBAN AREAS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.

LIBRARY U. OF I. URBANA-CHAMPAIGN

W76-09730

RUNOFF FREQUENCY PROCEDURE FOR SYNTHETIC HYDROGRAPH DEVELOPMENT,
Colorado Univ., Denver.
For primary bibliographic entry see Field 2A.
W76-09733

ILLUDAS - THE ILLINOIS URBAN DRAINAGE AREA SIMULATOR,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W76-09735

REMEDIAL MEASURES FOR URBAN FLOOD PEAK REDUCTION,
Georgia Inst. of Tech. Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-09736

A FLOOD MANAGEMENT MODEL FOR URBANIZING RIVER BASINS,
Massachusetts Inst. of Tech. Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W76-09737

AN APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Envirex Inc., Milwaukee, Wis. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W76-09738

USE OF THE COMPUTER PROGRAM 'STORM' FOR ANALYSIS OF THE QUANTITY AND QUALITY OF URBAN STORM WATER RUNOFF,
Hydrologic Engineering Center. Davis, Calif.
For primary bibliographic entry see Field 5B.
W76-09740

PHYSICAL AND ECONOMIC ASPECTS ASSOCIATED WITH RUNOFF FROM URBAN GROWTH: A METHODOLOGICAL APPROACH,
Iowa Univ., Iowa City. Dept. of Economics.
For primary bibliographic entry see Field 4C.
W76-09749

MANAGEMENT OF FLOOD CONTROL AND DRAINAGE IN THE URBANIZING ZONE,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
B. Van Weele.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 229-234, October 1974. 13 fig, 1 tab, 8 ref.

Descriptors: *Flood control, *Drainage, *Urban runoff, *Urbanization, Model studies, Mathematical models, Storm water, Storm runoff, Watersheds(Basins), Hydrology, Land use, Planning, Erosion, Sedimentation, Detention reservoirs, Cities.
Identifiers: *Fairfax County(Va).

Fairfax County, Virginia, is one of the fastest-growing counties in the United States and is therefore experiencing many and varied growing pains. One of these is flood control and drainage. Upon passage of a 'major storm' bond issue in 1971, the County elected to tackle the problems from two directions: (1) to prepare designs and start construction of facilities to alleviate many of the immediate problems that have been created because of urbanization, and (2) to implement plans for avoiding possible future flood control and drainage problems. The specific goals of the Fairfax County flood control and drainage program are to: (1) develop immediate solutions to existing flooding and channel erosion problems, (2) improve methods and procedures to develop budget projections for capital facilities for storm drainage, (3) establish a standard baseline from which to measure environmental change, (4) rewrite the drainage code and policy by incorporating a balance of on-site detention and off-site pro rata costs, and (5) make full utilization of the storm water runoff as a resource out of place. The 'heart' of the Fairfax County study is a tool that has been utilized to mathematically model the watershed runoff. This model is general-purpose rainfall-runoff simulation model, formulated in a problem-oriented computer language with a flexible command structure that permits selection of the many input/output and computational options available. (See also W76-09729) (Sims - ISWS)
W76-09750

MUNICIPAL STORM WATER MANAGEMENT PROGRAMS,
Lindley and Sons, Inc., Hinsdale, Ill.
R. W. Lindley, Jr.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 235-241, October 1974. 3 ref, 1 append.

Descriptors: *Storm water, *Urban runoff, *Legal aspects, *Urbanization, Detention reservoirs, Retention, Drainage systems, Cities, Schools(Education), Parks, Runoff, Floods, Flooding, Recreation, Land development, Land use, Construction, Water storage, Storm runoff, Planning.
Identifiers: *Naperville(Ill).

The City of Naperville, Illinois, is a rapidly growing community located in the western Chicago suburbs some 30 miles from the downtown Chicago area. The city has a population of approximately 28,000 and is divided by the West Branch of the Du Page River. The streets and associated pavement drainage systems were properly designed and have served the residents well over the past years. However, as the surrounding farmlands were transformed into single and multiple family residential subdivisions, it rapidly became apparent that the sewers designed to transport street and outlying farmland drainage were not adequate to transport urban runoff from highly populated residential areas. This report described the results of a four year effort by the City of Naperville, Illinois, the Naperville School District, the Naperville Park District and land development corporations to provide facilities for public education, recreation and storage of excess storm water runoff. Design paramenters utilized in the development of these areas were presented. An exerpt from the Storm Runoff Control Ordinance was appended. (See also W76-09729) (Sims - ISWS)
W76-09751

URBAN STORMWATER MANAGEMENT--PROBLEMS, SOLUTIONS AND IMPACT: A SUMMARY OF INTERVIEWS,
Poertner (Herbert G.), Bolingbrook, Ill.
For primary bibliographic entry see Field 4C.
W76-09752

A FLOODPLAIN MANAGEMENT FRAMEWORK WITH STRUCTURAL AND NON-STRUCTURAL MEASURES,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6F.
W76-09754

IMPROVING WATER QUALITY BY CONTROL OF ALGAE: CELLULAR AND EXTRACELLULAR BLUE-GREEN ALGAL POLYSACCHARIDES,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5G.
W76-09760

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS. RECOMMENDATIONS AND EXECUTIVE SUMMARY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09764

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09765

LANDSLIDE HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst., of Behavioral Science.
For primary bibliographic entry see Field 6F.
W76-09781

REGRESSION ANALYSIS AND PARAMETER IDENTIFICATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W76-09824

HYDROLOGIC UNIT MAP--1974, STATE OF ALASKA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09826

HYDROLOGIC UNIT MAP--1974, STATE OF OREGON,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09827

APPRAISAL OF WATER RESOURCES OF NORTHWESTERN EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W76-09828

A PRIMER ON FLOODPLAIN DYNAMICS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-09831

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE MAJOR COAL AND OIL SHALE AREAS OF WYOMING, 1975-76,
Geological Survey, Cheyenne, Wyo.
Open-file report, January 1976. 43 p, 10 fig, 5 tab, 44 ref.

Descriptors: *Environmental effects, *Coal mines, *Oil industry, *Water resources, *Wyoming, Sampling, Sites, Streams, Reservoirs, Groundwater, Aquifers, Sediments, Water quality, Chemical analysis, Data collections, Monitoring, Water quality control, Water pollution control, Gaging stations, Observation wells.

The U.S. Geological Survey, in cooperation with the State of Wyoming and other Federal agencies,

five data-collection activities and fourteen
er-resource appraisal projects in the major coal
oil shale areas of Wyoming. These activities
located primarily in the Northern Great Plains
l region of northeastern Wyoming (the Powder
er structural basin) and the Green River, Bear
er, and Great Divide basins of southwestern
oming. The data-collection activities include:
Continuous records of streamflow and reser-
storage; (2) peak flow information at partial-
ord sites; (3) sampling and chemical analyses of
er from streams and wells; (4) sampling and
iment analysis of water from streams; and (5)
asurements of water levels in wells. This report
tains lists of monitoring sites for these five
a-collection activities. (Woodard-USGS)
6-09833

TIONAL CONFERENCE OF DISTRICT
IEFS, ALBUQUERQUE, NEW MEXICO,
PTEMBER 28-OCTOBER 3, 1975--
OCEEDINGS,
logical Survey, Reston, Va.
primary bibliographic entry see Field 2A.
6-09838

VATER-LAND USE MANAGEMENT MODEL
R THE SEVIER RIVER BASIN PHASES I
D II,
h State Univ., Logan.
A. Narasimhan, and E. K. Israelsen.
gress Report, PRWG150-1, Utah Water
earch Laboratory, College of Engineering,
h State University, Logan, Utah, September
5. 44 p, 11 fig, 4 tab, 9 ref, append.

criptors: *Water resources development,
nd use, *River basins, *Management,
drology, *Simulation analysis, *Data collec-
n, Reservoirs, Monthly, Costs, Feasibility,
a processing, Irrigation efficiency, *Utah, Al-
native, Estimating, Mathematical models,
tems analysis.
ntifiers: Sevier River Basin(Utah).

Utah Division of Water Rights and the Utah
ter Research Laboratory have agreed jointly to
luate the effects of installing more efficient ir-
tion conveyance and application systems on
er users in the Sevier River Basin. As part of
first phase of the project, a hydrologic simula-
model for the selected subbasins in the Sevier
er Basin has been calibrated. The model con-
rs large space increments on a monthly time
ement. Additional data would improve the re-
ility of the model developed for some sub-
ns. The models resulting from the first phase
he study provide a functional tool for making
nagement decisions in the Basin. In phase two
the study, a daily hydrologic model was
brated to the Circle Valley Subbasin. In study-
this short time and space increment model, the
owing modeling concepts were considered: in-
n use processes; canal diversions; irrigation
ciency; runoff components; data collection and
cessing; and model calibration. Data require-
nts for a daily model using small space incre-
nts seem to negate the possibility of the micro-
el, at least for the present time. (Bell-Cornell)
6-09844

INEAR PROGRAMMING MODEL FOR USE
GUIDING URBAN FLOODPLAIN MANAGE-
NT,
ona Univ., Tucson. Dept. of Agricultural
nomics.
primary bibliographic entry see Field 6F.
6-09849

ECT OF SEQUENCE LENGTH N ON THE
OICE OF ASSUMED DISTRIBUTION OF
OODS,
I Thomas J Watson Research Center, York-
n Heights, N. Y.
Wallis, N. C. Matalas, and J. R. Slack.
Water Resources Research, Vol. 12, No. 3, p 457-471, June 1976. 14 tab, 1 ref.

Descriptors: *Floods, *Distribution, Effects, *Length, Estimating, *Design flood, Equations, *Statistics, Systems analysis, *Flood frequency.
Identifiers: Optimal assumed distribution, Sensitivity.

Although overdesign and underdesign losses vary with the length n of flood sequences, the choice of flood frequency distribution for estimating the design flood is not overly sensitive to n. Bias in the estimate of the design flood does not account for differences in the analytical forms of the underlying and optimal assumed distributions of floods. (Bell-Cornell)
W76-09851

ESTIMATING SELECTED PARAMETERS FOR THE KENTUCKY WATERSHED MODEL FROM WATERSHED CHARACTERISTICS,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 2A.
W76-09852

LAND USE CHANGES AND RESERVOIR DEVELOPMENT: AN APPLICATION OF LAND USE INFORMATION SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Geography.
Richard D. Hecock, and John F. Rooney.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 833, $6.00 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1976). 113 p, 19 fig, 43 tab, 10 ref. OWRT B-031-OKLA(1). 14-31-0001-5106.

Descriptors: Reservoirs, Migration, *Land use, Remote sensing, Pre-impoundment, Social change, Zoning, Regional analysis, Resevoir siting, Information exchange.
Identifiers: Keystone Reservoir(Okla), Tulsa(Okla), Land use information systems.

This research examines the relationship between reservoir development and land use change. It focuses particularly on a series of pre-defined zones surrounding the Keystone Reservoir near Tulsa, Oklahoma. Land use changes were evaluated through time by means of various remote sensors and on site field investigation. The research concludes that a land use information system provides a useful means with which to evaluate regional land use changes. It also demonstrated profound differences in reservoir related land use changes between the construction and post construction periods. Four major land use fluctuation zones were discovered at increasing distances from reservoir disruption. The findings strongly suggest that future reservoir planners and developers must be made to account for the likely land use impacts during the pre-project period. Consideration should be given predictable land use changes in each of the four impact zones. Effects on future food supply and migration demand particularly careful evaluation.
W76-09905

POSSIBILITIES AND LIMITATIONS IN BIOLOGICAL CONTROL OF WEEDS,
Staatliches Museum fuer Naturkunde, Ludwigsburg (West Germany).
H. Zwoelfer.
Bull Oepp (Org Eur Mediterr Prot Plant). 3(3), p 19-30, 1973.

Descriptors: *Biocontrol, *Aquatic weed control, Europe, Environment, Insects, Weeds.
Identifiers: Ambrosia, Galinsoga, Phytophagous, Polygonum, Pteridium, Rumex, Solidago.

Biological weed control is the attempt to reduce the competitivity of a weed and to stabilize it at low population levels with the aid of herbivorous organisms (like insects) or phytopathogens. The main factors involved in the process of biological weed control are discussed. Biological weed control is compared to conventional control measures and its advantages as well as its limitations are studied. As a consequence of the interactions between a weed, its control agents and the environment, there are only relatively few weed species and weed situations in Europe which are promising targets for biological control programs. Some of these weeds are Solidago, Ambrosia, Polygonum, Galinsoga, Pteridium and Rumex spp.--Copyright 1974, Biological Abstracts, Inc.
W76-09920

RECENT TRENDS IN WEED CONTROL IN FRESHWATER,
Agricultural Research Council, Kidlington (England). Weed Research Organization.
T. O. Robson.
Bull Oepp (Org Eur Mediterr Prot Plant). 3(3), p 5-17, 1973.

Descriptors: *Aquatic weed control, *Biocontrol, *Chemcontrol, Methodology, Ecosystems, Weeds.

In many situations, such as irrigation and drainage ditches, the unobstructed movement of water is paramount and complete control of the weeds is needed. Most freshwater has many functions some of which involve biological systems in which weeds play an important part. Trends in the development of new weed control techniques aimed at replacing traditional hand cutting methods while maintaining the required condition of the water are briefly reviewed. These include mechanical, chemical and biological methods all of which contain potentially valuable tools for the management of freshwater ecosystems.--Copyright 1974, Biological Abstracts, Inc.
W76-09921

DEPENDENCE OF PASTURE GRASS YIELD ON SOIL MOISTURE LEVEL, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR).
N. G. Andreev, V. A. Tyul'dyukov, and A. D. Prudnikov.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina. 4, p 2-4, 1974.

Descriptors: *Soil moisture, *Grasses, Irrigation, Pastures, Grasslands, *Crop production, Bromegrass, Fescues, Orchardgrass.
Identifiers: Alfalfa, Clover, Red clover, Timothy, USSR.

On irrigated pastures sown with brome, timothy, fescue, orchardgrass, red clover and alfalfa the best plant development was observed under conditions of the Moscow region (USSR) when the soil moisture content was 70% of field capacity, or 85% in especially dry years.--Copyright 1975, Biological Abstracts, Inc.
W76-09930

ST. LAWRENCE SEAWAY: A NEW GOAL OF YEAR-ROUND NAVIGATION,
ARCTEC, Inc., Columbia, Md.
For primary bibliographic entry see Field 2C.
W76-09942

SPECIFICATIONS FOR CONTAINER FACILITIES BY SIMULATION,
For primary bibliographic entry see Field 6A.
W76-09943

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control Of Water On The Surface

HYDROLOGIC FORECASTING FOR THE OHIO RIVER WATERWAY,
National Weather Service, Cincinnati, Ohio. River Forecast Center.
For primary bibliographic entry see Field 2E.
W76-09944

WAVE MOTIONS IN AN OFFSHORE HARBOR,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 8B.
W76-09947

USE OF MATHEMATICAL MODELS IN THE PALO ALTO MARSHLAND REHABILITATION PROJECT,
Water Resources Engineers, Walnut Creek, Calif.
For primary bibliographic entry see Field 8B.
W76-09949

NEAR-FIELD JET PENETRATION AND RESERVOIR MIXING,
Georgia Inst. of Technology, Atlanta.
For primary bibliographic entry see Field 8C.
W76-09962

PHYSICAL MODEL OF DISCHARGE IN A TWO-LAYER STRATIFIED AMBIENT,
Duke Power Co., Charlotte, N. C.
For primary bibliographic entry see Field 8B.
W76-09963

FORECASTS FOR THE SACREMENTO RIVER SYSTEM,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 2E.
W76-09967

SEDIMENT DEPOSITION MODEL FOR TARBELA RESERVOIR,
Gilbert Associates, Inc., Reading, Pa.
For primary bibliographic entry see Field 2J.
W76-09970

PHYSICAL MODELING TECHNIQUES USED IN RIVER MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. River Regulation Branch.
For primary bibliographic entry see Field 2E.
W76-09972

APPLICATION OF WATER QUALITY MODELS TO FINGER FILL CANALS,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-09981

THE ERADICATION OF THE SEAWEED SARGASSUM MUTICUM FROM BRITAIN,
Portsmouth Polytechnic (England). Dept of Biological Sciences.
For primary bibliographic entry see Field 5G.
W76-09989

4B. Groundwater Management

THE OVER-EXPLOITATION OF GROUNDWATER RESOURCES IN DRY REGIONS,
Hebrew Univ., Jerusalem (Israel). Graduate School of Applied Science and Technology.
S. Mandel.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 22 p, 3 fig, 3 tab, 11 ref. (Processed)

Descriptors: *Groundwater resources, *Groundwater mining, *Overdraft, *Aquifers, *Water management(Applied), *Withdrawal, Surface-groundwater relationships, Aquifer management, Safe yield, Desalination, Subsidence, Hydrologic equation, Recycling, Social impact, Economic impact, Water policy, Arid lands.
Identifiers: *Israel, Wasting reserves.

Evaluations are presented of the main hydrologic and social problems related to over-exploitation of groundwater resources in dry regions. Even safe-yield exploitation eventually causes depletion of the groundwater reserves. Distinction is made between two types of over-exploitation, that of 'wasting reserves' (water lost during the transition from a natural to artificial replenishment equilibrium) and that of mining. Exploitation of the wasting reserves involves acceleration of the transition to an equilibrium state commensurate with the safe yield but no damage to the water resource, while groundwater mining causes resource damage by consuming more of the remaining reserves. Conditions which restrict mining include reservoir emptying, low water levels and consequent high pumping-lifts, water quality deterioration due to subsurface mechanisms or pollution from the surface, and soil subsidence. Alternative water resources and techniques to alleviate the eventual depletion of groundwater supplies are outlined. Social and economic impacts of over-exploitation are discussed and policy suggestions presented. A case history is offered concerning the Tel Aviv-Beersheva area of Israel, where exploitation of wasting reserves was successfully managed. Intensive development of the area was advanced by nine years and a social and technical infrastructure established with no long-term damage to groundwater resources. (Jahns-Arizona)
W76-09479

NEW TECHNOLOGIES IN WATER PURIFICATION AND THEIR APPLICATION TO ARID LANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 3A.
W76-09481

OPTIMAL GROUND WATER QUALITY MANAGEMENT: WELL INJECTION OF WASTE WATERS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-09511

MONITORING WELLS,
Oregon State Engineer's Office, Salem.
H. R. Sweet.
Groundwater Report No. 19, October 1974. 39 p, 8 fig, 32 ref, 3 append.

Descriptors: *Observation wells, *Groundwater, *Monitoring, *Oregon, *Water quality, *Water levels, *Water level fluctuations, *Design criteria, Water table, Transmissivity, Hydraulic conductivity, Permeability, Storage coefficient, Specific yield, Potentiometric level, Lysimeters, Well casings, Well screens, Aquifer testing.
Identifiers: *Well design, *Gravel pack design, Well development, Suction lysimeter.

More than 100 water quality monitoring wells are in existence or under construction in Oregon. Reasons for, the theory behind, and methods of construction of typical water quality monitoring wells were summarized. Two examples of water quality monitoring were summarized. (Schicht - ISWS)
W76-09558

FIELD DRAINAGE WITH MANIFOLD WELL POINTS,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 5G.
W76-09586

INFLUENCE OF HYDRAULIC TROUGH AND LATERAL JOINTS ON THE GROUNDWATER POTENTIAL OF THE MASSIVE TRAP UNIT AT TANORIA IN SHAJAPUR DISTRICT (MP),
Central Ground water Board, Nagpur (India).
P. G. Adyalkar, and N. G. Gajbhiye.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 3, p 98-100, March 1975. 1 fig.

Descriptors: *Hydraulics, *Groundwater resources, *Groundwater mining, Water supply, Geology, Structure, Recharge, Water quality.
Identifiers: Lateral joints, Hydraulics trough, Climate, Yield tests.

Massive trap units in the basaltic trappean terrain are generally the problematic areas posing special problems in locating even a meager quantity of groundwater for basic necessities of life. In such cases, location of hydraulic trough and the influence of lateral joints can be of considerable significance in prospecting for groundwater. Taking advantage of the local hydraulic trough and the lateral joints, the scope lies not only in fully meeting the local water supply of 175 klpd of Tanoria village in Shajapur district of Madhya Pradesh, but also in producing more water to meet the increasing use of the flourishing township under proper hydrogeological guidance and control. (Bell-Cornell)
W76-09614

INVESTIGATIONS INTO THE YIELD OF AN EXISTING SURFACE RESERVOIR AND AQUIFER SYSTEM,
Lancashire River Authority (England).
For primary bibliographic entry see Field 3B.
W76-09631

NITROGEN IN THE SUBSURFACE ENVIRONMENT,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
For primary bibliographic entry see Field 5B.
W76-09662

UPWARD WATER MOVEMENT IN FIELD CORES,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-09726

EFFECTS OF LAND USE AND RIVER SEEPAGE ON GROUNDWATER QUALITY IN HALL COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Inst. of Agriculture; and Nebraska Univ., Lincoln. Div. of Natural Resources, Conservation and Survey.
For primary bibliographic entry see Field 5B.
W76-09728

HYDROLOGY OF THE MADISON FORMATION AND ITS POTENTIAL USE FOR WATER SUPPLY FOR ENERGY DEVELOPMENT,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2F.
W76-09757

GRAVITY GEOPHYSICS FOR GROUNDWATER EXPLORATION IN GLACIATED AREAS,
Michigan State University, East Lansing. Dept. of Geology.
R. S. Carmichael.

vailable from the National Technical Informa-
n Service, Springfield, Va 22161, as PB-254 542,
.00 in paper copy, $2.25 in microfiche. Institute
Water Research, Michigan State University,
ly 1976. 35 p, 14 fig, 11 ref. OWRT A-076-
ICH(1), 14-31-0001-5022.

escriptors: *Alluvial channels, Bedrock, Gravity
udies, Subsurface mapping, Groundwater, Com-
ter models, Michigan, Indiana, Hydrogeology,
eophysics, Gravimetry, Glacial sediments, Ex-
oration.
entifiers: Bedrock exploration, Gravimeters,
lacial valleys, *Glacial deposits.

his project has helped develop and assess the ap-
icability of the gravity geophysics method in
oundwater prospecting. By mapping variations
the gravity field over the ground surface, one
n define subsurface geologic structure such as
ried stream valleys on the bedrock surface
der glacial deposits. The research has involved
finition of subsurface conditions and measure-
ent errors that make the gravity method practi-
l, and innovative data analysis techniques such
(1) using theoretical diurnal-tide gravity varia-
n as part of the drift correction, and (ii) fitting a
gh-degree polynomial surface to data to compen-
te for elevation errors in reconnaissance sur-
ys. The method has been demonstrated by per-
rming field research studies for groundwater ex-
oration that include Durand, Michigan (30 miles
rtheast of Lansing), Orion township, Mich. (70
iles east of Lansing), and Hartford City, Indiana
70 miles south of Lansing). The field studies and
ta analysis interpretation were done with the
ssistance of 22 students, and a consulting
ydrology firm. The project has shown that the
avity method can be useful in finding ground-
ater in a number of geologic situations.
76-09758

OMPUTER ESTIMATES OF NATURAL ECHARGE FROM SOIL MOISTURE DATA - IGH PLAINS OF COLORADO,
olorado State Univ., Fort Collins. Dept. of Civil ngineering.
or primary bibliographic entry see Field 2F.
76-09761

HARACTERIZATION OF NITROGEN OURCES CONTAMINATING SHALLOW ROUND WATER IN AN ARID BASIN. LAS EGAS AREA, NEVADA,
levada Univ., Reno. Center for Water Resources esearch; and Nevada Univ., Reno. Desert esearch Inst.
or primary bibliographic entry see Field 5B.
76-09762

IYDROLOGY AND SEDIMENTATION OF IXLER RUN BASIN, CENTRAL PENNSYL-ANIA,
eological Survey, Harrisburg, Pa.
or primary bibliographic entry see Field 2J.
76-09830

EPORT OF WATER LEVELS IN SELECTED BSERVATION WELLS IN UTAH--APRIL 1976,
eological Survey, Salt Lake City, Utah.
. R. Herbert.
eological Survey report, 1976. 5 p, 1 map.

escriptors: *Water level fluctuations, Groundwater, *Observation wells, *Basic data ollections, *Utah, Hydrographs, Pumping, roundwater recharge, Variability.

nformation obtained by the U.S. Geological Sur-
ey from 14 selected observation wells in Utah
uring April 1975-March 1976 indicates that water
evels were higher than the previous year in most
ells. Water levels were lower in three wells in Se-
ier and Iron Counties. The month-end water levels for April 1975-March 1976 are shown by the hydrographs. They may be compared with average, highest, and lowest recorded water levels of record. On the index map the well symbol indicates the difference in water levels of April 1975-March 1976 with the previous year and with the average and extremes of record. Water-level trends extending from 1939 are shown by hydrographs of three wells in heavily pumped areas of southwestern Utah. (Woodard-USGS)
W76-09832

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE MAJOR COAL AND OIL SHALE AREAS OF WYOMING, 1975-76,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4A.
W76-09833

OPERATION AND MAINTENANCE OF A DEEP-WELL WATER-LEVEL MEASUREMENT DEVICE, 'THE IRON HORSE',
Geological Survey, Denver, Colo.
J. E. Weir, Jr., and J. W. Nelson.
Water-Resources Investigations 76-27, (open-file report), March 1976. 28 p, 8 fig, 2 ref.

Descriptors: *Instrumentation, *Water level recorders, *Deep wells, *Boreholes, *Water sampling, Methodology, Mechanical equipment, On-site tests, Mechanical control, Measurement.
Identifiers: Iron Horse, Assembly methods, Mechanical operation.

The deep-well investigative device--commonly called the Iron Horse--has been used extensively at the U.S. Energy Research and Development Administration's Nevada Test Site. The Iron Horse is used primarily for lowering and raising electrical water-level-measuring probes into and out of deep boreholes and wells. It can also be used for obtaining water samples, sounding depths, and determining vertical fluid velocity in a borehole. The device has proven especially useful for making measurements during prolonged hydraulic tests in wells where depths to water have been as great as 2,600 feet (792.5 metres). Assembly and general operation information of the Iron Horse is described. (Woodard-USGS)
W76-09835

GEOCHEMICAL AND ISOTOPIC ANALYSES OF WATERS ASSOCIATED WITH THE EDWARDS LIMESTONE AQUIFER, CENTRAL TEXAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-09836

CENOZOIC DEPOSITS OF SOUTHEASTERN NEW MEXICO AND AN OUTLINE OF THE HISTORY OF EVAPORITE DISSOLUTION,
Geological Survey, Colo.
For primary bibliographic entry see Field 2J.
W76-09837

MATHEMATICAL MODEL OF FLOW IN A STREAM-AQUIFER SYSTEM,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-09966

NUCLEAR TECHNIQUES IN HYDROLOGICAL STUDIES,
Uppsala Univ. (Sweden). Dept. of Hydrology; and Uppsala Univ. (Sweden). Dept. of Physical Geography.
For primary bibliographic entry see Field 2F.
W76-09996

4C. Effects On Water Of Man's Non-Water Activities

RE-EVALUATION OF THE EFFECTS OF MAN-MADE MODIFICATIONS ON GORDON CREEK BETWEEN 1887 AND 1973 AND ESPECIALLY AS REGARDS ITS FISH FAUNA,
Ohio State Univ., Columbus.
M. B. Trautman, and D. K. Gartman.
Ohio J Sci. 74(3); p 162-173, 1974.

Descriptors: *Streams, *Ohio, Channels, Carp, *Water pollution effects, *Fish, Minnows, Pikes, Perch, Suckers, Bullheads, Sunfishes, Bass, Darters.
Identifiers: Channelization, *Creeks, *Gordon Creek, Matumee River(Ohio), Grass pickerel, Goldenshiner, Chub, Mimic shiner, Tadpole, *Madtom, Pirateperch, Shiners, Johnny darter, Bluegill.

Gordon Creek, a tributary of the Matumee River in northwestern Ohio was investigated in 1887, 1929-38, 1954,and in 1973. Dredging and ditching in this area were begun about 1850, continuing until the present, with major channelization occurring in 1935. Channelization, together with the effects of dams and pollution, has had a major effect on the fish species present in this stream. The central mudminnow (Umbra limi), grass pickerel (Esox americanus vermiculatus), goldenshiner (Notemigonus crysoleucas), hornyhead chub (Nocomis biguttatus), mimic shiner (Notropis volucellus), tadpole madtom (Noturus gyrinus), and pirateperch (Aphredoderus sayanus) all require clean static or flowing water, rooted aquatic vegetation, sand and gravel substrates, and/or well-defined riffles and pools. These species have been largely reduced in population abundance or have been extirpated in part or entirely by the destruction of their habitants by channelization. In contrast, the creek chub (Semotilus atromaculatus), common shiner (Notropis cornutus), and spotfin shiner (N. spilopterus) are tolerant of a more or less uniform current flow, such as produced by channelization, and are therefore rather generally distributed and remain numerous. The silverjaw minnow (Ericymba buccata) and Johnny darter (Etheostoma nigrum) were recorded in greatest numbers over gravel-sand substrates. The carp (Cyprinus carpio), fathead minnow (Pimephales promealas), bluntnose minnow (P. notatus), common sucker (Catostomus commersoni), yellow bullhead (Ictalurus natalis), and green sunfish (Lepomis cyanellus) occurred most numerously in undredged pools or in pools largely recovered from former ditching; these pools were with or without currents, undercut banks, fallen timbers and brush heaps, and had various types of substrates. The large-mouthed blackbass (Micropterus salmoides), bluegill (L. macrochirus), suckermouth minnow (Phenacobius mirabilis), and orangespotted sunfish (L. humilis), asent in 1887, have been inadvertently introduced or have invaded the area. In some sections, riffles and pools have become partially reestablished since the last channelization, resulting in isolated small populations of such species as the orangethroat darter (Etheostoma spectabile).--Copyright 1975, Biological Abstracts, Inc.
W76-09407

ADDITIONAL OBSERVATIONS ON THE EFFECTS OF STRIP MINING ON SMALL-STREAM FISHES IN EAST-CENTRAL KENTUCKY,
Eastern Kentucky Univ., Richmond. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-09468

LIBRARY U. OF F. WATER RESOURCES RESEARCH CENTER

CHANGES IN WATER CHEMISTRY RESULTING FROM SURFACE-MINING OF COAL ON FOUR WEST VIRGINIA WATERSHEDS,
Forest Service (USDA), Berea, Ky. Northeast Forest Experiment Station.
W. T. Plass.
In: Third Symposium on Surface Mining and Reclamation, Vol. I, 1975, October 21-23, Louisville, Kentucky. p 152-169. 6 tab, 5 ref, 10 fig.

Descriptors: *Strip mines, *Water quality, Streams, Water chemistry, Appalachian Mountain region, *West Virginia, Water pollution sources, *Mine wastes, Water pollution control.

The nature and extent of change in water quality resulting from present day mining and reclamation methods is important to the maintenance of aquatic flora and fauna and to downstream water users. Investigations comparing water quality parameters from watersheds before mining with the same parameters after mining showed significant variation between growing and dormant seasons as well as from year to year. After mining, eight of twelve chemical elements describing water chemistry increased as weathering processes released chemical components of the overburden rock. During the initial three-year post-mining period, pH, specific conductance, alkalinity, bicarbonate, and zinc increased from year to year at a uniform rate. Sulfate, calcium, and magnesium increased at an accelerating rate from year to year. (Forest Service)
W76-09470

FOREST MANAGEMENT PRACTICES AS RELATED TO NUTRIENT LEACHING AND WATER QUALITY,
Northeastern Forest Experiment Station, Pennington, N. J.
E. S. Corbett, J. A. Lynch, and W. E. Sopper.
In: Proceedings Conference on Non-Point Sources of Water Pollution, May 1-2, 1975, Blacksburg, Virginia, Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, 1975, p. 157-173.

Descriptors: *Cycling nutrients, *Nutrients, *Nitrates, *Clear-cutting, *Water temperature, *Turbidity, *Leaching, Watersheds(Basins), Aquatic environment, Freshwater fish, Water pollution sources, Erosion, Herbicides, Vegetation regrowth, Calcium, Magnesium, Potassium, Sodium sulfate, *Forest management.
Identifiers: Non-Point water pollution, Stream nutrient concentration, Buffer strips, Timber harvesting, Controlling stream temperatures.

The effects of forest-management practices on water quality in the Eastern United States are reviewed. Changes in stream nutrient concentrations, water temperature, turbidity and sedimentation are quantified. Stream nutrient and temperature gradients from the headwaters to the mouth of both forested and clearcut watersheds are evaluated. (Forest Service)
W76-09471

THE SAHELIAN DROUGHT AND ITS DEMOGRAPHIC IMPLICATIONS,
Australian National University, Canberra, Department of Demography.
For primary bibliographic entry see Field 6G.
W76-09486

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 6G.
W76-09665

NATIONAL SYMPOSIUM ON URBAN RAINFALL AND RUNOFF AND SEDIMENT CONTROL,
Kentucky Univ. Lexington, Coll. of Engineering.
Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, University of Kentucky, Office of Research and Engineering Services, October 1974. 246 p. Kao, D.T.Y., editor.

Descriptors: *Urbanization, *Storm runoff, *Erosion control, *Sediment control, Runoff, Erosion, Sedimentation, *Rainfall, Construction, Urban runoff, Cities, Retention, Detention reservoirs, Flooding, Sewers, Combined sewers, Separated sewers, Drainage, Drainage systems, Precipitation(Atmospheric).

The papers of this symposium covered a variety of problems arising from runoff changes due to urbanization. One paper reported the distribution of heavy rainfall in a major urban area, and suggested that the urban area may have an effect on the distribution. Other papers covered ways to control increased runoff due to urbanization. Drainage systems, detention basins, and flooding were discussed. Means of controlling the increased erosion and sedimentation were described. Construction was shown to be one of the most important causes of increased erosion. The problems of separated and combined sewers were discussed. (See W76-09730 thru W76-09752) (Sims-ISWS)
W76-09729

OVERVIEW OF RAINFALL-RUNOFF PROCESS IN URBAN AREAS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W76-09730

OVERVIEW OF THE URBAN EROSION AND SEDIMENTATION PROCESSES,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
L. D. Meyer.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 15-23, October 1974. 8 fig, 36 ref.

Descriptors: *Erosion, *Urban runoff, *Soil erosion, *Sedimentation, Reviews, Runoff, Rill erosion, Channel erosion, Erosion rates, Erosion control, Sediments, Construction, Cities, Urban drainage, Urban hydrology, Hydrology.

Public concern and legislation are forcing responsible officials to face urban erosion and sedimentation problems. Results of agricultural research, especially the Universal Soil-Loss Equation and simulated-rainfall studies of erosion-control practices for denuded land, are major sources of applicable information. Disseminating and adapting available knowledge promises to hasten the development of effective solutions to these major urban environmental problems. (See also W76-09729) (Sims - ISWS)
W76-09731

RELATIONSHIP OF RATIONAL AND UNIT GRAPH METHODS IN RETENTION BASIN DESIGN,
Army Engineer District, Louisville, Ky.
L. Curry Jr.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 33-40, October 1974. 3 ref.

Descriptors: *Retention, *Runoff, *Urban runoff, Storage, Basins, Urban hydrology, Hydrographs, Drainage, Design data, Design storm, Rainfall, Precipitation(Atmospheric), Frequency curves, Hydrology, Urbanization.

The use of on-site retention basins in now recognized as a practical method of alleviating adverse effects of urban development on existing drainage facilities. A typical case occurs when a proposed development such as an apartment complex or land recently rezoned must discharge storm runoff into the storm system of an existing development of single family residences. If the existing storm system was designed to handle runoff from the undeveloped tract, based on single family use, it would be overloaded by the proposed development. Therefore a retention basin must be designed to reduce the peak of the future development's runoff to that previously assumed. In order to design such a basin, any private engineers and engineering firms will be dealing with runoff volumes for the first time in addition to runoff peaks with which they are fairly familiar. The most critical problem is to make their runoff volume computations compatible with runoff peaks based on the widely accepted rational method. This paper presented techniques for using the unit hydrograph method and storage routing (normally used for design of dams and spillways) to obtain results on a small scale compatible with those of the rational method. (See also W76-09729) (Sims-ISWS)
W76-09732

RUNOFF FREQUENCY PROCEDURE FOR SYNTHETIC HYDROGRAPH DEVELOPMENT,
Colorado Univ., Denver.
For primary bibliographic entry see Field 2A.
W76-09733

THE DISTRIBUTION OF HEAVY RAINFALL IN A MAJOR URBAN AREA,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W76-09734

ILLUDAS - THE ILLINOIS URBAN DRAINAGE AREA SIMULATOR,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W76-09735

REMEDIAL MEASURES FOR URBAN FLOOD PEAK REDUCTION,
Georgia Inst. of Tech. Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-09736

A FLOOD MANAGEMENT MODEL FOR URBANIZING RIVER BASINS,
Massachusetts Inst. of Tech. Cambridge. Dept. of Civil Engineering.
P. H. Kirshen, and D. H. Marks.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 93-107, October 1974. 3 fig, 2 tab.

Descriptors: *Model studies, *Flood control, *Land use, *Urbanization, Mathematical models, Rivers, Basins, Watersheds(Basins), Reservoirs, Runoff, Flow, Channel flow, Population, Urban hydrology, Planning, *Puerto Rico.

A mixed integer programming screening model was formulated to be used in flood control and related land use planning in Puerto Rico. The model gave some preliminary answers to the questions of what river control devices should be used in the basin such that flooding is controlled, population requirements are met, and multiple objectives for preferential land use, damage aversion and structural cost minimization are optimized. The model

as designed to be used in conjunction with tchment simulation models. After the model was rmulated it was applied to a hypothetical river sin and the results were discussed. (See also 76-09729) (Sims - ISWS)
76-09737

N APPLICATION OF THE STORM WATER ANAGEMENT MODEL,
nvirex Inc., Milwaukee, Wis. Environmental iences Div.
or primary bibliographic entry see Field 5D.
76-09738

THE SEPARATION OF SEWERS DESIRA-LE,
ydrotechnic Corp., New York.
or primary bibliographic entry see Field 5D.
76-09739

SE OF THE COMPUTER PROGRAM 'STORM' OR ANALYSIS OF THE QUANTITY AND UALITY OF URBAN STORM WATER RU-OFF,
ydrologic Engineering Center. Davis, Calif.
or primary bibliographic entry see Field 5B.
76-09740

OMBINED SEWAGE OVERFLOWS - REQUENCY, ENVIRONMENTAL EFFECTS, ND A CORRECTIVE PROGRAM,
linton Bogert Associates, Fort Lee, N. J.
or primary bibliographic entry see Field 5D.
76-09741

VALUATION AND CONTROL OF SOIL ERO-ION IN URBANIZING WATERSHEDS,
arsons, Brinckerhoff, Quade and Douglas, Inc., lew York.
or primary bibliographic entry see Field 4D.
76-09742

ROSION CONTROL DURING PIPELINE CON-TRUCTION,
ule, Jordan and Associates, Camp Hill, Pa.
or primary bibliographic entry see Field 5G.
76-09743

HE INFLUENCE OF URBANIZATION ON TREAM CHANNEL BEHAVIOR,
tate Univ. of New York at Buffalo. Dept. of Civil ngineering.
. P. Apmann.
n: National Symposium on Urban Rainfall and unoff and Sediment Control; Proceedings of ymposium held July 29-31, 1974, Lexington, Ken-ucky. Report UKY BU106, p 183-188, October 974. 12 ref.

Descriptors: *Streams, *Channel flow, Urbanization, Channels, Streamflow, Erosion, edimentation, Sediments, Channel morphology, hannel erosion, Shape, Slopes, Width, Runoff, lydraulics.
dentifiers: *Channel behavior, Hydraulic eometry.

A method was proposed for evaluating the impact f urban development on stream channel behavior. The method was based on equations relating the ydraulic geometry to mean flow discharges. Urban development can result in stream channel nlargement in affected watersheds with con-equent production of sediments from the channel. f development proceeds for a long time, channel nstability may be a continuing problem. In the irst approximation, the rate of channel sediment roduction and the ultimate channel size can be valuated from equations derived from the ydraulic geometry relations for a stream. As an xample, a channel in a watershed changing from natural conditions to an urbanized area having 30% impervious area would enlarge by a factor of about 2.8 times in the process. Another example indicated that the steady development of the Cuyahoga River Basin, Ohio, is responsible for a sediment production of about 40,000 tons/year from the channel between Old Portage and Independence, a distance of 31 miles. (See also W76-09729) (Sims - ISWS)
W76-09744

CHANGES IN THE SEDIMENTATION CHARACTERISTICS OF AN URBANIZING WATERSHED, DALLAS AND COLLIN COUNTIES, TEXAS,
Texas Dept. of Community Affairs, Austin.
E. V. Diniz, and W. L. Moore.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 189-198, October 1974. 10 fig, 4 tab, 36 ref.

Descriptors: *Sedimentation, *Urbanization, *Reservoirs, *Storage capacity, *Texas, Erosion, Reservoir storage, Lakes, Watersheds(Basins), Rainfall, Precipitation(Atmospheric), Evaporation, Runoff, Slopes, Slope stability, Surveys, Sediments, Cities, Sedimentology.
Identifiers: *White Rock Lake(Tex), *White Rock Creek(Tex), Dallas(Tex).

White Rock lake, on White Rock Creek, in Dallas and Collin Counties, Texas has a sediment contributing area of 97.4 sq mi, of which over 55% is urbanized. Storage of water in White Rock Lake was started in 1910. The effects of continuing urbanization on the sedimentation characteristics of the watershed were studied by use of three sedimentation surveys conducted in April 1935, March 1956, and October 1970. The relationships among reservoir capacity loss, sediment density, reservoir trap efficiency, watershed climate, and watershed land use were analyzed. In spite of an increasing reservoir capacity loss and an increase in average annual rainfall, it was found that the average dry weight of sediment in lbs per cu ft decreased with increasing urbanization. In the case of White Rock Creek, urban sediment created localized problems, but did not cause increased sediment production for the total watershed. (See also W76-09729) (Sims - ISWS)
W76-09745

PREDICTING SEDIMENT YIELD IN URBAN AREAS,
Soil Conservation Service, College Park, Md.
For primary bibliographic entry see Field 4D.
W76-09746

LEGAL APPROACHES TO CONTROL RUNOFF AND SEDIMENTATION: A CASE STUDY OF GEORGIA,
The Research Group, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 4D.
W76-09747

WATERSHED MANAGEMENT AND SEDIMENT CONTROL IN MONTGOMERY COUNTY,
Environmental Protection Agency, Montgomery County, Md. Storm Water Management Section.
For primary bibliographic entry see Field 4D.
W76-09748

PHYSICAL AND ECONOMIC ASPECTS ASSOCIATED WITH RUNOFF FROM URBAN GROWTH: A METHODOLOGICAL APPROACH,
Iowa Univ., Iowa City. Dept. of Economics.
J. R. Barnard, and T. E. Croley, II.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 219-228, October 1974. 1 fig, 32 ref.

Descriptors: *Model studies, *Runoff, *Economics, *Iowa, *Urbanization, Mathematical models, Watersheds(Basins), Hydrology, Urban runoff, Floods, Flooding, Hazards, Property values, Flow, Streamflow, Storm water, Flood plains, Hydrologic properties, Urban hydrology, Methodology, Analytical techniques.
Identifiers: *Iowa City(Iowa).

Urban growth often impinges upon local watersheds resulting in alteration of the frequency and magnitude of flooding along small creeks and low areas. Urban development generally takes place within the context of governmental intervention through land use zoning and planning with the explicit purpose being to protect property rights. In spite of land use regulation, urban growth frequently produces negative externalities in the form of increased frequency and magnitude of flood hazard. This paper presented the methodology for examining the physical and economic aspects of urban growth in a local watershed. Specifically, the Stanford Watershed Hydrologic Model was further developed for statistically determining the impact of urbanization upon flooding frequency and magnitude. The results from the hydrologic model were linked to an economic model to determine the extent that negative externalities impinge upon property as a result of urbanization and change in frequency and magnitude of flooding. An analysis of the property market is central to the issue of determining the effect of the changes in flooding hazard on property values and the extent of negative externalities upon property owners and possible income distribution effects. (See also W76-09729) (Sims - ISWS)
W76-09749

MANAGEMENT OF FLOOD CONTROL AND DRAINAGE IN THE URBANIZING ZONE,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 4A.
W76-09750

MUNICIPAL STORM WATER MANAGEMENT PROGRAMS,
Lindley and Sons, Inc., Hinsdale, Ill.
For primary bibliographic entry see Field 4A.
W76-09751

URBAN STORMWATER MANAGEMENT--PROBLEMS, SOLUTIONS AND IMPACT: A SUMMARY OF INTERVIEWS,
Poertner (Herbert G.), Bolingbrook, Ill.
W. W. Gast.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 243-246, October 1974.

Descriptors: *Storm water, *Urban runoff, *Water management(Applied), *Urbanization, Storm runoff, Flood control, Cities, Economics, Legal aspects, Planning, Detention reservoirs, Erosion, Sedimentation, Drainage, Hydrology, *Surveys.
Identifiers: Interviews.

Interviews of participants in the National Symposium on Urban Rainfall and Runoff and Sediment Control were conducted at the University of Kentucky, Lexington, during the period July 29-31, 1974. The purpose was to obtain information concerning significant and typical problems that impede or prevent the development of effective and economical stormwater management programs and facilities in urban and metropolitan areas of the United States. Information was also

LIBRARY U. OF I. URBANA-CHAMPAIGN

sought concerning solutions to these problems and the impact of stormwater management programs. Problems that were identified as impediments to establishing sound and sensible stormwater management programs were evident in many of the interviews. These included inadequate local and state laws, a dearth of information on legal aspects of stormwater management, the difficulty of obtaining needed legislation and authority, and unsatisfactory interaction between various governmental jurisdictions. Many urban governments have ordinances and regulations to control runoff, but many are not written clearly enough to avoid different interpretations by users and, at times, by personnel of the regulatory agencies. Most of those interviewed felt that the major objective in solving local runoff problems should be to develop a set of understandable criteria that are specific, yet flexible, and which can be used by all communities in an urban area or region to regulate the planning, construction, operation, and maintenance of all stormwater control facilities. (See also W76-09729) (Sims - ISWS)
W76-09752

SECONDARY EFFECTS OF PUBLIC INVESTMENTS IN HIGHWAYS AND SEWERS.
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5G.
W76-09778

THE ERODIBILITY OF PUMICE SOILS OF THE NORTH ISLAND, NEW ZEALAND,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
For primary bibliographic entry see Field 4D.
W76-09787

ANTHROPOGENIC EFFECT ON CONTINENTAL, MARINE, AND OCEANIC BIOHYDROCOENOSES, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-09819

STORM-PERIOD VARIABLES AFFECTING SEDIMENT TRANSPORT FROM URBAN CONSTRUCTION AREAS,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 2J.
W76-09840

URBAN-AREA SEDIMENT YIELD--EFFECTS OF CONSTRUCTION-SITE CONDITIONS AND SEDIMENT-CONTROL METHODS,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4D.
W76-09841

4D. Watershed Protection

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: PENN STATE EXPERIMENTAL WATERSHEDS,
Pennsylvania State Univ., University Park. School of Forest Resources.
J. A. Lynch, W. E. Sopper, E. S. Corbett, and D. W. Aurand.
In: Municipal Watershed Management Symposium Proceedings, USDA Forest Service, General Technical Report NE-13, 1975, p 32-46.

Descriptors: *Water yield, *Clear-cutting, *Hydrograph analysis, *Low flow, *Turbidity, *Water temperature, Rainfall-runoff relationships, Streamflow, Water quality, Nutrients, Storm runoff, Peak flow, Acidity, Experimental watersheds, Flow augmentation, Pennsylvania, Watershed management.
Identifiers: *Flow duration, Seasonal water yield, Monthly water yield, Quickflow, Hydrograph recession.

The results of phase one and phase two of a three-phase clearcutting experiment on a 106-acre watershed in central Pennsylvania are reported. Phase one involved the removal of the vegetative cover on 21.3 acres of the lower-slope portion of the watershed. Phase two consisted of clearcutting an additional 27.0 acres on the middle-slope portion of the watershed. The effects of these treatments on water quality, quantity, and streamflow timing have been evaluated. Water quality parameters investigated include turbidity, temperature, acidity, and selected nutrients. Water quantity data were evaluated on monthly, seasonal, and annual bases. Quickflow volume, instantaneous maximum peak, time to peak, time of recession, and antecedent flow rate of storm hydrographs were also investigated. (Forest Service)
W76-09463

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: BALTIMORE, MARYLAND, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
E. S. Corbett, and W. Spencer.
In: Municipal Watershed Management Symposium Proceedings, USDA Forest Service, General Technical Report NE-13, 1975, p 25-31.

Descriptors: *Water yield, *Rainfall-runoff relationships, *Antecedent precipitation, *Watershed management, *Erosion, Reforestation, Turbidity, Water temperature, Water quality, Hydrologic aspects, Experimental watersheds, Forest management, Cities, Maryland.
Identifiers: *Municipal watersheds, Land use change, Watershed policies, Thinning, Single-watershed calibration analysis, Piedmont, Baltimore(Maryland).

To complement its water-management program, the City of Baltimore, with the assistance of the Northeastern Forest Experiment Station, is conducting research on the effects of vegetation management on water yield and quality. Three small watersheds, ranging in size from 22 to 38 acres, have been selected for this purpose. Two of the watersheds, formerly in open land except for hardwoods along the riparian zones, were reforested 17 years ago with white and loblolly pines. Converting the open land to a pine forest caused a substantial reduction in water yield. The effects of removing riparian-zone vegetation and also thinning the young pine plantations are evaluated from the viewpoint of the municipal watershed manager. (Forest Service)
W76-09464

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: NEWARK, NEW JERSEY, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
E. S. Corbett, and J. H. Heilman.
In: Municipal Watershed Management Symposium Proceedings, USDA Forest Service, General Technical Report NE-13, 1975, p 47-57.

Descriptors: *Water yield improvement, *Water shortage, *Water storage, *Flow characteristics, Droughts, Experimental watersheds(Basins), Rainfall-runoff relationships, Reservoirs, Low flow, Peak discharge, Water quality, Water supply, Municipal water, Herbicides, Water temperature, Turbidity, Recreation, Aesthetics, *Watershed management, *New Jersey.
Identifiers: Defoliation, Gypsy moth, Streamflow timing, Streamside vegetation, *Municipal watersheds, Newark(NJ), *Pequannock Watershed(NJ).

The 36,000-acre Pequannock Watershed, owned by the City of Newark, New Jersey, provides about one-half of the water supply of Newark and adjacent cities. The collection and delivery of high-quality water to the city is the primary management objective. The Newark Division of Water Supply and the Northeastern Forest Experiment Station in 1959 initiated a cooperative study of the effects of chemical control of vegetation on water quality and yield. Three forested watersheds (oak-hickory type) in the Pequannock drainage, ranging from 24 to 68 acres, were used. Riparian zone vegetation was deadened on one watershed with herbicides (using tree injection and mist-blower application) to stimulate a streamside treatment that has been practiced on the Pequannock in the past. Herbicides were used to deaden overstory vegetation on another watershed. The effects of gypsy moth defoliation on water yield are quantified. The use of vegetation treatments in the management of a municipal watershed is discussed. (Forest Service)
W76-09465

SUMMARY OF MUNICIPAL WATERSHED MANAGEMENT SURVEYS IN EASTERN UNITED STATES,
Southeastern Area State and Private Forestry, Atlanta, Ga.
G. E. Dissmeyer, E. S. Corbett, and W. T. Swank.
In: Municipal Watershed Management Symposium Proceedings, USDA Forest Service, General Technical Report NE-13, 1975, p. 185-192.

Descriptors: *Land management, *Watersheds(Basins), Surface waters, Hydrologic data, Water quality, Water yield, Vegetation, Recreation, Forest watersheds, Northeast U.S., Southeast U.S., *Watershed management, Water management(Applied).
Identifiers: *Municipal watershed surveys, Information needs, Land ownership, Problem areas, Information dissemination.

The U. S. Forest Service conducted two municipal watershed management surveys in the eastern United States, using mailed questionnaires, to (1) determine the importance of surface water supplies, (2) inventory the land uses allowed in these watersheds, (3) inventory the nature and extent of various land-management problems related to water supplies, and (4) determine what information and management practices are needed to improve watershed management and water supplies. Results are presented. (Forest Service)
W76-09466

WATERSHED RESPONSE TO PARTIAL AREA APPLICATIONS OF SIMULATED RAINFALL,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 2A.
W76-09467

REQUIREMENTS AND USE OF FERTILIZER, LIME, AND MULCH FOR VEGETATING ACID MINE SPOILS,
Forest Service (USDA), Berea, Northeastern Forest Experiment Station.
W. G. Vogel.
In: Third Symposium on Surface Mining and Reclamation, Vol. II, October 21-23, 1975, Louisville, Kentucky. p 152-170, 8 tab, 13 ref.

Descriptors: *Strip mines, *Mulching, *Fertilizers, *Lime, Vegetation establishment, Appalachian Mountain region, *Acidic soils, Moisture availability, Mine drainage, Kentucky, Evaporation, Root zones, Regrowth.

Mulch, in addition to lime and N and P fertilizers, was required for successful establishment of grasses and legumes seeded on extremely acid spoils (pH 2.2 to 3.5) in eastern Kentucky. With only lime and fertilizer, a sparse vegetative cover (mostly grass) became established; but where a mulch of shredded bark also was applied, a good cover of grasses and legumes was established. The

nts were rooted only in the layer of spoil into ich the lime had been incorporated (2 to 4 hes deep). The mulch reduced evaporation and intained moisture in this rooting zone. (Forest rvice)
76-09469

UNICIPAL WATERSHED MANAGEMENT: HAT ARE THE OPPORTUNITIES,
rtheastern Forest Experiment Station, Penning-, N. J.
S. Corbett, W. E. Sopper, and J. A. Lynch.
Forestry Issues in Urban America. Society of nerican Foresters National Convention ceedings, September 22-26, 1974, New York, Y., 1975, p. 50-57.

scriptors: *Watershed management, *Land nagement, Resource allocation, Recreation, banization, Public Health, Aesthetics, Mu-ipalitis, Waste water disposal, Forestry, Water ality, Cities, Northeast U. S., *Water supply, ltiple-purpose projects.
ntifiers: *Municipal watersheds.

ban areas require large amounts of water to tisfy both domestic and industrial needs. In the ited States many communities obtain their ter supply from municipal watersheds. In the ghly urbanized Northeast over two million acres land are under the control of municipalities, vate water companies, and State and Federal encies for management as either water-source as or protection land for municipal water pply. In many urban areas, municipal tersheds are the only large forested tracts maining. They are valuable community assets. unicipal watersheds can provide many goods d services to the urban American in addition to a pply of high quality water. These benefits are umerated and management constraints evalu-ed from the viewpoint of both the urban resident d the watershed manager. (Forest Service)
76-09472

ONCEPTUAL HYDROLOGICAL MODEL FOR N AVERAGED-SIZED CATCHMENT AREA, I. ONCEPTS AND RELATIONSHIPS,
stitut Royal Meteorologique de Belgique, Brus-ls. Hydrology Section.
r primary bibliographic entry see Field 2A.
76-09579

ONCEPTUAL HYDROLOGICAL MODEL FOR N AVERAGE-SIZED CATCHMENT AREA, II. STIMATE OF PARAMETERS, VALIDITY OF ODEL, APPLICATION,
stitut Royal Meteorologique de Belgique russels). Hydrology Section.
r primary bibliographic entry see Field 2A.
76-09580

PROCEDURE FOR ESTIMATING OFF-SITE EDIMENT DAMAGE COSTS AND AN EMPIRI-AL TEST,
inois State Water Survey, Urbana.
r primary bibliographic entry see Field 4A.
76-09632

ATIONAL SYMPOSIUM ON URBAN RAIN-ALL AND RUNOFF AND SEDIMENT CON-ROL,
entucky Univ. Lexington, Coll. of Engineering.
r primary bibliographic entry see Field 4C.
76-09729

VERVIEW OF THE URBAN EROSION AND EDIMENTATION PROCESSES,
gricultural Research Service, Oxford, Miss. edimentation Lab.
r primary bibliographic entry see Field 4C.
76-09731

EVALUATION AND CONTROL OF SOIL EROSION IN URBANIZING WATERSHEDS,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
C-N. Chen.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 161-173, October 1974. 14 fig, 4 tab, 22 ref.

Descriptors: *Soil erosion, *Urbanization, *Erosion control, Watersheds(Basins), Construction, Sediments, Sedimentation, Suspended solids, Soils, Rainfall, Runoff, Erosion rates, Slope protection, Cities, *Virginia.
Identifiers: *Fairfax County(Va), *Urban watersheds, Sediment basins.

The natural processes of water-borne sedimentation generally consist of three basic elements - erosion, transportation, and deposition of soil by the action of rainfall, runoff, and gravity. The natural equilibrium of the sedimentation processes can be severely upset through man's uncontrolled land development activities. During urbanization or suburbanization involving construction activities, acceleration of the erosion process occurs as land surfaces are denuded and exposed to rainfall and runoff. As a result, transport and deposition of sediments in excessive quantities cause damages to downstream environments. In this paper, results of our current study for the County of Fairfax, Virginia, on setting erosion control criteria and on establishing the methodology for on-site erosion control were presented. The quantitative information on overland soil erosion and stream sediment concentration was established on the basis of field data collected from neighboring watersheds in the metropolitan area of Washington, D.C., and Baltimore, Maryland. Although the study was performed with the aim of achieving overall erosion control in the Fairfax County area, the concept and the methodology developed in this study are believed to be universally applicable to other urbanizing watersheds. The soil erosion rates from construction sites were determined to range from 50 to 200 t/a/yr while those from non-construction areas ranged between 1 and 3 t/a/yr. (See also W76-09729) (Sims - ISWS)
W76-09742

EROSION CONTROL DURING PIPELINE CONSTRUCTION,
Yule, Jordan and Associates, Camp Hill, Pa.
For primary bibliographic entry see Field 5G.
W76-09743

PREDICTING SEDIMENT YIELD IN URBAN AREAS,
Soil Conservation Service, College Park, Md.
S. M. Boysen.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 199-203, October 1974. 3 fig, 5 ref.

Descriptors: *Sediment yield, *Urbanization, *Erosion, Forecasting, Trap efficiency, Retention, Reservoirs, Sediments, Sedimentation, Sedimentation rates, Erosion control, Sediment control, Deposition(Sediments), Soils, Watersheds(Basins), Construction, Cities, Runoff.

Predicting sediment loss from urban construction sites is an important aspect in the planning and enforcement phases of a sediment control program. The Universal Soil Loss Equation (USLE) is an excellent means of relating soil management, cover, and other erosion control practices to erosion in agricultural areas. The USLE, however, cannot individually be used to estimate sediment yield. This paper described a procedure to predict sediment yield from urban construction areas. A sediment basin design procedure based on trap efficiency has been in use for several years in Maryland. The USLE concept for relating degree of erosion control to sediment basin trap efficiency is as yet untried in the field, but it appears to be one of the best procedures available. The universal soil loss equation is complex. Urban construction sites are not only complex but also changing daily. The complexities prevent accurate estimates of sediment yield from urban sites. (See also W76-09729) (Sims - ISWS)
W76-09746

LEGAL APPROACHES TO CONTROL RUNOFF AND SEDIMENTATION: A CASE STUDY OF GEORGIA,
The Research Group, Inc., Atlanta, Ga.
W. Q. Hudson, and G. T. Horton.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 205-209, October 1974.

Descriptors: *Erosion control, *Sediment control, *Legal aspects, *Georgia, Legislation, Erosion, Sedimentation, Construction, Farm, Farm management, Soil erosion, Sediments, Runoff, Urban runoff, Local governments, State governments, Land use, Sedimentology.

The State of Georgia's attempts to deal with its sedimentation problems, both urban and agricultural, offer a set of examples on approaches to problem solving. The purpose of this paper was to present the types of legal programs proposed and adopted in the state. The successes and failures were recognized. Sedimentation as a result of private and public actions in urban and rural areas is a problem which requires cooperative action from three governmental levels - state, regional, and local. Georgia's present situation was presented from these perspectives. The General Assembly during 1973-74 considered two major bills which offered a legal arrangement of duties and responsibilities. In addition, the enabling law for zoning and subdivision regulations which was adopted forty years ago was discussed. Regionally, two area-wide planning agencies have successfully adopted innovative approaches which rely on technical assistance to local government decision-making. Also, these two regional bodies are separately concerned with the urban and rural aspects of sedimentation control. Locally, through the continued assistance of local conservation districts, several cities and counties in Georgia have adopted sedimentation control ordinances and programs. (See also W76-09729) (Sims - ISWS)
W76-09747

WATERSHED MANAGEMENT AND SEDIMENT CONTROL IN MONTGOMERY COUNTY,
Environmental Protection Agency, Montgomery County, Md. Storm Water Management Section.
W. J. Davis.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 211-217, October 1974. 1 fig, 1 tab, 11 ref.

Descriptors: *Watershed management, *Sediment control, *Urbanization, *Maryland, Watersheds(Basins), Runoff, Urban runoff, Sediments, Sedimentation, Erosion, Channel erosion, Retention, Detention reservoirs, Structures, Streamflow, Streams, Rivers, Storm water, Water quality, Population, Local governments, Legal aspects.
Identifiers: *Montgomery County(Md).

Montgomery County, Maryland, immediately north of Washington, D.C., has undergone since 1950 a three-fold increase in population, accompanied by a phenomenal intensity of urban development outward from Washington, the

USDA/NAL U. of F. Gainesville, Serials

upshoot of heterogeneous, overlapping political jurisdictions, and a multitude and variety of physical problems, not the least of which are those related to the accelerated forces and pollution of storm water and their impacts upon the County's watersheds and the public and private interests therein. The County has embarked upon a comprehensive program for control for all of the problems involving storm water and sediment and other aspects of water quality where possible. This paper addressed the economic, social, political and legislative problems associated with the development and implementation of this program. The primary thrust is toward a watershed management system designed to prevent damages due to increased runoff from urban development. A pilot study is in progress for a typical urbanizing watershed in need of such a system. In addition, corrective measures are currently being developed in already urbanized watershed experiencing severe channel erosion and flooding. (See also W76-09729) (Sims - ISWS)
W76-09748

THE CONTRIBUTION OF A WATER INFORMATION SYSTEM FOR ENVIRONMENTAL PLANNING IN MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Geography.
For primary bibliographic entry see Field 6G.
W76-09753

THE ERODIBILITY OF PUMICE SOILS OF THE NORTH ISLAND, NEW ZEALAND,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
M. J. Selby, and P. J. Hosking.
J Hydrol (Dunedin). 12(1), p 32-56, 1973.

Descriptors: *Soil erosion, Land development, Grasses, Pastures, *Gully erosion, *Erosion control, Vegetation establishment.
Identifiers: *New Zealand(North Island), *Pumice soils, Scrub.

Land development in the last 20 yr on the pumice soils of the central North Island has been followed by gully erosion. The erodibility of the soils under 3 classes of vegetation-pasture grasses, ungrazed grass, and scrub-has been assessed with the use of a specially designed flume which simulates gully erosion. Erosion is significantly higher beneath scrub than beneath grass vegetation when the same erosive stress is applied in each case. Under natural conditions, however, greater runoff, and therefore greater erosive power, always occurs on pasture grasses than under scrub. In spite of the greater inherent erodibility of scrub, actual erosion is therefore greater on pasture lands. Under pasture grasses, plant roots and organic matter bind the soil particles and inhibit erosion. This effect is less under scrub. Gully erosion is attributable to the low density and easy entrainment of pumice particles. The best prediction equation accounts for 83% of erosion in terms of only 2 variables.--Copyright 1974, Biological Abstracts, Inc.
W76-09787

METHOD OF EVALUATING THE EFFECTIVENESS OF TECHNIQUES FOR INCREASING THE RESISTANCE OF SOILS TO EROSION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
V. Y. Grigor'ev, and M. S. Kuznetsov.
Biol Nauki. 17(12), p 130-133, 1974.

Descriptors: *Soil erosion, Methodology, Evaluation, Soil treatment, Wetting, Polymers, Soil horizons, Soil structure, Soil stability.
Identifiers: Hydrolyzed polyacrylonitrile, Polymer K-4.

The effect of preliminary wetting and treatment of soils with polymer K-4 (hydrolyzed polyacrylonitrile) for creating a water-stable structure on the resistance of loose tilled horizons to erosion was studied. An index for evaluating the effectiveness of these techniques is proposed.--Copyright 1975, Biological Abstracts, Inc.
W76-09805

RELATIONSHIP OF HEAVY RAINFALL TO SOIL EROSION IN VIEW OF ITS FORECASTING, (IN BULGARIAN),
Afforestn. Erosion Control Experimental Station, Sandanski (Bulgaria).
For primary bibliographic entry see Field 2J.
W76-09807

HYDROLOGY AND SEDIMENTATION OF BIXLER RUN BASIN, CENTRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 2J.
W76-09830

URBAN-AREA SEDIMENT YIELD--EFFECTS OF CONSTRUCTION-SITE CONDITIONS AND SEDIMENT-CONTROL METHODS,
Geological Survey, Parkville, Md.
T. H. Yorke, and W. J. Herb.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 100/3GI (Proceedings), Printed copy $23.75, Microfiche $15.00. Reprint from Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 2-52 - 2-64, 1975. 13 p, 5 fig, 2 tab, 10 ref.

Descriptors: *Sediment yield, *Construction, *Urbanization, *Sediment control, *Maryland, River basins, Streamflow, Sediment transport, Data collections, Grading, Vegetation, Effects.
Identifiers: *Montgomery County(Md).

Suspended-sediment discharge and land use were monitored in eight small drainage basins in Montgomery County, Maryland, between 1963 and 1974. Five of these basins, located on the fringe of the rapidly expanding Washington, D. C., metropolitan area, were subjected to continuous construction activity as woodlots, pastures, and cultivated fields were replaced by houses, apartments, and shopping centers. Construction-site sediment yields ranged from 16 to 226 tonnes per hectare per year (7 to 101 tons per acre per year). The degree of sediment control and the slope conditions on construction sites were the most significant factors affecting sediment yields; the proximity of construction to stream channels and the length of time that surface soils were unprotected affected yields to a lesser extent. As a result of improvements in grading practices and control measures, construction-site sediment yields were reduced 60 to 80 percent between 1966 and 1974. (Woodard-USGS)
W76-09841

ESTIMATING SELECTED PARAMETERS FOR THE KENTUCKY WATERSHED MODEL FROM WATERSHED CHARACTERISTICS,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 2A.
W76-09852

PARAMETER OPTIMIZATION FOR WATERSHED MODELS,
New South Wales Univ., Kensington, Australia. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-09853

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

STUDIES OF PHYTOPLANKTON ECOLOGY IN THE BAY OF VALPARAISO: II. PHYTOPLANKTON 1970-1971, (IN SPANISH),
Chile Univ., Vina del Mar. Departamento de Oceanologia.
P. S. Avaria.
Rev Biol Mar. 15(2); p 131-148, 1975.

Descriptors: *Phytoplankton, Ecology, South America, Bays, *Biomass, *Life cycles, Seasonal, Annual, *Bioassay.
Identifiers: *Bay of Valparaiso(Chile), *Vertical distribution.

An analysis of the phytoplankton was made from the surface to 30 m depth between Nov.-Oct. 1971. Approximately weekly samples were taken in the same station, 2 miles off shore in front of Renaca beach in the bay of Valparaiso (Chile) for a total of 246 samples. General aspects of the annual cycle, biomass evaluation, specific composition and vertical distribution are discussed. (See also W73-03870)--Copyright 1976, Biological Abstracts, Inc.
W76-09408

ISOLATION OF SALMONELLA FROM SEWAGE AND SURFACE WATERS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene.
S. N. Cherkinskii, K. M. Klimenkova, G. P. Yakovleva, and M. S. Balakovskii.
Gig Sanit. 2, p 17-20, 1975.

Descriptors: *Isolation, *Salmonella, Sewage, *Pollutant identification, Water analysis, Chlorination, Waste water treatment, Human diseases.
Identifiers: Salmonella-Anatum, Salmonella-Heidelberg, Salmonella-London, Salmonella-Paratyphi, Salmonella-Stanleyville.

Salmonella spp. may play a role in the spread of infectious diseases by water routes. Urban sewage and surface water analyses showed a high incidence of salmonella recovery. S. anatum, S. london, S. paratyphi, S. heidelberg, and S. stanleyville were most frequently isolated. The number of recoveries was highest in spring. Chlorination of the sewage resulted in a high degree of decontamination from Salmonella. The enrichment capacity of a number of nutrient media for isolation of Salmonella from water was assessed.--Copyright 1975, Biological Abstacts, Inc.
W76-09411

EXPLORATION ROCK GEOCHEMISTRY-DETECTION OF TRACE ELEMENT HALO AT HEATH STEELE MINES (N. B., CANADA) BY DISCRIMINANT ANALYSIS,
New Brunswick Univ., Fredericton, Dept. of Geology.
For primary bibliographic entry see Field 2K.
W76-09473

COMBINED EFFECTS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES TO THE ENVIRONMENT,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-09490

POSSIBLE FUTURE EFFECTS ON THE POPULATION OF THE FEDERAL REPUBLIC OF

GERMANY OF GASEOUS RADIOACTIVE EFFLUENTS FROM NUCLEAR FACILITIES,
Kernforschungsanlage Julich, Aachen, Federal Republic of Germany.
G. Schwarz, H. Bonka, K. Brussermann, and D. Brenk.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/1. p 193-207, 2 tab, 5 fig, 5 ref.

Descriptors: *Environmental effects, *Radioecology, Fuels, Radiation, Nuclear energy Effluents, Forecasting, *Air pollution effects, Path of pollutants.

The potential radioecological effects arising from an increasing exploitation of nuclear energy over a period of 100 years are assessed. Results indicate that the complete emission of all radionuclides generated during normal operation, especially of fuel reprocessing plants, will be unacceptable and that it will be necessary to retain the tritium and Kr 85 generated in fuel reprocessing plants at a level of about 90-99%. The results are sufficient to indicate the long term trend the radiological burden and they afford a possibility of stating limits of radiation exposure and the sources that require strictest control. (See also W76-09490) (Chilton-ORNL)
W76-09499

SYNERGISTIC EFFECTS OF ATMOSPHERIC RELEASES OF RADIOACTIVE GASES AND SO2 IN INDUCING NUCLEATION IN THE ATMOSPHERE,
Bhabha Atomic Research Centre, Bombay (India).
K. G. Vohra.
In: Combined Effects of Radi, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/3. p 209-221, 1 tab, 5 fig, 24 ref.

Descriptors: *Environmental effects, *Nucleation, Sulfur compounds, Atmosphere, Ionization, Radiation, Photoactivation, *Air pollution effects.
Identifiers: Synergism.

The ionizing radiation dose in stack plumes can give rise to rapid conversion of ambient SO2 to nuclei by photochemical and ion-induced reactions. These nuclei can increase the global aerosol background which has an important role in cloud formation processes and in maintaining atmospheric radiation balance. Experiments showed that the combined effect of SO2 and ionizing radiation can give a larger production of condensation nuclei than normal photo-oxidation of SO2 in sunlight. Diurnal variations are attributed to the solar effect in the formation oxidant. Samples of filtered free air containing normal concentrations of SO2 and natural radon give rise to spontaneous formation of particles. Peaks of nucleus concentration occur only when there is an increase in SO2 concentration or radon content or both. Estimates of beta dose rate in the air for normal releases of Ar41, short-lived noble gases and tritium from reactor stacks, and SO2 releases from fossil-fueled plants are presented. (See also W76-09490) (Chilton-ORNL)
W76-09500

ADVANTAGES OF NUMERICAL ATMOSPHERIC DISPERSION CALCULATIONS FOR ESTIMATING DISPERSAL AND COMBINATION EFFECTS OF STACK RELEASES FROM THE NUCLEAR INDUSTRY,
Technische Universitaet, Hanover (West Germany).
H. Schultz, E. Voelz, and C. D. Wuneke.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/20. p 223-232, 2 fig, 9 ref.

Descriptors: *Model studies, *Mathematical models, *Atmosphere, *Air pollution effects, Pollutants, Nuclear powerplants, Topography, Wind, Time, Dispersion.

Preliminary investigations of the generation and distribution of pollutants as a consequence of chemical and other reactions acting in combination with atmospheric transport processes showed that the Gaussian distribution model can not be used except under assumed conditions of atmospheric homogeneity. A better method for solving complex atmospheric pollution transport problems that may occur in the neighbourhood of large nuclear power stations appears to be the use of a combined Eulerian-Lagrangian numerical approach known as the particle-in-cell method. The method has been tested successfully by making comparisons with typical Gaussian calculations over long time intervals or large distances and it was also applied to several actual transport problems involving complex topographies with wind variations in time, and to the effects of chemical reactions and local rainfall. (See also W76-09490) (Chilton-ORNL)
W76-09501

DISCUSSION OF POSSIBLE EFFECTS DUE TO MIXING OF RADIOACTIVE AND THERMAL RELEASES TO THE ATMOSPHERE FROM NUCLEAR POWER PLANTS,
Kernforschungszentrum, Karlsruhe (West Germany).
W. G. Hubschmann, K. Nestor, and J. G. Wilhelm.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/28. p 233-242, 1 tab, 2 fig, 10 ref.

Descriptors: *Model studies, *Radioactivity effects, *Thermal pollution, Atmosphere, Nuclear powerplants, Iodine, Retention, *Path of pollutants, *Air pollution effects.

As the number of reactors, stacks and cooling towers at a site increases, not only are the total radioactive emissions from the site increased but mixing of radioactivity and moisture will occur more often. The paper discusses the questions of whether (1) wash-out or rain-out could cause an increased radioactive deposition or (2) the strong buoyancy of the wet plume could help to decrease the radiological impact on the environment. It was assumed that a 100 m high stack of a 1000 MW(e) nuclear power plant lines up with a wet cooling tower in the main wind direction. Mixing mechanism at various wind velocities was investigated. It was found that the radiological effect of noble fission gas was reduced but in the case of radioiodine the two effects partly compensate each other. This leads to the conclusion that future reactors for nuclear power plant sites should be equipped with an effective iodine retention system. (See also W76-09490) (Chilton-ORNL)
W76-09502

SYNERGISTIC EFFECTS OF AIRBORNE EMISSIONS FROM NUCLEAR POWER PLANTS,
Motor-Columbus Consulting Engineers Inc., Baden (Switzerland).
H. Fuchs, W. Hofmann, and H. M. von Euw.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/29. p 243-252, 7 fig, 8 ref.

Descriptors: *Air pollution effects, *Environmental effects, Cooling towers, Nuclear powerplants, Sulfur compounds, Design.
Identifiers: *Synergism.

Emissions from power plants are released into an atmosphere which may be characterized by parameters such as weather conditions, and content of foreign particles. Since, along with source height and topography, these parameters exhibit wide variations, differing interaction processes between emissions and atmosphere are to be expected. The paper discusses the dispersion of emissions from the stack as they may be influenced by turbulence down-wind of high buildings or cooling towers. Parameters influencing the interaction between the stack plume and cooling tower plume are geometry or design of the towers and meteorology. Interaction between the two plumes can be reduced by adjustment of either the towers siting or design. The behaviour of sulfur dioxide and iodine is reviewed and it is concluded that the presence of strong sources of sulfur dioxide can lead to serious problems, since detrimental effects can be quite noticeable, and detailed investigations should be initiated at an early stage of plant design. (See also W76-09490) (Chilton-ORNL)
W76-09503

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, ANALYTICAL STUDIES ON SEWAGE SLUDGE AND PLANT MATERIAL,
Technische Universitaet, Munich (West Germany). Institut fuer Radiochemie. Bayerische Landesanstalt fuer Bodenkultur, Pflanzenschutz, Munich (West Germany).
For primary bibliographic entry see Field 5D.
W76-09552

MONITORING WELLS,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 4B.
W76-09558

WATER CHEMISTRY OF THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
V. Subramanian, and B. D'Anglejan.
Journal of Hydrology, Vol. 29, No. 3/4, p 341-354, April 1976. 6 fig, 4 tab, 30 ref.

Descriptors: *Water chemistry, *St. Lawrence Seaway, *St. Lawrence River, *Chemical analysis, *Estuaries, *Water quality, Saline water, Water properties, Analytical techniques, Salinity, Geochemistry, Hydrogen ion concentration, Trace elements, Water analysis, Tides, Destratification, Erosion rates, Dissolved solids, Heavy metals, Suspended solids, Silica.
Identifiers: *Mineral analysis, Continental runoff.

Based on a total dissolved load of 160 ppm, an erosion rate of 7,056 x 10 to the 10th power kg/year has been calculated for the St. Lawrence basin. The St. Lawrence river contributes 0.24% of the continental runoff to the world oceans. The water chemistry of the estuary suggests the presence of two water masses. While the dissolved silicates and Mn behave conservatively with respect to salinity, Fe shows a strong non-conservative behavior possibly due to the presence of a turbidity front and other dynamic processes in the estuary. Trace metals such as Co, Ni and Zn are enriched nearly ten times in the fresh water as compared to the estuarine waters. The water composition plotted in the alumino-silicate system indicates that kaolinite, illite, Mg-chlorite and microcline can be expected to be present in the sediments. Mineralogical observations on the suspended matter and sediments agree with this prediction. (Henley - ISWS)
W76-09581

DETERMINATION OF TETRAMETHYLTHIURAM DISULFIDE (TMTD) IN WATER AND AIR BY COLIMETRY, (IN RUSSIAN),
Pervomaisk Chemical Plant (USSR).
G. V. Semukhina.
Gig Sanit. 2, p 74-75, 1975.

USDA - U. of Illinois - Urbana

Descriptors: *Pollutant identification, *Organic compounds, Water analysis, *Sulfides, *Colorimetry, Industrial wastes.
Identifiers: *Tetramethylthiuram disulfide.

To determine tetramethylthiuram disulfide (TMTD) in water it is extracted from water with chloroform, and a 1% alcoholic solution of copper chloride and alcohol are added to the chloroform solution of TMTD obtained in a quantity such that the chloroform/alcohol ratio is 2:3. After the solution obtained is held for 45 min on a water bath at 45-50C, it is analyzed by the colorimetric method. The sensitivity of the method is 0.2 mg/l. For determining the content of TMTD in the air of industrial rooms the dust of the preparation is caught by a filter and dissolved in chloroform. The further determination is conducted as described above. The sensitivity is 0.1 mg/m3.--Copyright 1975, Biological Abstracts, Inc.
W76-09590

MYXOBACTERIA OF THE MYXOCOCCUS GROUP AS INDIRECT INDICATORS OF FECAL MATTER IN SURFACE WATER: 1. COMMUNICATION, (IN GERMAN),
W. Graef.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 160(1), p 28-39, 1975.

Descriptors: *Bioindicators, Bacteria, Surface waters, Myxobacteria, Aerobic bacteria, Europe, Lakes, *Pollutant identification.
Identifiers: Austria, Fecal matter, Germany, *Myxococcus, Regnitz River, Switzerland, *Lake Constance(Germany), *Membrane-filter method.

The fruiting-body-forming myxobacteria of the Myxococcus group are coprophilic, i.e., they accumulate in biotopes containing fecal substances. A detection method of Myxococcus in water, based on the membrane-filter method, was developed. Field studies in the region of a mechanico-biological clarifying plant, above a stretch of the Regnitz River laden with waste-water, and on the Bodensee (Lake Constance) (West Germany) revealed a clear correlation between the load of fecal substances in such waters and their content of myxococci. These germs can be used as indirect bacterial indicators of fecal substances.--Copyright 1975, Biological Abstracts, Inc.
W76-09591

PHYTOPLANKTON OF THE SALINE WATERS OF KANEM (CHAD): X. CONCLUSIONS, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Dept. of Hydrobiology.
For primary bibliographic entry see Field 2H.
W76-09596

CHEMISTRY OF DISSOLVED INORGANIC CARBON IN ESTUARINE AND COASTAL BRACKISH WATERS,
Groningen Rijksuniversiteit (Netherlands). Environmental Isotopes Lab.
For primary bibliographic entry see Field 2L.
W76-09597

UNDERWATER OBSERVATIONS OF GELATINOUS ZOOPLANKTON: SAMPLING PROBLEMS, FEEDING BIOLOGY, LAND BEHAVIOR,
California Univ., Davis. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-09598

ISOLATION OF WATER VIBRIOS IN GREECE, (IN FRENCH),
Athens Univ. (Greece). Chaire Hygiene Epidemiology.
J. A. Papadakis, D. Trichopoulos, G. Papoutsakis, V. Kalapothaki, and P. Vassiliadis.
Ann Microbiol (Paris). 126A(3), p 361-366, 1975.

Descriptors: Isolation, *Pollutant identification, Europe, Water wells, Rivers, Water analysis, Sea water, *Bacteria.
Identifiers: Athens, Attica, *Greece(Athens), Attica, *Vibrio.

Water vibrios (Vibrio) were isolated from 3 superficial wells in the province of Attica, from 3 rivers situated at about 300,180 and 100 km NW of Athens, and from 4 samples of sea water from the seashore S of Athens (Greece).--Copyright 1975, Biological Abstracts, Inc.
W76-09601

DETERMINATION OF MICROQUANTITIES OF NAPHTHALENE IN ENVIRONMENTAL OBJECTS, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
L. R. Polishchuk.
Gig Sanit. 2, p 76-78, 1975.

Descriptors: *Pollutant identification, *Foods, *Spectrophotometry, Sewage, Calibration, Water analysis.
Identifiers: *Naphthalene.

A method of extracting naphthalene from food products and sewage, purification of the naphthalene-containing solutions on alumina and spectrophotometric determination are described. The content of naphthalene in the sample is calculated from calibration curves. The sensitivity is 0.1-0.2 micro-g/kg for food products and 0.2 mg/l for sewage.--Copyright 1975, Biological Abstracts, Inc.
W76-09620

THE ROLE OF BIOASSAYS IN ENVIRONMENTAL RESEARCH,
National Water Quality Lab., Duluth, Minn.
D. I. Mount.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A011 853, $3.50 in paper copy, $2.25 in microfiche. Report AMRL-TR-74-125, Paper No. 3, December, 1974. 8 p.

Descriptors: *Toxicity, *Bioassays, *Water Quality Act, *Analytical techniques, Laboratory animals, *Water analysis, Fish, Wildlife, *Laboratory tests, *Pollutant identification, Water pollution.
Identifiers: Applications of Bioassays, 1972 Water Quality Act.

A summary is presented of the use of bioassays with aquatic organisms to estimate the environmental impact of wastes discharged into water supplies. Toxicity bioassays are a useful analytical tool if applied skillfully and correctly. (Katz)
W76-09644

A SCREENING BIOASSAY USING DAPHNIA PULEX FOR REFINERY WASTES DISCHARGED INTO FRESHWATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
A. L. Buikema, Jr., D. R. Lee, and J. Cairns, Jr.
Journal of Testing and Evaluation, Vol. 4, No. 2, p 119-125, 1976. 6 tab, 24 ref.

Descriptors: *Bioassay, *Methodology, *Analytical techniques, Fresh water fish, *Toxicity, Invertebrates, Oil, Phenols, Ammonia, Chromium, Snails, *Daphnia, *Pollutant identification, Bioindicators, *Oil wastes, Oil pollution, Water pollution effects.
Identifiers: *Daphnia pulex, Daphnia magna, Oil refinery wastes.

A simple method is suggested for on-site toxicity testing of refinery effluents. An arbitrary reference mixture, containing six common constituents of refinery wastewaters, was used for static toxicity tests on 15 species of freshwater invertebrates and 3 species of fish. Daphnia pulex was selected for further testing because it was the most sensitive of the animals tested, relatively inexpensive and easy to maintain, and a potential fish-food organism. The Daphnia bioassay would be sufficiently sensitive to give reliable results within 48 h, whereas a fish bioassay would show no toxicity even after 96 h. To assess the suitability of the Daphnia bioassay, tests were conducted by personnel at six petroleum refineries. Results of tests using actual refinery effluents ranged from no toxicity after 96 h to a mean lethal concentration of 1.2% effluent after 48 h. (Katz)
W76-09653

THE MICROBIOLOGICAL POLLUTION OF NORTH SEA AND ENGLISH CHANNEL SHORE, (IN FRENCH),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 5C.
W76-09657

EFFLUENT DETENTION PONDS DECHLORINATE WASTEWATER,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W76-09678

MODERN TECHNIQUES OF WASTE DETECTION,
East Worcestershire Waterworks Co., Bromsgrove (England).
For primary bibliographic entry see Field 5F.
W76-09685

APPLICATION OF REAL-TIME MASS SPECTROMETRIC TECHNIQUES TO ENVIRONMENTAL ORGANIC GEOCHEMISTRY. I. COMPUTERIZED HIGH RESOLUTION MASS SPECTROMETRY AND GAS CHROMATOGRAPHY-LOW RESOLUTION MASS SPECTROMETRY,
California Univ., Berkeley. Space Sciences Lab.
B. R. Simoneit, D. H. Smith, and G. Eglinton.
Archives of Environmental Contamination and Toxicology, Vol. 3, No. 4, p 385-409, 1976. 5 fig, 1 tab, 41 ref.

Descriptors: *Organic compounds, *Pollutant identification, *Spectrometry, Computers, Sewage treatment, *Gas chromatography, Carbon, Hydrogen, Chlorine, Data collections, *Analytical techniques, *Mass spectroscopy, Methodology.

A mass spectrometer/computer system (LOGOS) was used to study organic compounds in the environment. A water-borne particulate sample, an air particulate sample from Bristol, England; filtered water samples from San Francisco Bay; and a sewage sludge sample were examined. The mass spectrum for the water-borne particulate sample consisted predominantly of hydrocarbon ions of relatively high degrees of unsaturation. The air particulate sample contained a more diverse and complex mixture. Species containing between one and four oxygen atoms made important contributions to the mixture. Solvent soluble extracts of water from the San Francisco Bay consisted predominantly of a variety of complex hydrocarbon mixtures. The relative amounts of the various hydrocarbon structural types varied widely. The major compound investigated in sewage sludge was bis(p-chlorophenyl)acetonitrile(p,p'-DDCN). The LOGOS system normally calculates composition according to numbers of carbon, hydrogen, and chlorine atoms within a specified range; but, to investigate a specific compound, another atom,

this case nitrogen, can be added and the maximum empirical formula specified only slightly larger than the empirical formula of the compound of interest. The mass spectrometer/computer system was very satisfactory for preliminary data characterization. (Snyder-FIRL)
W76-09687

DISSOLVED OXYGEN ANALYZER T-01 ANALYZER. A SIMPLE APPARATUS FOR ELECTROCHEMICAL DETERMINATION OF DISSOLVED OXYGEN IN WATER TLENOMIERZ T-01 UPROSZCZONY PRZYRAD ELEKTROCHEMICZNEGO OZNACZANIA TLENU ROXPUSZCZOMEGO W ROZTWORACH WODNYCH),
Czerniec, Z. Gregorowicz, J. Fligier, J. Zielinski, and W. Lexzozynski.
Inzynieria Sanitarna, Vol. 19, No. 443, p 133-141, 1976.

Descriptors: *Analytical techniques, *Dissolved oxygen, *Instrumentation, *Water analysis, Pollutant identification, Electrochemistry.

An analyzer has been developed for the electrochemical determination of dissolved oxygen in water. This dissolved oxygen analyzer, model T-01, is a galvanic cell consisting of a silver-lead couple separated from the test sample by a polyethylene membrane. Simple measurements may be made based on the output current without amplification or temperature compensation. (Kramer-FIRL)
W76-09688

ORGANIC CONTAMINANTS OF WATER,
Dow Chemical U. S. A., Midland, Mich. Waste Control Div.
C. E. Hamilton.
ASTM Standardization News, Vol. 4, No. 1, p 34-35, 49, January, 1976.

Descriptors: *Analytical techniques, *Pollutant identification, *Organic compounds, Biochemical oxygen demand, Chemical oxygen demand, Activated carbon, Gas chromatography, Water analysis.

Organic matter of either human or natural origin causes problems in drinking water and industrial water. Little is generally known about the specific organic compounds in a water waste stream; many possible products of reactions among the contaminants may never have been isolated or identified. Little effort is made to define the constitutents precisely except when adverse effects on humans or the environment are suspected. Sensory perception, by sight or smell, of organic pollution, although subjective, is widely available, inexpensive, and very sensitive to certain types of contamination. Smell has not been widely used due to the variation in individual response to the same stimuli. Photometers and colorimeters can be used to improve upon visual observation. Invisible portions of the spectrum can also be used. Biochemical oxygen demand (BOD) measures the oxygen required to stabilize biodegradable material, but can only be compared among similarly tested samples. Chemical oxygen demand (COD) does not measure organics specifically, because some inorganics also reduce the chemical oxidant. The organic concentration can be determined from the results of a form of total carbon analysis. The total oxygen demand measures the ultimate oxygen required to stabilize the contaminants, but may not accurately indicate organic content because some inorganics consume oxygen and some substances release oxygen. Solvent extraction and activated carbon absorption determine total organic contaminants, but variable extraction efficiencies, loss of volatile organics, and water and organic salts accumulation must be considered. Use of gas chromatography to analyze organic water contaminants has begun and will probably increase. (Snyder-FIRL)
W76-09689

EVALUATION OF COMBINED APPLICATIONS OF ULTRAFILTRATION AND COMPLEXATION CAPACITY TECHNIQUES TO NATURAL WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
R. G. Smith, Jr.
Analytical Chemistry, Vol. 48, No. 1, p 74-76, January, 1976. 1 fig, 2 tab, 11 ref.

Descriptors: *Membrane processes, *Organic compounds, Rivers, *Pollutant identification, Carbon, Analytical techniques, Distribution, Dissolved solids, *Georgia, Estuaries, Path of pollutants, Copper, Salinity, Volumetric analysis, Filtration.
Identifiers: *Ultrafiltration, *Anodic stripping voltametry, Complexing materials, Organic carbon.

The application of a combination of ultrafiltration, membrane fractionation, and anodic stripping voltammetry to studying the distribution of complexing materials in natural waters was evaluated. Each sample was separated into several fractions, and the complexation capacity of each fraction for copper was determined. Between 80 and 90% of the total dissolved organic carbon was recovered after fractionation with a plus or minus 4% coefficient of variation. Precision of plus or minus 8% was obtained. The technique was applied to samples from five stations in a Georgia estuary. The apparent ability of low molecular weight fractions to complex copper increased with increasing salinity. This method should be useful in studying the mechanisms of trace metal interaction with organics in river systems. (Snyder-FIRL)
W76-09690

PROBLEMS CONCERNING THE CHARACTER OF OXIDIZABILITY OF CERTAIN ORGANIC SUBSTANCES IN WATER TREATED WITH OZONE (PROBLEMES LIES A L'EVOLUTION DU CARACTERE D'OXYDABILITE DE CERTAIN CORPS ORGANIQUES PRESENTS DANS L'EAU TRATEE PAR L'OZONE),
For primary bibliographic entry see Field 5D.
W76-09692

BIODEGRADABILITY AND PROCESS FOR BIOLOGICAL PURIFICATION OF WASTE WATER (LA BIODEGRADABILITE ET LES PROCEDES D'EPURATION BIOLOGIQUE DES EFFLUENTS),
For primary bibliographic entry see Field 5D.
W76-09693

TURBIDIMETER LIGHTS THE WAY TO ACCURATE PROCESS CONTROL,
Process Engineering, p 87-88, February, 1976. 4 fig.

Descriptors: *Analytical techniques, *Turbidity, *Photometry, *Pollutant identification, Equipment, Control, Performance, Operations.
Identifiers: *Process control, *Turbidimeters, Photocells.

In the late 1960's only a few process photometers were available, most of which depended on effects such as extinction/absorption or scattering. Disadvantages of these meters included the need for large dilutions; the need for frequent cleaning, calibration, and maintenance; and sensitivity to color changes. A four beam alternating light photometer was subsequently developed, with a probe which can be submerged in the material being measured. It was designed to be sufficiently accurate for process control. The probe has two lamps, which can be lit alternately, and two photocells, with the fluid to be measured between the lamps and photocells. The extinction module of the fluid is determined from the current from the two photocells using one lamp at a time. Because the equations used eliminate the photocell currents and photo-electric constants, the measurements are independent of lamp intensity or dirt on the lamps or photocells. (Snyder-FIRL)
W76-09694

STEROIDS IN EFFLUENTS,
Clyde River Purification Board, Glasgow(Scotland).
J. P. Dawson, and G. A. Best.
Proceedings of the Analytical Division, Chemical Society, p 311-315, December, 1975. 1 fig, 4 tab, 4 ref.

Descriptors: *Tracers, *Coliforms, *Pollutant identification, Sewage treatment, Water pollution, Bacteria, Effluents, Waste water treatment, Bioindicators, Path of pollutants.
Identifiers: *Fecal contamination, *Coprostanol, *Steroids.

The use of coprostanol, a steroid, was investigated as an internal tracer for fecal contamination in water. The method was first tested on spiked samples; steroid concentrations were then determined at various stages of treatment in sewage works, upstream and downstream from an effluent discharge, near a large sewage works discharging settled sludge into an estuary, near a small outfall discharging macerated sewage, and at various remote areas on the West coast of Scotland. The reduction of coprostanol due to sewage treatment was similar to that of conventional water pollution parameters. The coprostanol concentration gradually decreased with distance downstream from the effluent discharge, but the cholesterol concetration showed no such trend, probably because cholesterol from farm drainage had entered the stream above the discharge. Tests in the estuary also showed the advantate of coprostanol over cholesterol as a tracer. Coliform counts were more variable than steroid analysis; steroids were rapidly diluted in the estuary, and steroids and coliforms were found in surface water over 20 km from the discharge. It was difficult to compare results from coprostanol, cholesterol, and coliform measurements near the small outfall, due to the variability of results. Results from both fresh and saline water indicated coprostanol to be a good indicator of fecal pollution. Coprostanol analysis requires more time than bacteria counting, but analysis does not need to be done immediately, and the results obtained are less subject to error. (Snyder-FIRL)
W76-09696

TRACE-ELEMENT ANALYSIS USING X-RAY EMISSION SPECTROSCOPY,
Institut., Rudjer Boskovic, Zagreb (Yugoslavia).
D. Rendic, S. Blagus, V. Pecar, and V. Valkovic.
Fizika, Vol. 7, p 112-115, 1975. 2 fig, 3 ref.

Descriptors: *X-ray spectroscopy, *Analytical techniques, *Pollutant identification, *Trace elements, Water pollution, Environmental effects, Metals, *X-ray analysis, Computer programs, *Spectroscopy.

The basic process in X-ray spectroscopy consists of exciting a sample with incoming photons or charged particles and detecting the X-rays emitted. It is used to analyze trace elements. Its many fields of application include the study of water pollution. Its advantages include simultaneous determination of all medium-heavy and heavy metals, simple sample preparation and the ability to use small sample quantities, high accuracy, and the ability to detect concentrations as small as one in 1,000,000. An X-ray spectroscopy system has been developed which includes a computer program for automatic analysis of X-ray spectra and determining absolute elemental concentrations. This system is widely used in studying environmental samples. A similar system is being built at the Rudjer Boskovic Institute based on experience with the first system. The development of similar computer programs for analyzing X-ray spectra is included. According to preliminary results, the

Library U. of F. Graham Area

method has numerous capabilities and advantages for analyzing elements in low concentrations. Using an X-ray source of around 1000 watts would establish X-ray emission spectroscopy as a powerful new technique with applications in fundamental research as well as environmental pollution. (Snyder-FIRL)
W76-09697

DISTRIBUTION OF BDELLOVIBRIO BACTERIOVORUS IN SEWAGE WORKS, RIVER WATER, AND SEDIMENTS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
J. C. Fry, and D. G. Staples.
Applied and Environmental Microbiology, Vol. 30, No. 4, p 469-474, April, 1976. 4 fig, 3 tab, 20 ref.

Descriptors: *Pollutant identification, *Bacteria, Rivers, *Sewage, Aerobic conditions, Anaerobic conditions, Sewage treatment, Effluents, Distribution, *Path of pollutants, Water pollution.
Identifiers: *Bdellovibrio bacteriovirus.

The source and extent of Bdellovibrio, a bacterial predator, in British rivers were studied, along with the possibility that it could grow or control bacterial populations in river sediments or sewage. Bacteria from samples of river water, liquid sewage, final settlement sludge, and river sediment were cultured, and plaques were counted and examined microscopically. Bdellovibrio occurred in all liquid sewage examined. It also occurred in all river sediments and polluted river waters examined, although it was not found in some of the unpolluted river waters. The predator could multiply on the large numbers of bacteria in aerobic percolating filter films, but not in anaerobic sludge. It occurred in river sediments' aerobic surface layers, but not in anaerobic bottom layers. Sewage works effluents were the major Bdellovibrio source in polluted rivers examined, and numbers in sediment and river water were correlated with the quality of the river water. Bdellovibrio was probably not important in controlling other bacteria either in sewage or in river sediment. (Snyder-FIRL)
W76-09698

LABORATORY EVALUATION OF THE COULTER ON-LINE PARTICLE MONITOR,
Welsh School of Pharmacy, Cardiff.
M. I. Barnett, E. Sims, and R. W. Lines.
Powder Technology, Vol. 14, No. 1, p 125-130, May-June, 1976. 2 fig, 3 tab, 7 ref.

Descriptors: *Measurement, *Laboratory tests, *Monitoring, Microorganisms, Flocculation, Oceans, Control, *Pollutant identification, Water pollution effects, Microbiology.
Identifiers: Coulter on-line particle monitor.

The Coulter On-Line Particle monitor, which counts particles within specified size intervals for control purposes or continuous monitoring, was evaluated in the laboratory. The monitoring applications studied include filtered electrolyte, intravenous fluids, sea and river water, and microbial growth. Instrumental noise and external interference caused a minor problem, giving a lower limit of about 3% of aperture diameter instead of the normal 2%. When used with the proper Coulter Counter, it has direct application to studying microbiological growth and flocculation. The monitor also has obvious applications to the study of particulate contamination. Sea water and river water were successfully monitored using 100 micron aperture tubes, although the low conductivity of the river water gave rise to some noise generation below 4 to 5% of the aperture diameter. (Snyder-FIRL)
W76-09699

HOW TO BUILD A BETTER BENCH SHEET,
Las Cruces Water Quality Lab., N. Mex.
For primary bibliographic entry see Field 5D.
W76-09701

REPRESENTATIVE DIRTY WATER SAMPLING,
R. Jenkins.
Effluent and Water Treatment Journal, Vol. 16, No. 3, p 144-145, March, 1976. 2 fig, 3 ref.

Descriptors: *Sampling, *Suspended solids, *Effluents, *Pollutant identification, Municipal wastes, Industrial wastes, *Monitoring.

Effluent sampling is required to determine the composition of liquids with suspended solids, but the sampling method itself may change the fall-out rate in its vicinity, leading to errors. Many samples are needed due to the varying composition of the fluid, and sampling rate should be proportional to flow, because many processes have periods of high flow rate and low contamination, and low flow rate and high contamination. The simplest continuous automatic sampler is the air displacement sampler, which is immersed in the fluid so that hydrostatic pressure pushes the sample into the sampling chamber. If the inlet is placed at 20% of 'full bore', the rate of sampling against flow rate approximates the characteristic of the pipe or channel. The average absolute error between 10 and 100% of full flow is under 1% for pipes and 2% for channels. The design of this type of sampler ensures that samples are 'representative' due to the design inlet and absence of a pump, and mathematically representative due to the rate of sampling being nearly proportional to flow rate. (Snyder-FIRL)
W76-09702

POLLUTION INFLUENCE ON THE INFUSORIAL FAUNA (PROTOZOA, CILIATA) OF BULGARIAN RIVERS II. THE OGOSTA RIVER AND ITS EFFLUENTS,
R. Detcheva.
Khidrobiologiia, No. 2, p 19-31, June, 1975. 1 fig, 3 tab, 4 ref.

Descriptors: *Pollutant identification, *Microorganisms, *Rivers, Water pollution effects, Biochemical oxygen demand, Ammonia, Dissolved oxygen, *Protozoa, Effluents.
Identifiers: *Bulgaria(Ogosta River).

Species of ciliates were investigated in 56 samples from 14 locations along the Ogosta River, Bulgaria, and its tributaries from spring to autumn 1969. The seasonal influence and the influence of river pollution on the species of ciliates present was studied. Fifteen hydrochemical indices giving some indications as to the saprobiological conditions in the river, compared with previous values. The data exactly coincided for several species. Some deviations occurred in the values of dissolved oxygen, ammonia, and biochemical oxygen demand (BOD). (Snyder-FIRL)
W76-09714

AN UNDERWATER TEMPERATURE-DEPTH DATA COLLECTION DEVICE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W76-09727

CONCENTRATION OF HEAVY METALS IN SEDIMENTS OF A HYDROELECTRIC IMPOUNDMENT,
Montana Univ., Missoula, Dept. of Zoology.
A. K. Bailey, and G. F. Weisel.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-254 549, $4.50 in paper copy, $2.25 in microfiche. Research Report No. 75, Montana University Joint Water Resources Research Center, Bozeman, March 1976. 66 p, 10 fig, 7 tab, 32 ref. OWRT A-086-MONT(1).

Descriptors: Water quality, *Heavy metals, *Sediments, Settling basins, *Mine wastes, *Lake sediments, Iron, Zinc, Copper, Manganese, *Pollutant identification, Impoundments, Hydroelectric plants, *Montana, Invertebrates, Oligochaetes, Diptera.
Identifiers: Milltown Dam(Mont), Clark Fork River(Mont), Metal concentration, Blackfoot River(Mont).

Milltown Dam, located near Bonner, Montana, has acted as a settling basin for 69 years for waste in the Clark Fork River originating from the Butte mines and Anaconda Copper Mining Company smelter 95 miles upstream. This study undertook the determination of the amounts of heavy metals accumulated in the sediments of Milltown reservoir. Sediments in the Blackfoot River portion of the reservoir were used for comparison with the Clark Fork River sediments. Sediment cores from the Clark Fork River had high levels of Cu, Zn, and Mn compared to sediments reported in other studies and to a core taken from the Blackfoot River. Peaks of high Cu, Zn, Mn, and Fe concentrations were found at the same depth within most of the Clark Fork cores. Cu concentration ranged in these cores from 50-7,900 microgram/gm; Zn ranged from 300-7,900 microgram/gm; Mn ranged from 350-2,900 microgram/gm; Fe ranged from 10,500-43,300 microgram/gm. The peaks of metal concentration were concluded to be caused by changes in operations, smelter shutdowns, and spills from settling ponds near Anaconda. Macroinvertebrates in sediment samples were predominately oligochaetes and one species of dipteran (Chironomus (Chironomus) sp.). There was no statistically significant difference between the numbers and kinds of macroinvertebrates at the mouth of the Blackfoot River and the Clark Fork impoundment.
W76-09755

MATERIALS BUDGETS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington. Dept. of Zoology.
E. B. Henson, and M. Potash.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 562, $4.50 in paper copy, $2.25 in microfiche. Vermont Water Resources Research Center, Burlington. Completion Report, January 1976. 62 p, 6 fig, 1 tab, 16 ref. OWRT A-014-VT(2).

Descriptors: Dissolved solids, Phosphates, Conductivity, Eutrophication, Lakes, *Nutrients, Water quality, *Recycling, *Vermont, *Cycling nutrients, Tributaries, Estimating, *Pollutant identification, Cations, Alkalinity.
Identifiers: *Lake Champlain.

Objectives were to ascertain the general water quality status of the tributaries discharging into Lake Champlain and to estimate the material input to the lake. Water samples were collected from about 40 tributaries during the period 1970-1974. The water samples were analyzed for the major cations (Ca++, Mg++, Na+, and K+), total and reactive phosphate, conductivity, alkalinity, and pH. In addition, analyses for dissolved oxygen, BOD, and suspended material were sometimes made. Total dissolved solids into Lake Champlain amounted to 888,429 tons annually (713 gms/sq. meter). Total phosphorous from the tributary streams ranged between 200 to more than 400,000 lbs/yr. It was estimated that more than 50% of the total phosphorous being added to the lake was retained in the lake, 21% of the sodium, 13% of the magnesium, and 3% of the dissolved solids. Ten years of data collected from the main lake reference stations were summarized.
W76-09756

SEDIMENT PROPERTIES, LAKE CHAMPLAIN: 1971-1975,
Vermont Univ., Burlington. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-09763

PLANKTON ANALYSIS TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 5C.
W76-09782

IS THE EXAMINATION OF DRINKABLE WATER AND SWIMMING POOLS ON PRESENCE OF ENTEROPATHOGENIC E. COLI NECESSARY, (IN GERMAN),
Mikrobiologie Institut Medical Fakulteti, Ljubljana (Yugoslavia).
For primary bibliographic entry see Field 5C.
W76-09785

RADIATION HAZARD OF IODINE-129, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W76-09788

MARINE SOIL POLLUTION AND SELF-PURIFICATION, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
L. N. Kiryukhina, M. I. Kucherenko, and O. G. Mironov.
Gidrobiol Zh. 10(2), p 55-59, 1974.

Descriptors: *Microorganisms, Marine animals, *Bottom sediments, *Bays, Bottom sampling, *Self-purification, Water analysis, *Pollutant identification.
Identifiers: *Carbohydrate oxidizing microorganisms.

A detailed analysis is given of the physicochemical composition of the bottom sediments, distribution of chemical components with depth and the species composition, density and regularity of occurrence of carbohydrate oxidating microorganisms. The data show weak self-purification processes in the bottom sediments of the bay.--Copyright 1975, Biological Abstracts, Inc.
W76-09789

SEDIMENTATION AND PHOSPHORUS BALANCE IN LAKE LUCERNE (HORW BAY) AND IN THE ROTSEE, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W76-09790

PRESENCE AND SOME PROPERTIES OF BACTERIA OF THE FAMILY PSEUDOMONADACEAE IN THE RIVER DANUBE, (IN GERMAN),
Slovenska Akademie Vied, Bratislava Czechoslovakia). Limnobiologisches Institut.
B. Trzilova.
Biologia (Bratisl) 29(9), p 681-690, 1974.

Descriptors: *Bacteria, *Pseudomonas, *Distribution, Rivers, Europe, Temperature, Aeration, *Enteric bacteria, *Chromatography, *Pollutant identification.
Identifiers: *Aeromonas, Aeromonas-Hydrophila, Aeromonas-Punctata, Aeromonas-Salmonicida, Chromatography, Czechoslovakia, Danube, Pseudomonas-Fragi, Pseudomonas-Putida, Pseudomonas-Stutzeri, *River Danube.

The numbers, species distribution and antagonistic activity of bacteria of the family Pseudomonadaceae from 1 profile in the middle of the river Danube (Czechoslovakia) from 1969-1970 are described. The bacteria showed great numbers during winter and spring, the lowest values seen from May until Sept. Isolated species were Pseudomonas fragi, P. putida, P. stutzeri, Aeromonas salmonicida, A. hydrophila and A. punctata. An indirect correlation with temperature was shown in bacteria of the genus Pseudomonas anda direct one in bacteria of the Aeromonas. From 102 isolated strains of the family Pseudomonadaceae some 69 inhibited the growth of bacteria of the family Enterobacteriacae. With water aeration of values to 1.01/min the elimination of Enterobacteriaceae is speeded up. By use of chromatography it was shown that strains of the genus Aeromonas and Pseudomonas produced efficient substances which are moderately hydrophilic in character and are spectrally related.--Copyright 1975, Biological Abstracts, Inc.
W76-09792

DETERMINATION OF FLUORINE IN DRINKING WATER WITH A CERIUM(III)- OR LANTHANUM ALIZARIN COMPLEX, (IN RUSSIAN),
Research Inst. of Public Water Supply Water Purification, Moscow (USSR).
L. A. Khristianova, N. I. Udal'tsova, and S. S. Soldatova.
Gig Sanit. 11, p 88-89, 1974.

Descriptors: *Pollutant identification, *Fluorine, Potable water, *Photometry, Methodology, Ions, Water analysis.
Identifiers: *Cerium, *Lanthanum-alizarin.

To determine the F ion in drinking water, the photometric method was tested, with the use of a Ce(III)- or La-alizarin complex. This method is highly sensitive and selective, and the time of analysis is 5-6 times shorter than with the use of the conventional method.--Copyright 1975, Biological Abstracts, Inc.
W76-09796

HYGIENIC STANDARDIZATION OF TIN DIBUTYL DIISOOCTYLTHIOGLYCOLATE IN WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 5C.
W76-09797

SANITARY INSPECTION OF SURFACE WATERS POLLUTED WITH AROMATIC AMINO AND NITRO-COMPOUNDS, (IN RUSSIAN),
Leningrad State Medical Inst. of Sanitation and Hygiene.
A. G. Ilichkina, I. I. Bat', and V. V. Kirichenko.
Gig Sanit. 9, p 100-101, 1974.

Descriptors: *Organic compounds, Surface waters, *Aromatic compounds, *Nitrogen compounds, Methodology, *Pollutant identification, Phenols, Amino acids, Oxidation, Metabolism, Oxygen, Water pollution.
Identifiers: Allergens, *Amino compounds, Aniline, Benzene.

Methods are described for quantitative analysis of p-phenetidine, p-nitrophenol, m-trifluoromethylnitrobenzene, which cause degenerative changes in the blood and methemoglobinemia and are delayed-type allergens. When present in small quantities, these aromatic amino- and nitro-compounds can be oxidized biochemically and chemically, but when present in higher quantities, they can be only chemically oxidized; these compounds utilize O2 during metabolic breakdown.--Copyright 1975, Biological Abstracts, Inc.
W76-09798

IRON-MANGANESE MICROORGANISMS STUDIED BY OVERGROWING TECHNIQUE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institute of Lakes Keeping.
R. S. Kutuzova.
Mikrobiologiya. 44(1), p 156-159, 1975.

Descriptors: *Microorganisms, Lakes, *Pollutant identification, Iron, Manganese, *Microscopy, Analytical techniques.
Identifiers: Euglena, Mettalogenium, Trachelomonas-Volvocina, *USSR(Lake Krasnoye), *Iron-manganese microorganisms, Capillary microscopy.

Microorganisms in the surface layer of ooze and in the bottom layer of water in the ore field of Lake Krasnoye were studied by capillary microscopy (USSR). The lake Fe-Mn organisms differ from those in the 2nd ooze profile. Fe-Mn microorganisms were found on Euglena, and the nature of the relationship is discussed. (Metallogenium and Trachelomonas volvocina are also discussed.)--Copyright 1975, Biological Abstracts, Inc.
W76-09813

THE HEAVY METAL CONCENTRATIONS IN THE WATERS ALONG THE COAST OF FUKUYAMA, (IN JAPANESE),
Kagoshima Univ. (Japan). Lab of Marine Botany and Environmental Sciences.
A. Inoue, R. Kaibara, and S. Asakawa.
Mem Fac Fish Kagoshima Univ. 23, p 217-228, 1974.

Descriptors: *Heavy metals, Coasts, *Spectrophotometry, *Pollutant identification, Seasonal, Rainfall, Iron, Manganese, Nickel, Zinc, Cobalt, Copper, Cadmium.
Identifiers: *Japan(Fukuyama), *Atomic absorption spectrophotometry.

The concentrations of heavy metals (Fe, Mn, Co, Cu, Zn, Ni and Cd) in the nearshore waters of Fukuyama (Japan), were determined at monthly intervals by atomic absorption spectrophotometry and their seasonal and geographic variations discussed. The heavy metal concentrations were 0.10-0.15 micro-g/ml, Fe; 0.001-0.030, Mn; 0.02-0.04, Co; 0.009-0.090, Zn; 0.004-0.030, Cu; 0.003-0.030, Ni; and 0.0005-0.003, Cd, respectively. The samples retain normal concentrations of trace elements for coastal waters with the exception of Ni. Seasonal changes of heavy metal concentrations were not detected except for Fe and Mn which increased during and after the rainy season in summer suggesting replenishment from land. No definite difference was found for any metals between the surface and bottom waters. A direct linear relationship was detected between Cu and Zn.--Copyright 1975, Biological Abstracts, Inc.
W76-09815

OSCILLOPOLAROGRAPHIC DETERMINATION OF CYANIDE IN WASTE ELECTROPLATING INDUSTRIAL EFFLUENTS,
Istituto di Chimica Generale e Inorganica Pavia (Italy). Laboratorio Chimica Analitica.
C. Bertoglio Riolo, T. Fulle Soldi, G. Spini, and M. Pesavento.
Ann Chim. 64(5/6); p 425-428, 1974.

Descriptors: Analytical techniques, *Polarographic analysis, Effluents, Wastes, Water pollution sources, *Industrial wastes, *Pollutant identification.
Identifiers: *Cyanide, *Electroplating industry, *Oscillopolarographic technique.

A rapid, easy and reliable oscillopolarographic technique for the determination of cyanide, free and/or complexed, in waste electroplating industrial effluents samples is described. The method provides sensitivity of 0.1 mg/1. The analysis is performed directly on the electroplating waste effluent samples, avoiding chemical pre-treatments and distillation processes. The method takes advantage of the formation of a Cu(I)-cyanide complex obtained by adding suitable quantities of cupric ions to the samples. This compound, in a basis medium, shows an oscillopolarographic peak. Its stability constant is higher than that of other cyanocomplexes of heavy cations (except

LIBRARY U. S. Bureau of Mines

for Fe(II) and Co(III)). This fact allows the determination of cyanide, free or complexed with such cations.--Copyright 1976, Biological Abstracts, Inc.
W76-09822

BALANIDAE AS POLLUTION INDICATORS IN THE BAY OF GUANABARA, (IN PORTUGUESE),
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil).
D. Lacombe, and W. Moneiro.
Rev Bras Biol. 34(4), p 633-644, 1974.

Descriptors: *Pollutant identification, *Bioindicators, Indicators, Analytical techniques, Bays, South America.
Identifiers: *Balanidae, Balanus-Amphitrite-Amphitrite, Balanus-Tintinnabulum, Brazil, Tetraclita-Squamosa-Stallactifera, *Barnacles, *Brazil(Bay of Guanabara).

Certain barnacle species are useful as pollution indicators. Among the different species occurring in the Bay of Guanabara (Brazil) Balanus amphitrite amphitrite is the best pollution indicator. This is the only dominant and widespread species in the bay. Three varieties of B. tintinnabulum were observed in the entrance of the bay and Tetraclita squamosa stallactifera in the Flamengo, Botafogo and surroundings. Only B. a. amphitrite is dominant in the bay; its resists all grades of pollution.--Copyright 1976, Biological Abstracts, Inc.
W76-09823

APPRAISAL OF WATER RESOURCES OF NORTHWESTERN EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W76-09828

HYDROLOGY AND SEDIMENTATION OF BIXLER RUN BASIN, CENTRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 2J.
W76-09830

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE MAJOR COAL AND OIL SHALE AREAS OF WYOMING, 1975-76,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4A.
W76-09833

DETERMINATION, STORAGE, AND PRESERVATION OF LOW MOLECULAR WEIGHT HYDROCARBON GASES IN AQUEOUS SOLUTION,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 2K.
W76-09834

GEOCHEMICAL AND ISOTOPIC ANALYSES OF WATERS ASSOCIATED WITH THE EDWARDS LIMESTONE AQUIFER, CENTRAL TEXAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-09836

BIOLOGICAL INDICATORS OF ENVIRONMENTAL QUALITY. A BIBLIOGRAPHY OF ABSTRACTS,
W. A. Thomas, W. H. Wilcox, and G. Goldstein.
Illus. Ann Arbor Science Publishers Inc.: Ann Arbor, Mich., 1973, 254 p. $16.50.

Descriptors: *Bioindicators, *Bibliographies, *Abstracts, Air pollution, Algae, Anions, Bacteria, Birds, Conifers, Environment, Fish, Lichens, Metals, Pesticides, Pollutants, Tobacco.
Identifiers: Moss.

An extensive bibliography is provided on the subject of biological indicators. The selected abstracts emphasize the practical aspects of interpreting the biological manifestations of deteriorated environmental conditions and are organized so that users can focus their attention at any level of biological organization from the molecule to the community. The content begins with a section on cell-free systems, including air pollutants, anions, pesticides, trace metals and water pollutants. A section is then included on cultured cells, followed by a section on tissues and organs, including animal tissue, blood chemistry fish brain enzyme and plant tissue. The next section covers organisms, beginning with air pollutants, including general, halides, nitrogen oxides, oxidants and sulfur oxides. Next, animals are discussed, including aquatic invertebrates, birds, and fish, followed by a section on plants, covering conifers, lichens and moss and tobacco. A section is then included on unicellular organisms covering algae and bacteria, followed by a section on water pollution, both fresh water and marine. Finally, a section is included on communities, discussing biotic indices, diversity indices and saprobic indices. The book ends with an addendum section containing other references by title, followed by a list of periodicals cited.--Copyright 1974, Biological Abstracts, Inc.
W76-09860

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS,
Canada Centre for Remote Sensing, Ottawa (Canada), Data Acquisition Div.
J. N. Devilliers.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-238 841, $3.50 in paper copy, $2.25 in microfiche. Canada Centre for Remote Sensing, Dept. Energy, Mines and Resources Data Report 73-7, September 1973. 11 p, 7 fig.

Descriptors: *Oil pollution, *Oil spills, *Mapping, *Remote sensing, *Pollutant identification, *Aerial photography, *Instrumentation, Aircraft, Environmental effects, Water resources, Resources development, Water pollution effects.
Identifiers: *Outer Continental Shelf, Grand Bahamas, Crude oil, Radiometers, Sensors, Infrared sensors, Television, Laser fluorosensors, Fluorosensors.

An airborne exercise is described employing various sensors to investigate their ability to detect and map Louisiana Crude and Naptha oil spills, both by day and by night. It is shown that photographic, infra-red scanning and low light level T.V. all have some ability to detect Louisiana; only infra-red scanning detected naptha. None of these sensors could identify the anomalies as oil. A laser fluorosensor showed promise in detecting oil at night. Further development will be needed to explore the full potential of such a technique. (Sinha-OEIS)
W76-09891

DEVELOPMENT OF A BOAT AND HELICOPTER DEPLOYABLE OIL SLICK SAMPLER,
Marconsult, Inc., Santa Monica, Calif.
A. A. Allen, and L. E. Fausak.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A010 199, $4.50 in paper copy, $2.25 in microfiche. Department of Transportation, U.S. Coast Guard Final Report No. CG-D-99-75, May 1975. 46 p, 6 fig, 8 tab, 2 append. DOT-CG-24,828A.

Descriptors: *Oil pollution, *Oil spills, *Sampling, *Instrumentation, Resources development, Water resources, *Pollutant identification, On-site tests, Testing, Boats.
Identifiers: *Oil samplers, Helicopters, Oil films, Oil slicks.

A device for the sampling of water-born oil films ranging from 10-2mm to 10 mm in thickness has been developed. The prototype device is a modified stainless steel testing sieve, normally used in sediment size analysis, into which is placed a sheet of sorbent material. The sampler is suspended from a cable or chain harness and is dipped into an oil slick; the oil film adheres to the stainless steel sieve screen and is absorbed by the sorbent sheet. After retrieval, the sampler is immediately sealed with a clean lid and bottom pan to prevent contamination of the oil sample, and thereby also becomes its own sample container. The results of a limited testing program indicate that the device will collect in excess of the required 50 ml of oil from fresh, thick films, but that samples of five to ten milliliters are more typical of very thin or weathered oil films. The testing pxrogram was limited in that it did not include the use of a helicopter as a sampling platform, nor were laboratory analyses of the collected samples conducted to confirm the sampler's chemical inertness with respect to various oils and solvents. These two areas will be investigated in subsequent Coast Guard testing. Several suggestions are offered to increase the performance and capability of the sampling device. (Sinha-OEIS)
W76-09892

OIL SPILL AND OIL POLLUTION REPORTS, NOVEMBER 1974 - FEBRUARY 1975,
California Univ., Santa Barbara, Marine Science Inst.
F. A. DeWitt, Jr., and P. Melvin.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-242 542, $9.00 in paper copy, $2.25 in microfiche. Environmental Protection Technology Series, Quarterly Report No. EPA-670/2-75-003, May 1975 260 p, numerous ref.

Descriptors: *Bibliographies, *Oil spills, *Oil pollution, *Pollutant identification, *Monitoring, *Remote sensing, *Water pollution effects, Sampling, Water resources Environmental effects, Water quality control, Water resources, Resources development.
Identifiers: *Outer Continental shelf, *Ecological effects, Environmental impact.

The November 1974 - February 1975 Oil Spill and Oil Pollution Reports is the second quarterly compilation of oil spill events and oil pollution report summaries. Presented in the report are: (a) summaries of oil spill events; (b) summaries and bibliographic literature citations; (c) summaries of current research projects; and (d) patent summaries. The summaries and bibliographic citations of articles presented in Section I are grouped according to subject and are then arranged alphabetically by senior author within each subject division. The sources of the summarized material are scientific, technical, and abstracting journals. Section II lists Current Research Project entries appearing in Report I and includes descriptive project information provided upon request by the principal investigators and/or performing organization. All reports and publications are entered in summary form. Current Research Project summaries are grouped according to subject and then arranged alphabetically by senior principal investigator within each subject division. Patent summaries are divided into United States and foreign subsections and arranged alphabetically by inventor in each section. All patent information was obtained from abstract journals. A subject cross index is provided at the end of the report. (Sinha-OEIS)
W76-09896

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM, FINAL REPORT,
Aerojet Electrosystems Co., Azusa, Calif.

. T. Edgerton, J. J. Bommarito, R. S. Schwantje, nd D. C. Meeks.
vailable from the National Technical Informa- on Service, Springfield, Va. 22161, as AD-A011 '5, $10.00 in paper copy, $2.25 in microfiche. De- rtment of Transportation, United States Coast uard Final Report No. CG-D-90-75, May 1975. 8 p, 122 fig, 26 tab, 5 append. DOT-CG-22170A.

escriptors: *Remote sensing, Water resources, Oil spills, *Prototypes, *California, *Aerial notography, Continental Shelf, Coasts, Seepage, adar, Microwave, Mapping, Equipment, Water llution effects, *Pollutant identification.
lentifiers: *Outer Continental Shelf, *Airborne nsors, Sensors, Television, Surveillance, Real- me.

prototype airborne oil surveillance system was eveloped for the U. S. Coast Guard. The mul- sensor system permits real-time day/night, all- eather detection, mapping and documentation of l spills at sea. The system was installed aboard a oast Guard HU-16 Albatross and flight tested off e California Coast. Surveillance data were ob- ined from natural seeps, a series of controlled oil ills, routine shipping and targets of opportunity. he airborne system consists of a sidelooking dar, a passive microwave imager, a multispectral w light level TV, a multichannel line scanner, a sition reference system, and a real-time proces- or/display console. The system reliably detected nd mapped oil spills and seeps for conditions nging from dense undercast to clear, wind eeds from 0 to 26 knots and daytime to total arkness. Test results demonstrate that airborne il surveillance is practical and the system can be valuable to other Coast Guard missions. (Sinha-EIS)
V76-09898

DETERMINING THE CONCENTRATION OF OIL IN WATER SAMPLES BY INFRARED SPECTROPHOTOMETRY. PHASE II. INTER-LABORATORY STUDY. VOLUME II,
Naval Ship Research and Development Center, nnapolis, Md.
. Finger, H. Feingold, E. Timko, and S. Orbach.
vailable from the National Technical Informa- on Service, Springfield, Va., 22161, as AD-A011 42, $5.00 in paper copy, $2.25 in microfiche. Naval Ship Research and Development Center Re- ort No. NSRDC 4536, January 1975. 88 p, 27 tab, 6 ref.

escriptors: *Oil pollution, *Pollutant identifica- on, *Methodology, *Spectrophotometry, Regres- ion analysis, Laboratory tests, Infrared radiation.
dentifiers: *Infrared spectrophotometry.

n interlaboratory study to validate a method for easuring the concentration of oil in water was onducted with the active participation of seven boratories. The test plan required each laborato- y to analyze either 120 samples (a full factorial) or 0 samples (a half fractional factorial). The results f the interlaboratory study indicate that the IR ethod can be used for the quantitative deter- ination of oil in aqueous solutions. No statisti- ally significant variations with respect to water alinity have been noted. Prediction of individual boratory performance based on the results are ade for concentrations of 10 p/m, 15 p/m and 100 /m; for sample sizes of 1, 2, 3, and 6; at con- idence leves of 80%, 90%, 95% and 98%. A pre- iction based on the combined results of all labora- ories was also made. This prediction is useful as a uide in designing sampling plans and preparing ontract specifications. This report has been is- ued in three (3) volumes. The first contains the ighlights of the results; this, the second gives the etails of the analysis; and the third, the actual ata. (See also W76-09901) (Sinha-OEIS)
V76-09900

DETERMINING THE CONCENTRATION OF OIL IN WATER SAMPLES BY INFRARED SPECTROPHOTOMETRY. PHASE II. INTER-LABORATORY STUDY. VOLUME III,
Naval Ship Research and Development Center, Annapolid, Md.
S. Finger, H. Feingold, E. Timko, and S. Orbach.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A011 043, $7.50 in paper copy, $2.25 in microfiche. Naval Ship Research and Development Center Report No. NSRDC 4536, January 1975.

Descriptors: *Oil pollution, *Pollutant identification, *Methodology, *Spectrophotometry, Regression analysis, Laboratory tests, Infrared radiation.
Identifiers: *Infrared spectrophotometry.

An interlaboratory study to validate a method for measuring the concentration of oil in water was conducted with the active participation of seven laboratories. The test plan required each laboratory to analyze either 120 samples (a full factorial) or 60 samples (a half fractional factorial). The results of the interlaboratory study indicate that the IR method can be used for the quantitative determination of oil in aqueous solutions. No statistically significant variations with respect to water salinity have been noted. Prediction of individual laboratory performance based on the results are made for concentrations of 1- p/m, 15 p/m and 100 p/m; for sample sizes of 1, 2, 3, and 6; at confidence levels of 80%, 90%, 95% and 98%. A prediction based on the combined results of all laboratories was also made. This prediction is useful as a guide in designing sampling plans and preparing contract secifications. This report has been issued in three (3) volumes. The first contains the highlights of the results; the second gives the details of the analysis; and this the third, the actual data. (See also W76-09900) (Sinha - OEIS)
W76-09901

SENSORS FOR CONTINUOUS MONITORING OF TOXIC IONS, NUTRIENTS, AND DISSOLVED GASES IN WATER,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
M. S. Shuman, and W. W. Fogleman.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 834 $6.00 in paper copy, $2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Rpt. No. 113, April 1976. 122 p, 14 fig, 9 tab, 398 ref. OWRT B-074-NC(1), 14-31-0001-4157.

Descriptors: *Electrodes, *Metals, *Monitoring, *Measurement, *Pollution identification, *Waste identification, *Potentiometers, Nutrients, Instrumentations, Cadmium, Copper, Iron, Lead, Mercury, Nickel, Silver, Zinc, Cyanide, Ions.
Identifiers: *Toxic ions.

Ion-selective electrodes and a new type of dissolved gas sensor based on piezoelectric crystals were assessed for use in continuous monitoring of water quality. Relevant stream and effluent water quality standards were reviewed in order to define the constraints on the use of these sensors. The use of sensors in continuous monitoring programs in the United States and other countries was also examined and reviewed. The state-of-the-art of ion-selective electrodes for toxic ions, nutrients and dissolved gases in water was reviewed. A tabular summary of electrode characteristics and an extensive bibliography were compiled. Recommendations for the use of these sensors were made with consideration of the practical problems encountered in continuous monitoring. A dissolved gas sensor for carbon dioxide utilizing a coated piezoelectric crystal was fabricated and evaluated. Didodecylamine and dioctadecylamine were useful coating materials but were also sensitive to water vapor and sulfur dioxide. A probe was designed with the crystal isolated from the aqueous sample by a film of polyvinyl chloride, cast Teflon or by a microporous Teflon filter. (Stewart - North Carolina State)
W76-09906

COAST GUARD'S RESPONSE TO SPILLED OIL,
Coast Guard Reserve, Washington, D.C. Office of Research and Development.
R. W. Ard, Jr.
Environmental Science and Technology, Vol 10, No 3, p 239-242, March 1976. 5 fig.

Descriptors: *Remote sensing, *Oil spills, *Pollution identification, *Water quality control, *Environmental effects, Resources development, Water pollution sources, Monitoring, Detection, Sensors, Oil pollution.
Identifiers: Outer Continental Shelf, *Offshore technology, Airborne sensors, In-situ sensors.

The Coast Guard's Office of Research and Development has an extensive remote sensing program to detect oil spills. This program is broken down into two major categories: in-situ and airborne. In-situ sensors are used to survey the immediate area of the sensor and are typically mounted on bridge piers, buoys, and piles. Airborne remote sensing, or using appropriate sensors on an aircraft, can cover tremendous areas over short periods of time and can map the extent of the spill with appropriate documentation for later legal action. Many in-situ sensor concepts have been investigated by the Coast Guard including those that use vapor detectors, various mechanical schemes, and visible, ultraviolet, and infrared detectors. The Coast Guard Research and Development Center is developing a system that will determine the source of a spill with sufficient confidence that violators can be prosecuted. Every promising technique was evaluated for its ability to characterize oils. The most promising techniques have been infrared and fluorescence spectroscopy, gas chromatography, and thin-layer chromatography. The detection probabilities for each method in ten simulated spills involving 63 samples were: infrared 94.4%; fluorescence 91.1%; gas chromatography 91.1%; and thin-layer chromatography 62.9%, for a combined probability of 99.9%. (Sinha-OEIS)
W76-09915

DEPENDENCE OF THE LEVEL OF NITROGENASE ACTIVITY ON THE WATER CONTENT OF THE THALLUS IN PELTIGERA CANINA, P. EVANSIANA, P. POLYDACTYLA, AND P. PRAETEXTATA,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
K. A. Kershaw.
Can J Bot. 52(6), p 1423-1427, 1974.

Descriptors: Chromatography, *Pollutant identification, *Nitrogen fixation, Monitoring, *Lichens.
Identifiers: Nitrogenase activity, Peltigera-Canina, Peltigera-Evansiana, Peltigera-Polydactyla, Peltigera-Praetextata, Thallus moisture(Lichens), *Peltigera sp.

The rates of nitrogen fixation and the response to changing levels of thallus moisture have been monitored in P. canina (L.) Willd., P. evansiana Gyel., P. polydactyla (Neck.) Hoffm. and P. praetextata (Somm.) Vain., using standard vapor-phase chromatography. Maximum levels of fixation range from 2.96 nmol of ethylene evolved/h mg dry weight in P. evansiana to 1.31 nmol G2H4/h mg dry weight in P. polydactyla. Each species shows a slightly different pattern of fixation response to changing levels of thallus moisture, and the pattern of fixation correlates with the ecological preferences of each species.--Copyright 1974, Biological Abstracts, Inc.
W76-09916

PESTICIDE AND PCB RESIDUE IN ORGANS OF WILD ANIMALS AS INDICATORS OF ENVIRONMENTAL CONTAMINATION, (IN GERMAN),
Munich Univ. (West Germany). Institut fuer Tierphysiologie.
J. Brueggemann, L. Busch, U. Drescher-Kaden, W. Eisele, and P. Hoppe.
Z Jagdwiss. 20(1), p 70-74, 1974.

Descriptors: *Pesticide residues, *Polychlorinated biphenyls, Indicators, Gas chromatography, *Pollutant identification, Environment, *Wildlife.
Identifiers: Bird, Codfish, Liver.

During the years 1970-1973, 800 samples of organs, adipose tissue and eggs from 26 wild animal species were investigated using gas chromatography with respect to chlorinated pesticides and polychlorinated biphenyls (PCB). The most abundant pesticides were HCB and Lindane + isomers. The pesticide- and PCB-concentrations in liver- and fat tissue of herbivores were about 5 times lower (ppb-values) than in carnivores, where the residues accumulated accordng to the food chain. The highest values gotten from eggs of predatory birds and from codfish liver (ppm-values Tab. 2 and 3; for instance DDE and DDT + isomers).--Copyright 1974, Biological Abstracts, Inc.
W76-09922

A SIMPLE PHYSICOCHEMICAL METHOD OF DETECTING TRACES OF SURFACTANTS IN WATER,
Florence Univ. (Italy). Dept. of Physical Chemistry.
R. Cini, A. Ficalbi, and G. Loglio.
Mikrochim Acta 2, p 203-212, 1974.

Descriptors: *Surfactants, *Pollutant identification, *Physicochemical properties, Water quality, Organic compounds, Trace elements.

A physical-chemical method of detecting traces of surfactants (both natural and synthetic) in water is described. This method is based on the measurement of the surface pressure on water samples containing surfactants with molecular weight higher than 150-200, in concentration lower than 2 ppm. In well-defined conditions, the method can yield also quantitative results. Typical results for dimethyldecylphosphine oxide (DC10PO), dimethyldodecylphosphine oxide (DC12PO), isooctylphenoxypolyethoxyethanol(Triton X-100) and sodium dodecylsulfate are reported. A new parameter is proposed to indicate the quality of water with respect to surfactants.--Copyright 1974, Biological Abstracts, Inc.
W76-09927

TECHNIQUE OF WATER SAMPLING IN SANITARY INVESTIGATIONS OF LARGE BODIES OF WATER, (IN RUSSIAN),
Kazan Inst. of Postgraduate Medicine (USSR).
L. N. Krepkogorskii, and Y. N. Pochkin.
Gig Sanit. 38(7), p 72-75, 1973.

Descriptors: *Sampling, Water pollution, *Pollutant identification, *Water analysis, Chemical analysis, Bottom sampling, *Water sampling.

The described water sampler greatly shortens the time required for taking water samples during sanitary investigations of bodies of water. It takes 2 persons 40-50 min to take 6 samples for complete sanitary-chemical, bacteriological, and special analyses (filling of 42 glass bottles) on a 400-800 m wide river at 3 points (near the left bank, middle, and near the right bank; surface and deep or bottom samples are taken at each point). The design of the water sampler eliminates secondary contamination of the sample for bacteriological investigations.--Copyright 1974, Biological Abstracts, Inc.
W76-09928

GAS-LIQUID CHROMATOGRAPHIC DETERMINATION OF BUTYL ACETATE, BUTANOL AND ACETONE PRESENT TOGETHER IN WASTE WATERS, (IN RUSSIAN),
Kiev Medical Preparatory Plant (USSR).
M. S. Komskii, and M. A. Bogatskii.
Gig Sanit. 38(9), p 70-71, 1973.

Descriptors: *Pollutant identification, Methodology, *Gas chromatography, Organic compounds, Analytical techniques.
Identifiers: Acetates, Acetone, Butanol, Butyl acetate.

A rapid, sensitive gas-liquid chromatographic method was developed for quantitative determination of butyl acetate, butanol and acetone present together in waste waters. The determination of all 3 components takes 15 min. The analysis is performed on a gas chromatograph using flame-ionization detector. The sensitivity of the method is 0.2 micro-g of butyl acetate or butanol and 0.05 micro-g of acetone in the analyzed sample.--Copyright 1974, Biological Abstracts, Inc.
W76-09929

'TOXIC' OR 'POISONOUS' WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
For primary bibliographic entry see Field 5C.
W76-09932

USING A CHN ANALYZER TO REDUCE CARBONATE INTERFERENCE IN PARTICULATE ORGANIC CARBON ANALYSES,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
G. Telek, and N. Marshall.
Mar Biol (Berl). 24(3), p 219-221, 1974.

Descriptors: *Pollutant identification, *Carbonates, Water analysis, Carbon, Nitrogen, Hydrogen, Oxidation.
Identifiers: *Organic carbon, *CHN analyzer.

Using a CHN analyzer at a reduced temperature (720C), the organic carbon of particulates taken from water is oxidized while little dissociation of carbonate occurs. When necessary for increased precision or for samples with a high CaCO3 content, the small interference of carbonate with organic C determinations can be quantified by running representative samples at different oxidation time intervals and interpolating to time zero. By running replicates, one at 720C and one at 1100C, data on organic and inorganic C and on N are obtained with the analyzer.--Copyright 1974, Biological Abstracts, Inc.
W76-09940

5B. Sources Of Pollution

EFFECTS OF STORM DISCHARGES ON RIVER WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
J. H. N. Garland.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 593-602, 1976. 4 fig, 2 tab, 13 ref.

Descriptors: *Storm runoff, *Water pollution source, Rivers, Sewage treatment, Sewerage, Suspended solids, Weirs.

In 1963 about 37% of the storm overflows in Wales and England were considered unsatisfactory. Pollution problems from storm sewage most frequently appeared where overflow settings were below six times dry-weather flow, usually older industrial urban areas where substantial parts of sewage systems had outlived their original design capacity. Considerable deterioration of water quality in the River Tame resulted from storm overflows and surface drainage. A realistic approach to the problem is that of treating the entire river below the last large Effluent outfall using a series of several settling basins. The effect of storm sewage discharge on a river depends primarily on the discharge's duration and strength and the dilution provided by the river. Its strength depends on dry-weather sewage, time of day, time since the last storm, and the flow. In combined sewerage systems, a flood wave precedes the mixed sewage and may cause spillage of dry-weather sewage. If a long time has elapsed since the last rainfall, storm runoff in the first flush may contain very large amounts of suspended solids which had accumulated on surfaces. Discharge duration depends intensity and duration of the rainfall, how the overflow weir is set, and the drainage system's storage capacity. The overflow weir setting has the greatest effect on the frequency of pollution episodes. Another problem is posed by metals, such as zinc, copper, and lead, contained in dust entering urban rivers with runoff. The River Tame shows two types of polluted conditions: one caused by inadequate treatment of effluents, and the other caused by additional pollutants entering during storms. (Snyder-FIRL)
W76-09401

URBAN DRAINAGE STUDIES,
Environmental Protection Service, Ottawa (Ontario).
T. M. Koplyay.
Water and Pollution Control, Vol. 114, No. 1, p 14-16, January, 1976. 1 fig, 2 tab.

Descriptors: *Urban drainage, *Storm runoff, Water pollution sources, Model studies, Snowmelt, Storm drains, Combined sewers, Drainage systems.
Identifiers: Storm Water Management Model.

New approaches to designing and constructing systems to convey surface waters are being examined, due to increasing land servicing costs. Loss of pervious ground due to land development results in increased storm flow velocities and higher peak flows, causing local flooding. The higher velocities also increase the pollution and sediment loads. The Canada/Ontario urban drainage program was set up to define the stormwater problem in the Canadian Great Lakes region, establish priorities and schedules for studies, and develop a strategy for implementing solutions. A study is being conducted to provide an order of magnitude estimate of pollution loadings from urban runoff. Problem identification efforts also include reviewing existing municipal practices in Ontario. The Storm Water Management Model (SWMM) ofthe United States Environmental Protection Agency is being adapted to Canadian conditions. Several data collection projects provide site calibration data, and a sub-routine dealing with snowmelt phenomena is being added. Problems with storm sewers and combined sewers in the United States and Europe were studied. Efforts are being made to ascertain that foreign technical practices will be assessed in terms of their applicability in Canada. An ideal model for regulatory practices will be developed. (Snyder-FIRL)
W76-09402

ENVIRONMENTAL POLLUTION BY CADMIUM AND ZINC DISCHARGED FROM A BRAUN TUBE FACTORY, (IN JAPANESE)
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
T. Asami.
Sci Rep Fac Agric Ibaraki Univ. 22, p 19-24, 1974.

Descriptors: *Cadmium, *Zinc, Water pollution sources, Waste water(Pollution), *Industrial wastes, Effluents, Sediments.
Identifiers: Soil pollution, Braun tube factory wastes, *Japan.

Cd and Zn discharges from a braun tube factory at Funabashi city, Chiba Prefecture, Japan, were investigated. Sediment of one wastewater outlet contained 9770 ppm Cd and 37,500 ppm of Zn; that of the other contained 4820 ppm Cd and 15,500 ppm Zn. Slag from settling tank thrown on a roadside near an outlet contained 45,500 ppm Cd and 70,000 ppm Zn. The soil even 4 m under the road surface contained 186 ppm Cd and 662 ppm Zn. Sediments in the irrigation canal polluted by the factory waste water contained much Cd and Zn; paddy soils near the canal were polluted by the metals. Houses near the factory were polluted by Cd carried by dust from the slag thrown on the roadside. Surface soil of a yard contained 9.8 ppm Cd. Dust from the nearest house contained 76.5 ppm Cd; the amount of Cd in the dust decreased gradually in proportion to distance from the factory.--Copyright 1976, Biological Abstracts, Inc.
W76-09405

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: PENN STATE EXPERIMENTAL WATERSHEDS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 4D.
W76-09463

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: BALTIMORE, MARYLAND, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
For primary bibliographic entry see Field 4D.
W76-09464

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: NEWARK, NEW JERSEY, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
For primary bibliographic entry see Field 4D.
W76-09465

CHANGES IN WATER CHEMISTRY RESULTING FROM SURFACE-MINING OF COAL ON FOUR WEST VIRGINIA WATERSHEDS,
Forest Service (USDA), Berea, Ky. Northeast Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W76-09470

FOREST MANAGEMENT PRACTICES AS RELATED TO NUTRIENT LEACHING AND WATER QUALITY,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 4C.
W76-09471

DISCUSSION OF POSSIBLE EFFECTS DUE TO MIXING OF RADIOACTIVE AND THERMAL RELEASES TO THE ATMOSPHERE FROM NUCLEAR POWER PLANTS,
Kernforschungszentrum, Karlsruhe (West Germany).
For primary bibliographic entry see Field 5A.
W76-09502

CHARACTERISTICS OF COASTAL CIRCULATION AFFECTING THE TRANSPORT AND DISPERSION OF MATERIAL RELEASED FROM THE NUCLEAR INDUSTRY,
Energy and Research and Development Administration, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-09504

OPTIMAL GROUND WATER QUALITY MANAGEMENT: WELL INJECTION OF WASTE WATERS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-09511

A THREE-DIMENSIONAL GALERKIN FINITE ELEMENT SOLUTION OF FLOW THROUGH MULTIAQUIFERS IN SUTTER BASIN, CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2F.
W76-09562

NUMERICAL SIMULATION OF WASTE MOVEMENT IN STEADY GROUNDWATER FLOW SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
J. F. Pickens, and W. C. Lennox.
Water Resources Research, Vol. 12, No. 2, p 171-180, April 1976. 10 fig, 1 tab, 24 ref.

Descriptors: *Model studies, *Groundwater movement, *Underground waste disposal, Groundwater, Waste disposal, Water pollution, Water pollution sources, *Path of pollutants, Mathematical models, Finite element analysis, Analytical techniques, Wastes, Waste disposal wells, Flow, Flow system, Water table, Infiltration.

The finite element method based on a Galerkin technique was used to formulate the problem of simulating the two-dimensional transient movement of conservative or nonconservative wastes in a steady state saturated groundwater flow system. The convection-dispersion equation was solved in two ways: in the conventional Cartesian coordinate system and in a transformed coordinate system equivalent to the orthogonal curvilinear coordinate system of streamlines and normals to those lines. The two formulations produced identical results. A sensitivity analysis on the dispersion parameter 'dispersivity' was performed, establishing its importance in convection-dispersion problems. Examples involving the movement of nonconservative contaminants described by distribution coefficients and examples with variable input concentration were also given. The model can be applied to environmental problems related to groundwater contamination from waste disposal sites. (Sims - ISWS)
W76-09564

THE CONCENTRATION OF DISSOLVED SOLIDS AND RIVER FLOW,
Manhattan Coll., Bronx, N. Y. Dept. of Civil Engineering.
D. J. O'Connor.
Water Resources Research, Vol. 12, No. 2, p 279-294, April 1976. 15 fig, 2 tab, 18 ref.

Descriptors: *Dissolved solids, *River flow, *Mathematical studies, *Streamflow, Water properties, *Water chemistry, Salts, Chemical properties, Discharge(Water), Time, Runoff, Mathematics, Hydrologic data, Equations, Flow characteristics, Distribution patterns, Graphical analysis, Natural streams, *Path of pollutants, *Ohio.
Identifiers: *Muskingum River(Ohio), Point sources, Steady state conditions, Time variable conditions, Nonpoint sources, Distributed sources, Flow-concentration relationships.

A general expression for the spatial and temporal distribution of conservative dissolved solids in freshwater rivers which incorporates the contribution of both the groundwater and surface water components of river flow was presented. The first part of this paper deals with the steady state conditions. With certain simplifying assumptions the correlation between concentration of dissolved solids and flow was developed for both spatially uniform and nonuniform conditions. The analysis includes the effect of both geophysical discontinuities and point sources. Examples from a number of rivers throughout the country were presented to indicate the utility of the analysis. The second part addresses the temporal variation of the dissolved solids concentration for two time scales. One described the annual variation in concentration due to the time variable components of the river flow, and the second the variation over a semimonthly period due to a time variable point input. Applications to a variety of river conditions were also presented for the time variable analysis. (Henley-ISWS)
W76-09577

WATER CHEMISTRY OF THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 5A.
W76-09581

MODELING THE CHESAPEAKE BAY AND TRIBUTARIES: A SYNOPSIS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 2L.
W76-09587

LONGITUDINAL DISPERSION COEFFICIENTS FOR STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
S. C. Jain.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE2, Proceedings Paper 12037, p 465-474, April 1976. 5 fig, 2 tab, 10 ref, 3 append.

Descriptors: *Dispersion, *Water pollution sources, *Velocity, *Hydraulics, Environmental engineering, Open channel flow, Rivers, Theoretical analysis, Cross-sections, Mixing, Mathematical models, *Path of pollutants, *Missouri River.
Identifiers: Transverse mixing coefficient.

The coefficient of longitudinal dispersion is an important parameter which characterizes the ability of a stream to reduce the concentration of pollutants along the channels. Field determination of this dispersion coefficient is very time consuming and costly. Using the Fischer formula for variation in the velocity distribution in the transverse direction, an analytical expression was obtained for the dispersion coefficient in terms of a dimensionless parameter, transverse mixing coefficient, shear velocity and average flow velocity, and top width of channel and area of flow cross section. An expression for the dimensionless parameter for an idealized tetragonal cross section was derived. The estimate for the dispersion coefficient for a reach of the Missouri River by the proposed method was shown to be in fair agreement with the observed value. (Singh-ISWS)
W76-09589

STUDIES ON THE METABOLISM OF A SULFUR-OXIDIZING BACTERIUM. VII. PURIFICATION AND CHARACTERIZATION OF SOLUBLE COMPONENTS INDISPENSABLES FOR SULFUR OXIDATION BY THIOBACILLUS THIOOXIDANS,
Nagoya Univ. (Japan). Biological Inst.
For primary bibliographic entry see Field 5C.
W76-09592

PHOSPHORUS AND NITROGEN CYCLE ON A TRANSECT IN LAKE ONTARIO DURING THE

INTERNATIONAL FIELD YEAR 1972-1973 (IFYGL),
Canada Centre for Inland Waters, Burlington (Ontario). Applied Limnology and Physical Processes Section.
For primary bibliographic entry see Field 5C.
W76-09594

THE DESIGN OF WATER QUALITY MANAGEMENT PROJECTS WITH INADEQUATE DATA,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W76-09623

DEVELOPMENT OF LABORATORY MODEL ECOSYSTEMS AS EARLY WARNING ELEMENTS OF ENVIRONMENTAL POLLUTION,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 5C.
W76-09643

ECOSYSTEM MODELING,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5C.
W76-09645

MICROBIAL DEGRADATION OF MODEL PETROLEUM AT LOW TEMPERATURES,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-09648

SPECIES COMPOSITION AND DIVERSITY OF POLYCHAETES IN THE NEW YORK BIGHT,
Pacific Northwest Environmental Research Lab., Newport, Oreg. Marine Science Center.
For primary bibliographic entry see Field 5C.
W76-09650

NITROGEN IN THE SUBSURFACE ENVIRONMENT,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
M. L. Rowe, and S. Stinnett.
Environmental Protection Agency, Report EPA-660/3-75-030, June, 1975. 34 p, 1 fig, 106 ref. EPA Program Element 1BA024. R801381.

Descriptors: *Nitrogen, *Nitrogen compounds, *Water pollution, *Groundwater, Nitrification, Denitrification, Fertilizers, Farm wastes, Domestic wastes, Public health, *Path of pollutants.
Identifiers: *Nitrogen contamination, Methemoglobinemia.

Increased quantities of nitrogen are being released into the soil system. Consequently, higher concentrations of nitrogeneous compounds are making their way into subsoil regions. Knowledge of the behavior and fate of nitrogeneous chemical species in the subsurface environment is needed by those concerned with the prevention and control of ground-water pollution. Any nitrogen compound can be leached if the proper conditions exist. Compounds of nitrogen can move through pore spaces of soil as gases or as solutes in an aqueous solution. Nitrification and denitrification reactions occur in the soil system and are dependent on factors such as soil texture, moisture, temperature and pH. Nitrogen contamination of ground-water supplies is due to agricultural fertilizers, animal wastes, domestic wastes and natural sources. A potential health hazard does exist from the ingestion of nitrate in water supplies. The most apparent danger is to infants less than six months of age, but the nitrate ion could cause methemoglobinemia in adults if it is present in sufficient concentrations. (Heiss-NWWA)
W76-09662

EVALUATION OF COMBINED APPLICATIONS OF ULTRAFILTRATION AND COMPLEXATION CAPACITY TECHNIQUES TO NATURAL WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5A.
W76-09690

STEROIDS IN EFFLUENTS,
Clyde River Purification Board, Glasgow(Scotland).
For primary bibliographic entry see Field 5A.
W76-09696

DISTRIBUTION OF BDELLOVIBRIO BACTERIOVORUS IN SEWAGE WORKS, RIVER WATER, AND SEDIMENTS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5A.
W76-09698

ACID-IRON WASTE AS A FACTOR AFFECTING THE DISTRIBUTION AND ABUNDANCE OF ZOOPLANKTON IN THE NEW YORK BIGHT: I. LABORATORY STUDIES ON THE EFFECTS OF ACID WASTE ON COPEPODS,
Harvard Univ., Cambridge, Mass. Biological Labs.
For primary bibliographic entry see Field 5C.
W76-09700

EFFECTS OF LAND USE AND RIVER SEEPAGE ON GROUNDWATER QUALITY IN HALL COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Inst. of Agriculture; and Nebraska Univ., Lincoln. Div. of Natural Resources, Conservation and Survey.
R. F. Spalding.
Nebraska Water Survey Paper Number 38, January 1975. 95 p, 17 fig, 2 tab, 60 ref, 5 append.

Descriptors: Water pollution, *Groundwater, *Farm wastes, *Sewage effluents, *Fertilizers, Phosphates, Nitrates, Nitrogen, Chlorides, Sulfates, *Land use, Subhumid climates, Evaporation, Irrigation, Evapotranspiration, Water table, Recharge, Infiltration, Groundwater movement, Wells, Water levels, Sampling, Specific conductivity, Leaching, Septic tanks, Hydrogen ion concentration, Seepage, *Nebraska.
Identifiers: *Ogallala formation(Neb), Soil maps, Nitrogen balance, *Platte River seepage(Neb).

Zones of differing groundwater quality have been delineated in Hall County. Concentrations of sulfates ranged from about 250 mg/l beneath the Platte River bottomlands to greater than 500 mg/l in a broad terrace north of the river. Sulfates in the bottomlands were attributed to infiltration of river water which has concentrations of about 250 mg/l sulfates. High sulfate concentrations beneath the terrace are attributed to leaching of water, accelerated by infiltrating irrigation water, through layers of gypsum in the overlying soils. Nitrate concentrations are variable. Contribution of nitrates from anhydrous ammonia fertilizer application was related to soil types. Leachate from manure accumulations and from septic tanks accounts for some locally high concentrations of nitrate. Seepage from the Platte River has a diluting effect on the nitrate influx to bottomland groundwater. There is a tendency for nitrate concentrations to increase with time. (Schicht-ISWS)
W76-09728

USE OF THE COMPUTER PROGRAM 'STORM' FOR ANALYSIS OF THE QUANTITY AND QUALITY OF URBAN STORM WATER RUNOFF,
Hydrologic Engineering Center. Davis, Calif.
A. D. Feldman, and J. W. Abbott.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 125-134, October 1974. 3 fig, 2 tab, 9 ref.

Descriptors: *Model studies, *Urban runoff, *Water quality, *Flow, Storm runoff, Overflow, Treatment, Computer programs, Mathematical models, Runoff, Rainfall, Storage, Discharge(Water), Pollutants, Water pollution, Cities, Urban hydrology.

The quantity and quality of urban storm water runoff can be analyzed on a continuous (hourly) basis by the computer program STORM, to aid in the selection of the storage capacities and treatment rates required to achieve desired control of urban storm water runoff. The model considers the interaction of eight storm water elements: precipitation, snowfall and snowmelt, runoff, land surface erosion, pollutant accumulation, storage capacity, treatment rate, and overflows from the storage/treatment system. In this approach, dust and dirt and the associated pollutants are washed from the watershed into gutters and storm sewers. The resulting storm water runoff is diverted (for treatment) at rates not exceeding the specified treatment rate. Runoff in excess of the treatment rate is diverted into storage for subsequent treatment. Runoff in excess of both the treatment rate and storage capacity (overflow) is diverted directly into receiving waters. The quantity and quality of this untreated water (for each combination of storage capacity and treatment rate) is assessed. The quantity and quality of overflows from the storage/treatment facility were assessed for an urban watershed near Oakland, California. (See also W76-09729) (Sims - ISWS)
W76-09740

COMBINED SEWAGE OVERFLOWS - FREQUENCY, ENVIRONMENTAL EFFECTS, AND A CORRECTIVE PROGRAM,
Clinton Bogert Associates, Fort Lee, N. J.
For primary bibliographic entry see Field 5D.
W76-09741

CONCENTRATION OF HEAVY METALS IN SEDIMENTS OF A HYDROELECTRIC IMPOUNDMENT,
Montana Univ., Missoula, Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W76-09755

CHARACTERIZATION OF NITROGEN SOURCES CONTAMINATING SHALLOW GROUND WATER IN AN ARID BASIN. LAS VEGAS AREA, NEVADA,
Nevada Univ., Reno. Center for Water Resources Research; and Nevada Univ., Reno. Desert Research Inst.
R. O. Patt, and J. W. Hess.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 545, $4.50 in paper copy, $2.25 in microfiche. Technical Report Series H-W, Publication No. 26, February 1976. 44 p, 7 fig, 5 tab, 45 ref, append. OWRT A-063-NEV(1) 14-31-0001-5028.

Descriptors: *Nitrates, Nitrogen, Organic Soils, *Aquifers, *Groundwater mining, Hydrogeology, *Nevada, Arid lands, Water wells, Water pollution sources, Fertilizers, *Geochemistry.
Identifiers: *Las Vegas Valley(Nev).

The problem of high nitrate concentration in shallow ground water in the Las Vegas Valley, Nevada, first became apparent in 1972 when Health Department officials reported nitrate concentrations of up to 449 mg/litre in domestic wells of the area. Possible sources for these high nitrate levels include nitrogen fertilizer, septic system leachates, animal corral leachates, and buried natural organic materials. An initial study was made of the geolo

gy, hydrology, and ground-water geochemistry of the area to characterize potential nitrogen sources of ground-water contamination. High nitrate concentrations in the ground water are between first water and approximately 61 m, though exact thickness of this zone is unknown. There is no evidence to date to indicate nitrate contamination of lower aquifer zones. Natural nitrate producing sources have not been ruled out or proven as the source of the nitrate pollution in the area. All new wells in the area should be drilled to a depth of at least 137 m and sealed for at least the first 61 m. Old wells, as they are phased out, should be properly sealed to minimize opportunity for leakage between aquifer zones. (Fallon-Nevada)
W76-09762

SEDIMENT PROPERTIES, LAKE CHAMPLAIN: 1971-1975,
Vermont Univ., Burlington. Dept. of Geology.
A. S. Hunt.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 546, $5.00 in paper copy, $2.25 in microfiche. Vermont Water Resources Research Center, Burlington, Completion Report, August 1975. 85 p, 7 fig, 7 tab, 16 ref. OWRT A-015-VT(1) 14-31-1-5046.

Descriptors: Cobalt, Copper, Zinc, Iron, Manganese, Lead, Titanium, *Lake sediments, Sediments, *Trace elements, Lakes, *Vermont, Industrial wastes, *Pollutant identification, Distribution, *Path of pollutants, Chromium, Nickel.
Identifiers: *Lake Champlain.

Analysis of the minor elements iron, manganese, and titanium, and the trace elements chromium, cobalt, copper, nickel, zinc, and lead has provided information on the distribution and concentration of these substances in the sediments of Lake Champlain. All trace elements concentrations were similar to those of Southern Lake Michigan except cobalt which was considerably higher. Lake Champlain was found to have relatively high surface values for chromium and nickel in the Ticonderoga area and Malletts Bay which have been attributable to industrial pollution. Surface sediment enrichment was found to occur with lead, zinc, and, to a lesser degree, copper throughout much of the Lake. Although the evidence is not conclusive it is most probable that the sediments have derived their characteristics primarily from transport of particulate material into the basin rather than from adsorption from overlying water or upward migration within the sediment column.
W76-09763

TRANSFORMATION OF CONCENTRATED AND COMPLEX PHOSPHORUS FERTILIZERS IN MODOW-BOG SOIL WITH A HIGH MOISTURE CONTENT, (IN AZERBAIJANI),
R. K. Guseinov, and F. G. Akhundov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 4, p 48-52, 1974.

Descriptors: *Phosphorus, *Fertilizers, *Moisture content, Flooding, *Phosphates, Soils, Soil moisture.

A study of the transformation of P fertilizers in soil under laboratory conditions of flooding with water showed that the P of Nitrophoska, Ammo-Phos and double super-phosphate on interacting with the soil is absorbed less than the P of simple super-phosphate. The lesser fixation of P in soil and high content of readily assimilable forms provide greater availability of these fertilizers.--Copyright 1975, Biological Abstracts, Inc.
W76-09786

RADIATION HAZARD OF IODINE-129, (IN RUSSIAN),
Y. I. Moskalev, and I. Y. Vasilenko.
Gig Sanit. 2, p 80-83, 1975.

Descriptors: Iodine, *Radioisotopes, Radioactivity, *Path of pollutants, Environmental effects, Food chains, Cycles, Reviews, Air pollution effects.
Identifiers: Biosphere, *Iodine-129.

A review is presented of the literature on the radiation hazard of I-129, global fallout, discharges of nuclear reactors and plants of the atomic industry, local fallout due to air and ground nuclear explosions, accumulation of I-129 in natural environments, metabolism and migration in the biosphere and content in main food products (bread, meat, milk and vegetables).--Copyright 1975, Biological Abstracts, Inc.
W76-09788

PRESENCE AND SOME PROPERTIES OF BACTERIA OF THE FAMILY PSEUDOMONADACEAE IN THE RIVER DANUBE, (IN GERMAN),
Slovenska Akademie Vied, Bratislava Czechoslovakia). Limnobiologisches Institut.
For primary bibliographic entry see Field 5A.
W76-09792

ANTHROPOGENIC EFFECT ON CONTINENTAL, MARINE, AND OCEANIC BIOHYDROCOENOSES, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-09819

BALANIDAE AS POLLUTION INDICATORS IN THE BAY OF GUANABARA, (IN PORTUGUESE),
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil).
For primary bibliographic entry see Field 5A.
W76-09823

RECONNAISSANCE MAP SHOWING RELATIVE AMOUNTS OF SOIL AND BEDROCK IN THE MOUNTAINOUS PART OF THE MORRISON-EVERGREEN QUADRANGLES AND ADJOINING AREAS TO THE WEST IN JEFFERSON COUNTY, COLORADO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09825

OPEN-LOOP WATER-WASHABLE INSPECTION PENETRANT PROCESS,
For primary bibliographic entry see Field 5D.
W76-09859

BIOLOGICAL INDICATORS OF ENVIRONMENTAL QUALITY. A BIBLIOGRAPHY OF ABSTRACTS,
For primary bibliographic entry see Field 5A.
W76-09860

CALCULATION OF WATER TEMPERATURES IN CLEAR LAKE, IOWA,
Ichthyol. Assoc., Berwick, Pa. Icthyological Associates, Inc., Berwick, Pa.
T. V. Jacobsen, and R. W. Bachmann.
Iowa State J Res. 48(4), p 285-290, 1974.

Descriptors: *Water temperature, Lakes, *Iowa, *Regression analysis, Treatment facilities, *Air temperature, New York, Indiana, Equations.
Identifiers: *Clear Lake(Iowa).

A 16-yr series of daily water temperature readings from the Clear Lake Water Treatment Plant was used to develop a regression equation for the calculation of lake water temperatures during the ice-free portion of the year. Daily maximum and minimum air temperatures from a local observation station were used as the independent variables. The relationship that gave the minimum standard deviation from regression was Y equal 1.40 plus 0.980 X, where Y is the estimated water temperature (C) on a given day and X is the average of the maximum plus minimum daily air temperatures (C) on that day and the previous 9 days. Daily water temperatures can be calculated with a standard deviation of 1.84 C by use of the equation. Similar relationships were developed for Oneida Lake, New York, Lake Maxinkuckee, Indiana, and Big Spirit Lake.--Copyright 1974, Biological Abstracts, Inc.
W76-09879

THE HYGIENIC QUALITY OF THE WATER IN A GROWING-FINISHING PIGGERY, (IN ROMANIAN),
Institutul Agronomic Dr. Petru Groza, Cluj (Rumania).
T. Buhatel, and G. Pura.
Inst Agron Dr, Petru Groza Cluj Lucr Stiint Ser Med Vet. 27, p 341-348, 1971.

Descriptors: Water quality, *Farm wastes, *Nitrates, *Nitrites, *Ammonium, Organic matter, *Microorganisms, *Bacteria, Coliforms, Streptococcus, Potable water, Fungi, Potassium, Water pollution sources.
Identifiers: Anaerobes, Manganate, *Piggery wastes, Spores, Staphylococcus.

A study of the hygienic quality of the water in a growing-fattening piggery showed that the degree of impurity was: at source (ammonium 0.05 mg/1; nitrites 0.002 mg/1; nitrates 63 mg/1; coliform index 200/1); on the water supply circuit (ammonium 0.28 mg/1; nitrites 0.01; organic substances 23 mg KMnO 4/1; coliform index 280/1); and in the watering troughs (ammonium 1.1. mg/1; nitrites 0.77 mg/1; nitrates 81 mg/1; organic substances 302 mg KMnO 4/1; total number of microorganisms 5 x 108/ml; coliform index 4 x 108/1 and fungal spores 9 x 104/m1). Determinations of the main microorganism groups (staphylococci, streptococci, coliforms, anaerobes and funji) in the water of the drinking troughs with continuous and intermittent flows indicated a larger microorganism population in the troughs with intermittent flow where a correction of the potability of the water is necessary.--Copyright 1975, Biological Abstracts, Inc.
W76-09883

HYGIENIC STANDARDIZATION OF FLOTATION REAGENT BB-2 AND ITS COMPONENTS AS INDUSTRIAL CONTAMINANTS OF WATER BODIES, (IN RUSSIAN),
Kazanskii Gosudarstvennyi Meditsinskii Institut (USSR).
A. V. Ivanov.
Gig Sanit. 38(9), p 14-19, 1973.

Descriptors: *Industrial wastes, Flotation, *Water quality standards, Organoleptic properties, Water pollution.
Identifiers: *Flotation reagent BB-2.

Standards for the maximum permissible concentrations of flotation reagent BB-2 should be set at a level of 2.4 mg/1 according to organoleptic signs of noxiousness. Using the same criteria, the maximum permissible concentrations for the components of BB-2 are recommended to be 0.44 mg/1 for 1,2-pentadiole, 0.40 mg/1 for 1,5-pentadiole and 0.79 mg/1 for 1,4,5-pentantriole. Experiments to determine the LD50 were carried out with mice, rats, guinea pigs and rabbits.--Copyright 1975, Biological Abstracts, Inc.
W76-09886

ASSESSING POTENTIAL OCEAN POLLUTANTS,
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-09889

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS,
Canada Centre for Remote Sensing, Ottawa (Canada), Data Acquisition Div.
For primary bibliographic entry see Field 5A.
W76-09891

OIL SPILL AND OIL POLLUTION REPORTS, NOVEMBER 1974 - FEBRUARY 1975,
California Univ., Santa Barbara, Marine Science Inst.
For primary bibliographic entry see Field 5A.
W76-09896

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1975,
Southern California Coastal Water Research Project, El Segundo, Calif.
Southern California Coastal Water Research Project, Annual Report for the Year Ended 20 June 1975, 1975. 215 p, 47 fig, 40 tab, 1 ref, 4 append.

Descriptors: *Ecosystems, *Environmental effects, *Pollutant identification, *Resources development, *Water resources, *Water pollution sources, *Water pollution effects, *Water quality control, *Coasts, Continental shelf, Biology, Fish diseases, Toxicity, Invertebrates, Metals, Engineering, Management, Facilities.
Identifiers: *Outer Continental Shelf, Trace metals, Chlorinated hydrocarbons, Environmental impact.

The Coastal Water Research Project was organized in 1969 to make scientific studies of the problems of pollution in the coastal waters of California, especially those associated with the discharge of municipal wastes. The goal is to become expert on the subject of ocean pollution by making and reporting careful measurements of the quantities and movements of pollutants and of their effects. The special value of this project comes from looking 'beyond the ends of the pipes' at the regional ecological situation and trying to determine the effects of all factors that influence marine life so that any changes can be seen in the true perspective of natural biological variability and other acts of man. This report describes the main points of progress during the fiscal year ending 30 June 1975. Research, including extensive work at sea and in the laboratories is discussed; findings are summarized as a list of partial answers to key questions; and persons involved and the funds spent are listed. Separate reports are included on: the biology program; toxicity; invertebrate ecology; fish ecology; chemical pollutants; engineering program; and management and facilities. (Sinha-OEIS)
W76-09899

DETERMINING THE CONCENTRATION OF OIL IN WATER SAMPLES BY INFRARED SPECTROPHOTOMETRY. PHASE II. INTERLABORATORY STUDY. VOLUME II,
Naval Ship Research and Development Center, Annapolis, Md.
For primary bibliographic entry see Field 5A.
W76-09900

DETERMINING THE CONCENTRATION OF OIL IN WATER SAMPLES BY INFRARED SPECTROPHOTOMETRY. PHASE II. INTERLABORATORY STUDY. VOLUME III,
Naval Ship Research and Development Center, Annapolid, Md.
For primary bibliographic entry see Field 5A.
W76-09901

OIL IN THE ARCTIC,
Massachusetts Inst. of Tech. Cambridge.
For primary bibliographic entry see Field 5C.
W76-09902

OPERATIONAL MODEL FOR PREDICTING THE MOVEMENT OF OIL IN CANADIAN NAVIGABLE WATERS,
Canada Centre for inland Waters, Burlington (Ontario).
T. J. Simons, G. S. Beal, K. Beal, E. Shaarawi, and T. S. Murty.
Marine Sciences Directorate Manuscropt Report Series No. 37, 1975. 30 p. 4 fig.

Descriptors: *Computer programs, *Oil pollution, *Oil spills, *Canada, *Navigable waters, Water resources, Climatology, *Tidal effects, *Estuaries, Data collections, Models, Feasibility studies, St. Lawrence Seaway.
Identifiers: St. Lawrence Estuary.

The feasibility of an operational model to compute the movement of oil slicks in Canadian navigable waters is demonstrated. Some guidelines for establishing a data bank on the topographies of the water bodies, climatology of the various regions and tidal currents in different locations are developed. Descriptions of the computer programs and the relevant subroutines are included. In view of continuing changes in navigational routes and economically favored terminals, and planning of potential future sites, it is recognized that the data bank would require continual updating and expansion. This, however, is a relatively straght-forward matter and does not require any modifications in the basic operational scheme as described. A complete documentation of the program is presented with a simulation of a hypothetical oil spill in the St. Lawrence estuary. (Sinha - OEIS)
W76-09908

METABOLIC CYCLES FOR TOXIC ELEMENTS IN AQUEOUS SYSTEMS,
Minnesota Univ., St. Paul. Freshwater Biological Research Foundation.
For primary bibliographic entry see Field 5C.
W76-09933

THE DISTRIBUTION OF COLIFOKMS IN FRESH WATER, (IN JAPANESE),
Shimane Univ., Matsue (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5C.
W76-09934

USE OF THE PRINCIPLES AND METHODS OF RADIO-ECOLOGY IN SOLVING SOME URGENT PROBLEMS OF MAN'S EFFECT ON THE ENVIRONMENT, (IN RUSSIAN),
For primary bibliographic entry see Field 6G.
W76-09936

ORGANIC SEDIMENT MODEL FOR WASTEWATER OUTFALL,
Tetra Tech, Inc., Lafayette, Calif.
C. W. Chen, D. J. Smith, J. D. Jackson, and J. D. Hendrick.
In: Symposium On Modeling Techniques Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 179-207, 1975. 14 fig, 2 tab, 11 ref.

Descriptors: *Model studies, *Organic wastes, *Sediments, *Outfall sewers, Mathematical models, Waste water(Pollution), Sedimentation, Dispersion, Benthic fauna, Benthos, Biota, Heavy metals, Biochemical oxygen demand, Suspended solids, Bacteria.
Identifiers: *Organic sediments.

In addition to bacterial contamination of beaches, marine wastewater discharges can create environmental problems through accumulation of organic sediments near the outfall. Organic sediment modifies the living environment of benthic animals, causing populations to change, composition to shift, and subtrates to become enriched by heavy metals or other toxic materials. An organic sediment model was developed to follow the processes of sediment accumulation through sedimentation, lateral dispersion, decay, resuspension and dispersion of settling particles of sewage origin. The model was applied to four outfalls under various operating conditions. Available data indicate the veracity of the model. Wider applications of the model, better definition of input data, and capability of the model to consider current characteristics at different strata of water column can improve the results. They in turn can contribute to the goal of designing the outfall system for the protection of indigenous biota. (See also W76-09941) (Sims - ISWS)
W76-09951

PARTICLE-LADEN JETS WITH APPLICATION TO OCEAN DUMPING,
Delaware Univ., Newark. Dept. of Civil Engineering and Marine Studies.
J. D. Ditmars, and M. J. McCarthy.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 335-351, 1975. 7 fig, 12 ref.

Descriptors: *Model studies, *Jets, *Dispersion, Diffusion, Mathematical models, Hydraulic models, Numerical analysis, Laboratory tests, Saline water, Freshwater, Waste disposal, Hydraulics.
Identifiers: *Particle-laden jets, Particle spreading.

The applicability of single-phase buoyant jet models for the prediction of the gross features of particle-laden jets discharged into coastal waters was considered. Laboratory experiments of a continuous discharge into a stagnant, uniform density receiving water were performed for a saltwater jet and three particle-laden jets, all with the same densimetric Froude number. Measurement of concentration profiles within the four different jets indicated different jet behavior for each case. An analysis of the particle-laden jet using the integral similarity approach was presented for the prediction of jet velocity, particle concentration, and width as a function of distance from the discharge. The effect of the particle slip relative to the fluid motion was included. The experimental results and model predictions were used to evaluate the model and to determine an effective spreading coefficient or turbulent Schmidt number for particles. The study indicated that the spreading of particles is less than that of momentum for large values of the ratio of particle fall velocity to jet discharge velocity. (See also W76-09941) (Sims-ISWS)
W76-09959

TEMPERATURE PREDICTIONS FOR OFFSHORE POWER PLANTS,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
E. E. Adams, and D. R. F. Harleman.
In: Symposium on Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 352-367, 1975. 5 fig, 1 tab, 13 ref.

Descriptors: *Heated water, *Powerplants, *Ocean circulation, *Model studies, Nuclear powerplants, Thermal water, *Thermal pollution, Oceans, Coasts, Cooling, Dispersion, Mixing, Circulation, Mathematical models, Currents(Water), Ocean currents.
Identifiers: *Offshore powerplants.

A far field model was developed and applied to the prediction of ocean temperatures caused by the thermal discharges from a proposed offshore

ower plant. The model calculated three-dimen-ional excess temperatures by superimposing the emperature distributions resulting from discrete, ertically-distributed line sources which are reated by the method of moments. Ambient cur-ents which can vary in the vertical direction and time, surface heat loss, and turbulent diffusion all directions were considered. The presence nd dynamic effect of the near field was handled xplicitly by representing dilution and the size and ocation of the near field mixing zone as a known unction of time. The model was compatible with he type and extent of field data most easily col-cted-namely, time series data from moored cur-ent meters and diffusion experiments using dye or rogues. Because numerical integration is only equired in the vertical direction and in time, the odel should be useful for generating inexpensive ransient temperature estimates for extended eriods of time or for quickly comparing far field eat transport characteristics at a number of dif-erent locations. (See also W76-09941) (Sims-SWS)
/76-09960

AMPLING NETWORK DESIGN FOR DISPER-ION VERIFICATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of ivil Engineering.
. R. Pearce, R. N. DeGuida, G. C. Dandy, and S. . Moore.
n: Symposium On Modeling Techniques, Volume ; 2nd Annual Symposium of the Waterways, Har-ors and Coastal Engineering Division of ASCE (2 ol.), San Franciso, California, September 3-5, 975. American Society of Civil Engineers, New ork, p 368-379, 1975. 2 fig, 1 tab, 8 ref.

Descriptors: *Model studies, *Dispersion, Suspended solids, *Networks, *Sampling, Dredging, Mathematical models, Numerical analy-is, Bays, Circulation, Tides, *Network design, ath of pollutant, Massachusetts.
dentifiers: *Dispersion models, *Massachusetts ay.

Collection of accurate field data is necessary for erification of pollutant dispersion predictions. Due to the complexity of space and time depen-ent concentrations, and the high costs of obtain-g data, there is a need for a quatitative ethodology for design of sampling networks. A wo-dimensional finite element dispersion model as used in which the circulation pattern inputs an be determined by a compatible circulation odel. These models were applied to Mas-achusetts Bay, where a large-scale dispersion ex-eriment was performed in June 1973. The objec-ve was to simulate a proposed dredging operation f a valuable deposit of sand and gravel. The ex-eriment proved to be very costly, while the esults were of marginal value. The objective of he present research was to devise a useful ethodology for design of sampling networks for ispersion experiments. The immediate objective as evaluation of Estimation Theory as a can-idate technique, as applied to the case study of lassachusetts Bay. (See also W76-09941) (Sims - SWS)
/76-09961

EAR-FIELD JET PENETRATION AND ESERVOIR MIXING,
eorgia Inst. of Technology, Atlanta.
or primary bibliographic entry see Field 8C.
/76-09962

HYSICAL MODEL OF DISCHARGE IN A WO-LAYER STRATIFIED AMBIENT,
uke Power Co., Charlotte, N. C.
or primary bibliographic entry see Field 8B.
/76-09963

RESULTS OF SALINITY TESTS ON THE SAN FRANCISCO BAY-DELTA HYDRAULIC MODEL,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 2L.
W76-09978

HYDRODYNAMIC TRANSPORT PHENOMENA IN ESTUARIES AND COASTAL WATERS: SCOPE OF MATHEMATICAL MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
C. B. Vrengdenhil, and J. Voogt.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 690-708, 1975. 1 fig, 26 ref, 2 append.

Descriptors: *Model studies, *Mathematical models, *Estuaries, Coasts, Hydrodynamics, Tidal effects, Flow, Velocity, Water circulation, Salinity, Hydraulics.
Identifiers: *Model techniques.

An analysis was given of the assumptions in different types of mathematical models for the transport of water and other quantities in estuaries and coastal waters. The starting-point was formed by the equations for three-dimensional turbulent flow. An estimate of the importance of various terms was given. By several averaging processes, increasingly simpler models were obtained, but the interpretation of coefficients became increasingly more difficult. Also the numerical possibilities were discussed, with special emphasis on aspects of accuracy and non-linear stability which are considered the most important numerical problems. Attention was limited to nearly horizontal flow, although the influence of short waves on these flows was also treated. (See also W76-09941) (Sims - ISWS)
W76-09980

APPLICATION OF WATER QUALITY MODELS TO FINGER FILL CANALS,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
T. O. Barnwell,Jr., and T. R. Cavinder.
In:Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 709-728, 1975. 7 fig, 1 tab, 7 ref.

Descriptors: *Model studies, *Mathematical models, *Canals, *Florida, Water circulation, Water quality, Dye releases, Computer models, Sedimentation, Suspended solids, Biological properties, Water chemistry, Simulation analysis, Dispersion, Hydrology.
Identifiers: *Finger fill canals.

To assess the impact of finger fill canal developments on water quality, EPA Region IV conducted studies on several Lower Florida Canal systems. An attempt was made to model dye studies in the canals using the Receiving Waters Block of the Storm Water Management Model (SWMM). SWMM did not accurately reproduce dye profiles but a different version of the model, the Columbia River Model, did. SWMM's failure lies in omission of dispersion in the mass transport expression. Dispersion appears to be the major transport mechanism in finger fill canals. (See also W76-09941) (Sims-ISWS)
W76-09981

RIVER AND ESTUARY MODELING WITH THE SIVA SYSTEM,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Centre.
For primary bibliographic entry see Field 2A.
W76-09982

HYDRODYNAMIC AND MATERIAL TRANSPORT MODEL FOR MOBILE BAY, ALABAMA,
Alabama University, University. Department of Chemical Engineering.
G. C. April, D. O. Hill, and H-A. Lin.
In: Symposium on Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York p 764-782, 1975. 7 fig, 2 tab, 10 ref. NASA NAS8-29100.

Descriptors: *Model studies, *Mathematical models, *Pollutants, *Water pollution, *Estuaries, *Alabama, Computer models,Streamflow, Rivers, Bays, Coasts, Hydrodynamics, Salinity, Path of pollutants, Coliforms, Water quality, Winds.
Identifiers: *Mobile Bay(Ala).

The purpose of this study were to formulate a hydrodynamic and material transport mathematical model for Mobile Bay and to investigate the influences that river flow rate, wind direction and speed, coliform loading and bay temperature have on bay behavior using the verified models. Results of a detailed parametric study were reported aas tidal cycle average current and salinity profiles, and monthly average coliform profiles. For current and salinity distributions, wind (above 15 knots) effects and river flow rate are significant in shaping the patterns within the bay. Coliform concentration profiles are likewise strongly influenced by river flow rate and water temperature. In all cases, computing efficiency and perceptibility of computer output were of major consideration in the formulation of the Mobile Bay model. (See also W76-09941) (Sims-ISWS)
W76-09983

APPLICATION OF PHYSICAL TIDAL MODELS IN HARBOR AND MARINA DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. E. Nece, and E. P. Richey.
In: Symposium on Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 783-801, 1975. 16 fig, 7 ref.

Descriptors: *Model studies, *Marinas, *Harbors, *Washington, Hydraulic models, Pollutants, Water quality, Tidal effects, Tidal waters, Mixing, Dispersion, Water circulation, Water pollution, Estuaries.
Identifiers: *Tidal flushing, *Puget Sound(Wash).

Small scale physical models are efficient, economical tools in the evaluation of designs for small harbors and enclosed marinas where quality problems associated with circulation and tidal exchange are important. Techniques used in such small models for determining flushing characteristics and internal circulation patterns of marinas were presented. The utility of various visual methods for information transfer to various agencies involved with the assessment of a project in its early design phases was discussed. Some generalized features relating planform geometry, tidal range, and entrance configurations to flushing and internal mixing characteristics based on model studies of six marinas, existing or proposed, in Puget Sound, Washington were presented. The application of flushing data obtained from physical model studies to predictive water quality models in the evaluation of proposed designs is a desired result of the studies; one such coupling was presented. (See also W76-09941) (Sims-ISWS)
W76-09984

5C. Effects Of Pollution

RE-EVALUATION OF THE EFFECTS OF MAN-MADE MODIFICATIONS ON GORDON CREEK BETWEEN 1887 AND 1973 AND ESPECIALLY AS REGARDS ITS FISH FAUNA,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 4C.
W76-09407

STUDIES OF PHYTOPLANKTON ECOLOGY IN THE BAY OF VALPARAISO: II. PHYTOPLANKTON 1970-1971, (IN SPANISH),
Chile Univ., Vina del Mar. Departamento de Oceanologia.
For primary bibliographic entry see Field 5A.
W76-09408

ECOLOGY OF CHOLERA VIBRIOS, (IN RUSSIAN),
O. V. Baroyan, P. N. Burgasov, I. N. Gailonskaya, and G. M. Medinskii.
Vestn Akad Med Nauk SSSR. 2, p 45-53, 1975.

Descriptors: Ecology, Epidemiology, *Human diseases, *Pathogenic bacteria.
Identifiers: *Cholera vilrios, *Vibrios.

Lack of integrity in studies of epidemiology of (human) cholera is discussed. The pathogen ecology is underestimated. Conditions favoring the survival and maintenance of cholera vibrios in the environment (water basins) are described. Long-term maintenance (40 days-14 mo.) of cholera vibrios in isolated water basins is discussed. Further research of the ecology of cholera is needed.--Copyright 1975, Biological Abstracts, Inc.
W76-09409

CONCENTRATION OF CESIUM-137 IN AQUATIC ORGANISMS, WATER AND BOTTOM DEPOSITS OF WATER BODIES WITH A DIFFERENT MINERAL COMPOSITIONS OF THE WATER, (IN RUSSIAN),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rynogo Khozyaistva i Okeanografii, Murmansk (USSR).
N. I. Buyanov, and T. M. Antonenko.
Vopr Ikhtiol. 15(1); p 176-179, 1975.

Descriptors: Cesium, Aquatic animals, *Benthos, Fish, *Trophic level, Reservoirs, *Mineralogy, *Fish food organisms, Absorption, Radioisotopes, Sampling.
Identifiers: *Cesium-137.

Specimens of water, bottom deposits, benthos and fishes belonging to several trophic levels were collected from 3 reservoirs having different levels of water mineralization. The concentration of Cs137 due to global atmospheric fallout in fishes was inversely proportional to the mineralization of the water. The concentration of Cs137 in fishes of higher trophic levels was higher than in organisms of the 1st trophic levels. The presence of a direct effect of trophic levels permits indirect demonstration of the predominant role of food in the uptake of radiosotopes into fish.--Copyright 1975, Biological Abstracts, Inc.
W76-09410

ADDITIONAL OBSERVATIONS ON THE EFFECTS OF STRIP MINING ON SMALL-STREAM FISHES IN EAST-CENTRAL KENTUCKY,
Eastern Kentucky Univ., Richmond. Dept. of Biological Sciences.
B. A. Branson, and D. L. Batch.
Transactions of Kentucky Academy of Science, Vol. 35, No. 3-4, p 81-82, December 1974, 2 tab, 1 fig, 1 ref.

Descriptors: *Strip mines, *Appalachian Mountain region, *Sedimentation, *Fish reproduction, Fish food organisms, Streams, Silting, Turbidity, Fish eggs, Minnows, Darters, Kentucky.
Identifiers: *Kentucky River(Kent).

Continued siltation from strip mine operations in two streams tributary to the North Fork of the Kentucky River has prevented the recovery of fish populations in those streams. All species reported from Leatherwood Creek in 1972 have been forced downstream, and six of those species are now absent from that stream. Two other species are now missing from both streams. Populations of Semotilus atromaculatus apparently are on the increase, perhaps because of the removal of competing species. (Curtis-Forest Service)
W76-09468

POWER GENERATION IN ARIZONA AND ITS ENVIRONMENTAL IMPLICATIONS,
Arizona Univ., Tucson. College of Engineering, Engineering Experiment Station.
For primary bibliographic entry see Field 6D.
W76-09485

REDOX POTENTIAL IN IRRIGATED DESERT SOILS AS AN INDICATOR OF AERATION STATUS,
Imperial Valley Conservation Research Center, Brawley, California.
For primary bibliographic entry see Field 2G.
W76-09488

COMBINED EFFECTS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES TO THE ENVIRONMENT,
International Atomic Energy Agency, Vienna (Austria).
Available from UNIPUB, Box 433, Murray Hill Station, New York, N.Y. 10016. Proceedings of a symposium held in Stockholm, June 2-5, 1975. STI/PUB/404, 358 p.

Descriptors: *Environmental effects, *Conferences, *Radiation, *Thermal pollution, Chemical wastes, Effluents, Radioisotopes, Absorption, Radioactivity effects.
Identifiers: Synergism, *Combined effects(Pollutants).

The symposium was sponsored by the International Atomic Energy Agency in cooperation with the OECD Nuclear Energy Agency. The proceedings contains a total of 22 papers from 9 countries and one international organization. A panel discussion is included that examined a number of important questions concerning the combined effects of releases to the environment from the nuclear and other industries. Topics covered in the seven sessions included: effects of temperature on radionuclide uptake, synergism and combination effects in aquatic systems, effects of chemical releases on radionuclide uptake, synergism and combination effects from releases to the atmosphere, and other factors in the assessment of synergistic and combination effects. (See W76-09491 thru W76-09509) (Chilton-ORNL)
W76-09490

INTERACTION MECHANISMS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES FROM THE NUCLEAR INDUSTRY, METHODOLOGY FOR CONSIDERING COOPERATIVE EFFECTS,
Institut fur Medizinische Strahlenphysik und Strahlenbiologie, Klinikum Universitats, Essen, Federal Republic of Germany.
C. Streffer.
In: Combined effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a Symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/22. p 3-13, 1 fig, 34 ref.

Descriptors: *Environmental effects, *Radioactivity effects, *Thermal effects, *Chemicals, Radiosensitivity, Methodology.
Identifiers: Synergism.

Data is reported for radiosensitizing agents. The action of radiation on the biological functions and metabolism of DNA are discussed and it is indicated that part of the radiation effects in DN can be repaired and that living cells can recove from radiation damage. The reactions of a group radiosensitizers which interacts with DNA or th DNP-complex to change the configurational structure or metabolism is discussed. Antibiotics such as actinomycin D, SH-blocking agents have effe in these interactions. The electron affinic chemcals such as nitro-compounds, ketones, etc. a identified as a second group of radiosensitizer The problem of possible synergistic effects arisi from the chemicals and radiation from the nucle industry is considered. (See also W76-0949 (Chilton-ORNL)
W76-09491

IMPACT OF THERMAL AND RADIOACTIV EFFLUENTS ON A TROPICAL NEARSHOR ECOSYSTEM,
Bhabha Atomic Research Centre, Bombay (India Health Physics Div.
B. Patel, M. C. Balani, S. Patel, V. K. Soman, and S. D. Soman.
In: Combined Effects of Radioactive, Chemic and Thermal Releases to the Environmen Proceedings of a Symposium held in Stockhol June 2-5, 1975. IAEA-SM-197/2. p 17-34, 5 tab, fig, 32 ref.

Descriptors: *Environmental effects, *Therm pollution, *Radioactivity, Oysters, Clam Aquatic environment, Ecosystems, Population Water pollution effects.
Identifiers: Synergism, India.

Possible effects are discussed of elevated te peratures on the bioaccumulation of a few fissio and corrosion-product radionuclides and the pos ble synergistic effects of the chemical on certa lamellibranchs. Populations of oysters, ark-sh blood clams and the venerid clam were tra ported to a discharge canal for field studies. An ysis of gamma spectra of these populatio showed photopeaks which were identified as bei due to Cs 137, Co 58, 60, and I 131. The oyst populatiom also showed a photopeak which w identified as being due to Zn 65. The impact temperature on filtration rate was studied wi blood clams in the laboratory. The filtration ra increased with increasing temperature from 21 30 degrees C. With further rise in temperature, t rates declined slightly, eventually remaining mo or less constant between the range of 31 to degrees C. The effect of 2 ppm of chromium af 24 hours acclimation at various temperatures w a depressing one and the depressing effect creased with temperature from 21 to 28 degrees (See also W76-09490) (Chilton-ORNL)
W76-09492

THE EFFECT OF TEMPERATURE ON THE U TAKE AND RETENTION OF CO 60 AND ZN BY THE COMMON SHRIMP CRANGON CRA GON (L),
Reactor Centrum Nederland, Petten, N. H., Th Netherlands.
A. W. van Weers.
In: Combined Effects of Radioactive, Chemic and Thermal Releases to the Environmen Proceedings of a Symposium held in Stockhol June 2-5, 1975. IAEA-SM-197/10. p 35-49, 3 tab fig, 14 ref.

Descriptors: *Environmental effects, *Therm pollution, *Radioisotopes, *Shrimp, Cobalt, Zin Food, Retention, Temperature, Water pollut effects, Absorption.

The mean concentration factor of Zn65 in whole shrimps after 16-21 days of the uptake experiments ranged from 30-60 and of Co60 from 6-10. The loss of Co60 and Zn65 observed at moulting indicates that adsorption to the exoskeleton plays an important role in the accumulation. Both moulting frequency and rate of food uptake are seen to increase with temperature. Reduction of the biological half-lives of Co60 and Zn65 by a factor of about two for an increase of 10 degrees C in temperature was observed. Temperature increase will result in an increased food uptake and therefore, an increased growth rate. Because of the resulting increase of the rate of turnover of the radionuclides, equilibrium between the concentrations in shrimps and those in the food organisms will be reached more quickly. (See also W76-09490) (Chilton-ORNL)
W76-09493

INFLUENCE DE LA TEMPERATURE SUR LA CONTAMINATION D'ESPECES MARINES PAR LE FER-59, (INFLUENCE OF TEMPERATURE ON THE CONTAMINATION OF MARINE SPECIES BY IRON-59),
Laboratoire de radioecologie marine, Centre de La Hague, Cherbourg, France, Departement de protection.
A. Fraizier, and J. Ancellin.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a Symposium held in Stockhom, June 2-5, 1975. IAEA-SM-197/15. p 51-66, 2 tab, 6 fig, 23 ref.

Descriptors: *Environmental effects, *Temperature, *Radioisotopes, Iron, Fish, *Mollusks, Water pollution effects, Thermal pollution.
Identifiers: *Iron-59.

The marine mollusc, Mytilus edulis, and the fish, Blennius pholis, were used to study their interactions with Fe 59. Emphasis was placed on the physiochemical states of the radionuclide and temperature. Contamination appears to be dependent on temperature and this factor partly influences the physiochemical state of the radionuclide and the metabolic activity of the species. (See also W76-09490) (Chilton-ORNL)
W76-09494

SWEDISH STUDIES ON COMBINATION EFFECTS OF THERMAL DISCHARGES IN THE AQUATIC ENVIRONMENT, SOME ASPECTS OF POWER PLANT SITING POLICY,
Swedish Environment Protection Board, Stockholm, Sweden.
U. Grimas, and U. Ehlin.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a Symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/24, p 69-81, 6 fig, 1 tab.

Descriptors: *Environmental effects, *Water quality, *Thermal pollution, Heat, Oxygen, Cooling water, Water pollution effects, Organic matter.
Identifiers: Negative effects, Mineralization.

Transport mechanisms which involve the direct use of the energy of cooling water discharges are discussed. Speeding up the mineralization of organic matter by addition of heat and oxygen is expected to result in an improvement of water quality. Three examples are discussed where cooling water discharges in polluted areas appear to end up in producing negative effects-a discharge in the innermost part of a long series of semi-enclosed basins, in the mouth of a large estuarine basin, and due to combination effects with toxic metals such as mercury. In choosing between possible sites, areas have to be identified where the available energy of the discharge can be used to improve water quality rather than be lost to the environment. (See also W76-09490) (Chilton-ORNL)
W76-09495

EVALUATION OF THE THERMAL EFFECTS OF A NUCLEAR POWER PLANT,
Ente Nazionale per l'Energia Elettrica, Rome, Italy.
E. Ioannilli, and E. Smedile.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/5, p 83-94, 4 fig, 2 ref.

Descriptors: *Environmental effects, *Thermal pollution, Model studies, Assessments, Environmental control, Nuclear powerplants, Water pollution effects.

The approach to environmental problems as applied to the coarse Nuclear Power Plant includes the prediction and assessment of power plant impact. The predictive studies involve laboratory work, model research and experimentation on an existing plant located on a site biologically similar to the proposed site. The studies are intended to permit the preparation of a predictive model to be applied to the proposed and future plants. Detailed assessment of the biological resources and chemical parameters in the preoperational phase will be compared statistically with new assessment during operation. (See also W76-09490) (Chilton - ORNL)
W76-09496

BIOLOGICAL EFFECTS OF SIMULATED DISCHARGE PLUME ENTRAINMENT AT INDIANPOINT NUCLEAR POWER STATION, HUDSON RIVER ESTUARY, USA,
New York Univ., Medical Center, N. Y. Inst. of Environmental Medicine.
G. R. Lanza, G. J. Lauer, T. C. Ginn, P. C. Storm, and I. Zubarik.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/25. p 95-126, 16 tab, 8 fig, 9 ref, 1 append.

Descriptors: *Environmental effects, *Thermal pollution, *Chlorination, *Phytoplankton, Copepods, Juvenile fish, Model studies, *Hudson River, New York, Water pollution effects.

Experiments carried out to examine the effects of simulated plume entrainment upon phytoplankton assemblages showed in one case that the majority of phytoplankton assemblages displayed no measurable effects on photsynthetic activity or chlorophyll a content while another occasion at different ambient temperature resulted in decreased photosynthetic activity. There were no statistically significant differences between survival of ambient exposure groups of copepods and test groups exposed to simulated plume temperatures. Test copepods exposed to chlorinated samples displayed low survival rates. The amphipod, Gammarus spp. did not appear to suffer significant mortality during simulated entrainment. Juvenile striped bass were not affected by simulated plume transit. (See also W76-09490) (Chilton-ORNL)
W76-09497

EFFECT OF ENTRAINMENT IN POWER STATION COOLING SYSTEMS STUDIED USING PERIPHYTIC COMMUNITIES,
Ente Nazionale per l'Energia Elettrica, Rome, Italy.
E. Smedile, and V. Parisi.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/6. p 127-142, 4 tab, 7 fig, 14 ref.

Descriptors: *Environmental effects, *Thermal pollution, Biota, Seston, *Entrainment, Water pollution effects, *Periphyton.
Identifiers: Colonization.

The studies were aimed at quantifying the difference in biota composition between the intake and outfall and to evaluate the detrimental effects on the organisms. A particularly dynamic study was a comparison of the ability of suspended organisms in the river water ahead of the plant and in the discharge canal to colonize immersed substrates. From a comparison of the patterns of colonization it was possible to hypothesize that the functional capacity of the tygmophil organisms of the bioseston is not affected by passage through the condensers. The data demonstrated how a temperature rise modifies the characteristics of a periphytic community and the dynamics of colonization of immersed substrata. (See also W76-09490) (Chilton-ORNL)
W76-09498

POSSIBLE FUTURE EFFECTS ON THE POPULATION OF THE FEDERAL REPUBLIC OF GERMANY OF GASEOUS RADIOACTIVE EFFLUENTS FROM NUCLEAR FACILITIES,
Kernforschungsanlage Julich, Aachen, Federal Republic of Germany.
For primary bibliographic entry see Field 5A.
W76-09499

SYNERGISTIC EFFECTS OF ATMOSPHERIC RELEASES OF RADIOACTIVE GASES AND SO2 IN INDUCING NUCLEATION IN THE ATMOSPHERE,
Bhabha Atomic Research Centre, Bombay (India).
For primary bibliographic entry see Field 5A.
W76-09500

ADVANTAGES OF NUMERICAL ATMOSPHERIC DISPERSION CALCULATIONS FOR ESTIMATING DISPERSAL AND COMBINATION EFFECTS OF STACK RELEASES FROM THE NUCLEAR INDUSTRY,
Technische Universitaet, Hanover (West Germany).
For primary bibliographic entry see Field 5A.
W76-09501

DISCUSSION OF POSSIBLE EFFECTS DUE TO MIXING OF RADIOACTIVE AND THERMAL RELEASES TO THE ATMOSPHERE FROM NUCLEAR POWER PLANTS,
Kernforschungszentrum, Karlsruhe (West Germany).
For primary bibliographic entry see Field 5A.
W76-09502

SYNERGISTIC EFFECTS OF AIRBORNE EMISSIONS FROM NUCLEAR POWER PLANTS,
Motor-Columbus Consulting Engineers Inc., Baden (Switzerland).
For primary bibliographic entry see Field 5A.
W76-09503

CHARACTERISTICS OF COASTAL CIRCULATION AFFECTING THE TRANSPORT AND DISPERSION OF MATERIAL RELEASED FROM THE NUCLEAR INDUSTRY,
Energy and Research and Development Administration, Washington, D. C.
J. O. Blanton.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/21, p 255-268, 7 fig, 20 ref.

Descriptors: *Environmental effects, Pollution, Coasts, *Water circulation, Winds, *Dispersion, Nuclear powerplants, Currents(Water), Thermocline, Path of pollutants, *Lake Ontario, Lakes.

Future increase in the number of nuclear power plants and associated industry necessitates an ob-

jective assessment of the capacity of the coastal water to transport and disperse the wastes from the nuclear industry that are ejected nearshore. These studies represent an attempt to obtain the spatial and tempral resolution necessary to describe circulation in the coastal zone. Data taken during thermally stratified conditions in Lake Ontario indicate the existence of a zone extending 8 to 10 km from the shore where upwelling and downwelling of the thermocline is confined. The root-mean-square (rms) speeds of the currents are a small fraction of the along-shore velocity component in this zone. Beyond this zone the rms speeds dominate the flow regime and are 2 to 10 times the mean velocity. An important characteristic of dispersion and transport of suspended matter is the large time lag of as much as three days seen in current reversals across the coastal zone which result in episodes of large lateral shear. High shear values do not coincide with high winds but are related to the inability of the nearshore currents to adjust to a slowly varying wind regime. The time for adjustment decreases as water depth nearshore decreases. (See also W76-09490) (Chilton-ORNL)
W76-09504

A SITE STUDY OF THE MULTIPLE EFFECTS OF THERMAL RELEASES ON THE AQUATIC LIFE IN AN ESTUARINE AREA,
Ente Nazionale per l'Energia Elettrica, Milan (Italy).
D. Borgese, G. Dinelli, L. Guzzi, and E. Smedile.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/27. p 269-284, 1 tab, 4 fig, 10 ref.

Descriptors: *Environmental effects, *Model studies, *Thermal pollution, Aquatic life, *Estuaries, Heat, Chlorine, Oxygen, Salinity, Water pollution effects.
Identifiers: Synergism, *Po River Delta(Italy).

A detailed research program on the Po River Delta was established to study the structure of the plant and animal populations, primary production and bacterial activity, physical and chemical characteristics of estuarine waters, coastal characterization, and thermal effects on the biocenosis entering condensers of existing plants. The synergistic effects of heat, chlorine, oxygen and salinity stresses will be established. The data will be used to develop cause-and-effect modelling techniques for relating the local effects of a thermal discharge to their regional consequences. The formulation of predictive impact models will be validated by experiments to provide empirical corrections as required. (See also W76-09490) (Chilton-ORNL)
W76-09505

COST EFFECTIVENESS OF RELEASE PREVENTION CONTROLS FOR TRITIUM AND KRYPTON-85,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5G.
W76-09506

THE EFFECT OF TEMPERATURE ON THE BEHAVIOR OF MARINE FISHES, A COMPARISON AMONG ATLANTIC MACKEREL, SCOMBER SCOMBRUS, BLUEFISH, POMATOMUS SALTATRIX, AND TAUTOG, TAUTOGA ONITIS,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Lab.
B. L. Olla, A. L. Studholme, A. J. Bejda, C. Samet, and A. D. Martin.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/4. p 299-308, 4 fig, 1 tab, 13 ref.

Descriptors: *Environmental effects, *Thermal pollution, Temperature, Fish, Fish behavior, Water pollution effects.
Identifiers: *Bluefish, *Atlantic Mackerel, *Tautog.

The comparisons of behavioural responses of the fish to temperature were conducted under controlled laboratory conditions. Under changed temperature conditions, either elevated or lowered, the juvenile and adult bluefish and the adult Atlantic mackeral increased their swimming speeds by 61-190%. This was interpreted as behavioural avoidance to a particular level of temperature and indicated an ability for directive movements in relation to ambient temperature. In contrast to these pelagic species, the tautog, a demersal species which is tied to a particular locus for part of its life and which lives in close association with objects providing cover, was limited in its ability to respond to stress by moving away. Thermal stress caused tautogs to reduce their activity and to exhibit an increased association with cover in the young. Adults did not increase their association with cover. (See also W76-09490) (Chilton-ORNL)
W76-09507

CYCLING OF FE55 AND ZN65 IN COLUMBIA RIVER CARP FOLLOWING REACTOR SHUTDOWN,
Oregon Coll. of Education, Monmouth.
W. M. Jones, C. D. Jennings, and N. H. Cutshall.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/19. p 309-318, 5 fig, 1 tab, 13 ref. AT(45-1)2231, AT(45-1)2227.

Descriptors: *Environmental effects, *Radioactivity effects, Radioisotopes, Model studies, Carp, Iron, Zinc, *Columbia River.
Identifiers: *Fe-55, *Zn-65.

Declines of Fe55 and Zn65 were observed in the tissues of carp following shutdown of the plutonium production reactor at Hanford, Washington. A model for decrease in specific activity was tested for carp flesh and it was found that the loss of Fe55 from carp hearts was faster than the other tissues while the loss rate of Zn65 from hearts appeared to be slowest. The following decreasing order of loss rates of Fe55 from one tissue to another is suggested: heart, eggs, flesh, liver. Zn65 showed no statistically significant difference in loss rates between tissues but the following decreasing trend was suggested: skin, flesh, eggs-liver, heart. The ability of an organism to free itself of radionuclide contamination will depend on what portion of the organism is contaminated and what radionuclide is involved. (See also W76-09490) (Chilton-ORNL)
W76-09508

EFFECTO DE LA TEMPERATURA DE ACLIMATACION SOBRE LA PROLIFERACION DE PRECURSORES ERITROPOYETICOS EN CARASSIUS AURATUS, (THE EFFECT OF ACCLIMATION TEMPERATURE ON PROLIFERATION OF ERYTHROPOIETIC PRECURSORS IN CARRASSIUS AURATUS AND ON THE UPTAKE OF TRITIATED THYMIDINE IN HAEMATOPOIETIC AND INTESTINAL TISSUE),
Junta Energia Nuclear, Madrid (Spain). Division of Quimica.
M. N. Garcia, M. J. B. Pere, and J. G. M. Fernandez.
In: Combined Effects of Radioactive, Chemical and Thermal .Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/9. p 319-327, 4 tab, 3 fig, 6 ref.

Descriptors: *Environmental effects, *Thermal pollution, Fish, Temperature, *Cytological studies, Water pollution effects.
Identifiers: Acclimation temperature, *Goldfish.

Cellular proliferation of undifferentiated erythropoietic precursors in the goldfish acclimated at 5, 10, 20, 30, and 35 degrees C were studied. The duration of cellular cycle from the decrease in the number of grains per nucleus with time were investigated using high resolution autoradiography and DNA labeling. For high acclimation temperatures, an increase in the labelled cell fraction and in the number of grains per nucleus were observed with a shortening of the nitotic cycle. Uptake of tritiated thymidine in intestinal and haematopoietic tissue showed an increased uptake in the haematopoietic tissue with increased temperature and a decrease in uptake by intestinal tissue between 20 and 25 degrees C. (See also W76-09490) (Chilton-ORNL)
W76-09509

SURVEYS ON RADIATION-RESISTANT ASPOROGENIC BACTERIA IN NATURAL ENVIRONMENTS,
Tokyo Univ. (Japan). Lab. of Radiation Genetics.
K. Yano, B. Cho, T. Yoshinaka, and H. Yamaguchi.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/202. p 85-98, 6 fig, 2 tab, 28 ref.

Descriptors: *Radioecology, *Radiation, *Bacteria, Resistance, Environment, Environmental effects, *Surveys, Water pollution effects, Path of pollutants, *Pollutant identification, Sampling.

More than 200 samples were tested including rice grains, faeces of various kinds, and water, mud and soil from areas that were both specific or non-specific for natural or artificial radiation. Highly and extremely radioresistant bacteria which retain only a vegetative form in life had been accidentally discovered after radiosterilization of foods. It was demonstrated that the survey of soil for asporogenic radioresistants was not successful. The results from an aqueous environment were more fruitful with five strains being isolated from a radioactive spring at Misasa. The case of rice grains was particularly noteworthy in connection with the possible presence of a plant symbiont. No radioresistant was discovered in the faeces of animals. The direct function of pigment as a protective agent for ionizing radiation has not been proven but it was noted that all the radioresistants so far isolated produced reddish pigment(s). (See also W76-09512) (Chilton-ORNL)
W76-09519

BIOLOGICAL EFFECTS OF HIGH-ENERGY ELECTRON IRRADIATION OF MUNICIPAL SLUDGE,
Massachusetts Inst. of Tech. Cambridge.
A. J. Sinskey, D. Shah, K. A. Wright, E. W. Merrill, and S. Sommer.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/302. p 139-149, 7 fig, 17 ref.

Descriptors: *Sewage treatment, *Sludge treatment, *Irradiation, Municipal wastes, Disinfection.
Identifiers: High energy electron irradiation, High Voltage Research Laboratory, Electron accelerator.

Preliminary results are presented on the biological effectiveness of high-energy electron treatment of municipal sludge. Positive conclusions include the requirement for blending of raw sludge for maximum effectiveness of the electron beam. Introduction of oxygen in raw sludge leads to increased microbial inactivation. The use of intermittent oxygenation permitted a lowering of the treatment dose. The irradiations were performed at the High Voltage Research Laboratory using a compressed gas-insulated 4-MeV Van de Graaff

ectron accelerator, which was operated on simu-
ted or actual sewage at 3 MV for most of the stu-
es. The selection of doses depended on the sen-
ivity of the organisms and effects under study.
ee also W76-09512) (Chilton-ORNL)
76-09522

NITARY EFFECT OF GAMMA IRRADIA-
ON ON SEWAGE SLUDGE,
rich Univ. (Switzerland). Veterinary Bac-
riological Inst.
r primary bibliographic entry see Field 5D.
76-09527

FFECTS OF GAMMA RADIATION FROM
060 ON DILUTE AQUEOUS SOLUTIONS OF
NEAR ALKYL SULFONATE SURFACTANTS
ND OTHER ORGANIC POLLUTANTS,
orida Inst. of Tech., Melbourne.
r primary bibliographic entry see Field 5D.
76-09531

FFECTS OF GAMMA IRRADIATION ON THE
EGRADATION OF DYES,
olitecnico di Torino (Italy). Instituto di Chimica
dustriale.
r primary bibliographic entry see Field 5D.
76-09532

XPERIENCE WITH A PILOT PLANT FOR
HE IRRADIATION OF SEWAGE SLUDGE,
ESULTS ON THE EFFECT OF DIFFERENTLY
REATED SEWAGE SLUDGE ON PLANTS
ND SOIL,
ayerische Landesanstalt fuer Bodenkultur Pflan-
nbau und Pflanzenschutz, Munich (West Ger-
any).
r primary bibliographic entry see Field 5D.
76-09551

YDROLOGIC AND CHEMICAL ANALYSIS
F THE PRINCIPAL PIEDMONTESE TRIBU-
ARIES OF LAGO MAGGIORE IN RELATION
) ITS TROPHIC MODIFICATIONS, (IN
'ALIAN),
Barranti, A. Calderoni, and A. Carollo.
9 p. Edizioni dell'Istituto Italiano di
robiologia: Verbania Pallanza, Italy. 1974.

escriptors: Trophic level, *Chemical analysis,
akes, Europe, *Pollutant identification,
ytoplankton, Rainfall, Temperature, Tributa-
es.
entifiers: Anabaena-Spiroides, Asterionella-for-
osa, Fragilaria-crotonensis, Human, Hydrolog-
, *Italy(Lago Maggiore), Lyngbya-limnetica,
elosira-islandica-var-helvetica, Microcystis-
ruginosa, Mougeotia-sp, Oligochaete, Oscilla-
ria-rubescens, Rhodomonas-lacustris,
hodomonas-minuta, Scenedesmus-bijugatus,
enedesmus-quadricauda, Synedra-acus-var-an-
stissima.

ie morphology, rainfall, and temperature ranges
the catchment basin of Lago Maggiore (Italy) in
e past and in 1972-1973, were studied. Chemical
alyses of water samples from the various tribu-
ies of the lake showed variation due to the in-
ience of natural, human and industrial wastes.
esults were applied in studies of water drinkabili-
, irrigation, recreation and fishing. Similar
alyses were performed on the lake itself. An ex-
ination of seasonal variation in phytoplanktonic
e showed an abundance of Oscillatoria ru-
scens, Melosira islandica var. helvitica,
sterionella formosa, Synedra acus var. angustis-
na, Fragilaria crotonensis, Rhodomonas minuta,
lacustris, Microcystis aeruginosa, Mougeotia
, Lyngbya limnetica, Anabaena spiroides,
enedesmus quadricauda and S. bijugatus. An in-
ntory of fish and oligochaete populations was
o made.--Copyright 1975, Biological Abstracts,
c.
76-09576

UPWELLING NEAR SAMALGA PASS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-09585

MYXOBACTERIA OF THE MYXOCOCCUS GROUP AS INDIRECT INDICATORS OF FECAL MATTER IN SURFACE WATER: 1. COMMUNICATION, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W76-09591

STUDIES ON THE METABOLISM OF A SULFUR-OXIDIZING BACTERIUM. VII. PURIFICATION AND CHARACTERIZATION OF SOLUBLE COMPONENTS INDISPENSABLES FOR SULFUR OXIDATION BY THIOBACILLUS THIOOXIDANS,
Nagoya Univ. (Japan). Biological Inst.
S. Takakuwa.
Plant and Cell Physiology, Vol. 16, No. 6, p. 1027-1035, 1975. 4 fig., 3 tab., 20 ref.

Descriptors: *Metabolism, *Sulfur bacteria, *Biochemistry, *Oxidation, Iron, Proteins, Enzyme, Chelation, Heavy metals, Inhibitors.
Identifiers: *Thiobacillus thiooxidans, Flavoproteins, Sulfur oxidation.

To understand the sulfur oxidation mechanism in Thiobacillus thiooxidans, the nature of a collodion membrane-impermeable soluble fraction was studied. This fraction was required for the sulfur-oxidizing system of Thiobacillus. It was resolved into two components by ammonium sulfate fractionation, Amberlite CG-50 and DEAE cellulose column chromatography, and Sephadex gel filtration. Both components were needed for sulfur oxidation. The first component had a molecular weight of 120,000 and was a non-heme iron protein. The absorption maximum of the oxidized form was 410 nm but reduction shifted it to 420 nm. The second component was a new flavoprotein containing non-heme iron. It also showed an absorption change at 410 nm, but there was a shoulder at 485 nm in the oxidized form which disappeared on reduction. Its molecular weight was 23,000 by gel filtration. Metal-chelating agents like EDTA, sodium diethyl dithiocarbamate, and o-phenathroline inhibited the reconstituted system's sulfur-oxidizing activity. Several nucleotides, which are known flavoprotein inhibitors, inhibited the sulfur-oxidizing activity. Removal of iron from soluble fraction components with potassium cyanide or sodium diethyl dithiocarbamale decreased the reconstituted system's sulfur-oxidizing activity. The iron and flavin in the soluble components may play an important role in the elemental iron-oxidizing system of this organism. (Buchanan-Davidson--Wisconsin).
W76-09592

INTERSTITIAL PROTOZOA AND ALGAE OF LOUISIANA SALT MARSHES,
Tulane Univ., New Orleans, La. Newcomb Coll.
P. B. Elliot, and S. S. Bamforth.
Journal of Protozoology, Vol. 22, No. 4, p. 514-519, 1975. 5 fig., 1 tab., 19 ref.

Descriptors: *Bottom sediments, *Salt marshes, *Algae, *Protozoa, *Louisiana, Distribution, Mud, Oxidation-reduction potential, Varieties, Anaerobic conditions, Decomposing organic matter, Hydrogen sulfide, Photosynthetic bacteria, Food chains, Migration, Omnivores, Carnivores.

Interstitial ciliate distributions were studied in Louisiana salt marshes, stagnant connecting pools with vegetation dominated by Spartina and Distichlis spicata. The sediments had a rich ciliate fauna and constituted a 'sulfide biome'. The marshes lacked an overlying oxidized zone. Water above the sediment and sediment surfaces formed a redox-potential-discontinuity layer containing oxidized and reducing compounds and Eh values reaching to -350 mV. Oxygen flow into interstices is restricted by small size of silt. Undecomposed organic matter depth depended on frequency of disturbances. The redox-potential-discontinuity layer supported algae using light from above and nutrients from below. Anaerobic decomposition produces reduced low molecular weight compounds; and inorganic endproducts like hydrogen sulfide are oxidized by thiobacteria and photosynthetic bacteria, so there were food chains to support diverse ciliate fauna. Sulfide-tolerant organisms resided in surface sediments. Migrations of Plagiocampa, Metopus, Caenomorpha, Sonderia, and Plagiophyla into sulfide-rich zones were observed. The 200 interstitial ciliate species showed definite stratification. Interstitial habitats favored unicellular organisms with flexible, flattened, or worm-like bodies. Carnivores and omnivorous species of Holosticha, Uroleptus, Blepharisma, and Tracheloraphis were restricted to the upper two sediment layers. Small bactivores with rigid pellicles and strong swimming patterns penetrated the compacted layer. (Buchanan-Davidson--Wisconsin)
W76-09593

PHOSPHORUS AND NITROGEN CYCLE ON A TRANSECT IN LAKE ONTARIO DURING THE INTERNATIONAL FIELD YEAR 1972-1973 (IFYGL),
Canada Centre for Inland Waters, Burlington (Ontario). Applied Limnology and Physical Processes Section.
P. Stadelmann, and A. Fraser.
International Association of Great Lakes Research, Proceedings 17th Conference Great Lakes Research, p. 92-108, 1974. 9 fig., 21 ref.

Descriptors: *Cycling nutrients, *Phosphorus, *Nitrogen, *Lake Ontario, *Spatial distribution, *Water temperature, Nitrates, Organic matter, Biomass, Thermocline, Water circulation, Stratification, Turnovers, Epilimnion, Primary productivity, Sedimentation, Path of pollutants.

Horizontal and vertical orthophosphate and nitrate distributions and their conversion to organic matter using particulate phosphorus and organic nitrogen as biomass indicators were studied in Lake Ontario samples from a transect at 78 deg W longitude during circulation, thermal bar development, summer stratification, and beginning of fall overturn. Maximum particulate organic nitrogen was 230, particulate phosphorus 20, and chlorophyll 17 micrograms/liter at 10 m in July. Phosphorus and nitrate concentrations decreased when changing from deep circulation to stratification. Recycling of nutrients in the epilimnion was about 81% of the primary production rate expressed as nitrogen uptake rate and 93% when expressed as phosphorus uptake rate; when loading data were included, percentages were reduced to 69% and 87% of the nitrogen and phosphorus uptake rates, respectively. During summer stratification sedimentation from the epilimnion was approximately 0.14 g phosphorus and 3.3 g nitrogen/sq m. During fall overturn, mixing caused total nitrogen and phosphorus concentrations to return to approximately spring circulation values. Nutrient and biomass indicators were identified in both horizontal and vertical dimensions. Midlake epilimnion biomass production depended primarily on nutrient regeneration. The results are limited to a specific transect of the lake. (Buchanan-Davidson--Wisconsin).
W76-09594

AN ASSESSMENT OF POSSIBLE POLLUTION EFFECTS OVER A CENTURY OF THE BENTHIC MARINE ALGAE OF CO. DURHAM, ENGLAND,
Durham Univ. (England). Dept. of Botany.
P. Edwards.

Botanical Journal of the Linnean Society, Vol. 70, No. 4, p. 269-305, 1975. 1 fig., 86 ref.

Descriptors: *Water pollution effects, *Benthic flora, *Marine algae, Phaeophyta, Shores, On-site data collections, Phodophyta, Chrysophyta, Biological communities, Varieties, Europe, Chlorophyta.
Identifiers: England, County Durham(England).

One of the most polluted British shores is in County Durham, England. Pollution effects could be studied there, because extensive herbarium algal collections were made from 1793-1864 before pollution increased dramatically. This list was revised according to modern algal systematics and surviving herbarium specimens examined. There were 145 species, although 8 were excluded because they may not have been collected in Durham and 3 because they were incorrectly identified. These were compared with the present flora of 122 species collected. A detailed list of species is presented, showing their vertical and seasonal abundance, reproduction, characteristics, and collection dates. Eighty-six species were common to both lists. Approximately 48 species were common in the earlier study and 53 now (excluding estuarine algae). The figures indicate there has been little or no reduction in common species with time and pollution. Of the 48 species found earlier, six are now absent and two rare; therefore there has only been a 16.6% reduction in common species over the past century despite increases in industrialization and urbanization. It is concluded that pollution has had only a minimal effect on species diversity on the open Durham County coast where there is good water circulation. (Buchanan-Davidson--Wisconsin)
W76-09595

PHYTOPLANKTON OF THE SALINE WATERS OF KANEM (CHAD): X. CONCLUSIONS, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Dept. of Hydrobiology.
For primary bibliographic entry see Field 2H.
W76-09596

UNDERWATER OBSERVATIONS OF GELATINOUS ZOOPLANKTON: SAMPLING PROBLEMS, FEEDING BIOLOGY, LAND BEHAVIOR,
California Univ., Davis. Dept. of Zoology.
W. M. Hamner, L. P. Madin, A. L. Alldredge, R. W. Gilmer, and P. P. Hamner.
Limnology and Oceanography, Vol. 20, No. 6, p. 907-917, 1975. 51 ref.

Descriptors: *Zooplankton, *Marine animals, *Sampling, *Animal behavior, Food habits, Food chains, Scuba diving, Tropical regions, Oceans, Predation, Jelly fish, Larvae.
Identifiers: *Gelatinous zooplankton, Hydromedusae, Siphonophora, Scyphomedusae, Ctenophora, Heterpoda, Pteropoda, Thaliceae, Appendicularia.

The avoidance behavior, feeding, and predation of the Hydromedusae, Siphonophora, Scyphomedusae, Ctenophora, Heteropoda, Pterpoda, Thalicea, Appendicularia and many meroplanktonic larve were observed (and samples collected) by SCUBA divers. Conventional plankton collection is not likely to sample these organisms accurately because of their fragility, patchy distribution, and escape responses. These relatively large organisms represent several phyla and span two or three trophic levels, but are considered an ecological group on the basis of the predator-protection strategies which they have in common. Many gelatinous plankters filter feed using mucuous structures and are efficient in collecting particulate material, and because mucus is a source of organic aggregates in the sea, their importance has been underestimated. These aggregates are often large, irregularly distributed, of complex composition, and contribute considerable spatial heterogeneity to a seemingly homogenous environment. An entire category of pelagic animals live in association with these floating substrates. Many organic aggregates (marine snow) appear to originate from the mucous secretion of gelatinous zooplankton but their fragility hampers accurate sampling by netting or from the surface. Underwater observations indicated that many 'planktonic' organisms depend heavily on the presence of discrete surfaces, both living and nonliving, in the pelagic environment. (Auen-Wisconsin)
W76-09598

METHODS FOR MEASUREMENT OF BIODEGRADABILITY OF CHEMICAL COMPOUNDS,
Akzo Research Lab., Arnhem (Netherlands).
J. Blok.
International Biodeterioration Bulletin, Vol. 11, No. 3, p. 78-84, 1975. 17 ref.

Descriptors: *Analytical techniques, *Measurement, *Biodegradation, *Chemicals, Activated sludge, Standards, Laboratory tests, Water analysis, Adaptation, Toxicity, Limiting factors, Biomass, Sampling, Degradation(Decomposition).

Standardization of methods for determining biodegradability is needed. Primary biodegradation is detected by specific analysis of the original molecule; environmentally acceptable degradation means that degradation products will cause no further damage or inconvenience to the environment; and ultimate degradation is complete conversion to carbon dioxide, water, and inorganic salts. Biodegradation tests should be designed so that natural or practical conditions are imitated and possible. Biodegradation occurs in water, soil, anaerobic environments, and plants-sunlight. Each major problem--adaptation, toxicity, non-biotic elimination, and analytical limitations--is discussed and recommendations made. Methods for measuring biodegradation are classified on the basis of microbiological criteria: the test substance and biomass concentrations, whether the test substance was the only carbon source, and length of adaptation period. Test methods should be done in environments that provide for adaptation so that the degradation potential will be similar to that of purification plants, fresh surface water, and soil. Besides differences in biodegradation potentials, there is no sharp separation between primary and ultimate degradation. Tests are divided into inoculated die-away and activated sludge tests; the latter came nearest to an ideal situation. Inoculated die-away tests are suitable for measuring ultimate degradation and specific analyses but are not suitable for adaptation tests. (Buchanan-Davidson--Wisconsin)
W76-09599

ON LONG-TERM STABILITY OF ZOOPLANKTON COMPOSITION,
Uppsala Univ. (Sweden). Inst. of Limnology.
B. Pejler.
In: Report No. 54, Institute of Freshwater Research, p. 107-117, 1975. 14 tab., 34 ref.

Descriptors: *History, *Zooplankton, *Data collections, *Lakes, Sampling, Plankton nets, Varieties, Oligotrophy, Eutrophication, Bioindicators.
Identifiers: *Sweden.

Data were collected from central Swedish lakes in which relatively comprehensive studies had been made in different decades. The author's records, literature reports, and archived material were used. There were large variations in collection methods, especially net mesh size, sampling frequency and location, and seasons. Species found in each lake, year reported, and frequencies are presented. Some species (Bosima coregoni and Leptodora kindti) were found in all types of lakes studied. Holopedium gibberum, an indicator of oligotrophic conditions, was frequently found before 1921, but has not been found recently. Daphnia cucullata, an indicator of eutrophy, was only found in some lakes after 1921. Bosmina longirostris, Chydorus sphaericus, and Ceriodaphnia also increased with eutrophication. Bosmina coregoni was not present in the six most eutrophic lakes; in one lake it seemed as if it had been replaced by B. longirostris. Species indicating oligotrophy are usually larger than those indicating eutrophy. Dispersal barriers seemed to play an important role for Eudiaptomus and Eurytemora. Lowered water levels caused true limnoplankters to disappear. There was a high degree of similarity in the earlier and present studies, indicating stability of zooplankton composition; most changes appeared to be short-term rather than long-term. (Buchanan-Davidson--Wisconsin)
W76-09600

DEVELOPMENT OF LABORATORY MODEL ECOSYSTEMS AS EARLY WARNING ELEMENTS OF ENVIRONMENTAL POLLUTION,
Illinois Univ. at Urbana-Champaign.
R. L. Metcalf.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A011 851. $3.50 in paper copy, $2.25 in microfiche. Report AMRL-TR-74-125, Paper No.1, December, 1975. 12 p, 25 ref.

Descriptors: *Toxicity, Methodology, Laboratory tests, Laboratory animals, Analytical techniques, *Water analysis, *Bioassays, Biological communities, *Ecosystems, Water pollution effects, *Pesticide residues, *Pesticide removal, *Biodegradation.
Identifiers: Model ecosystems, Bioaccumulation, Degradation products.

Described are the development and use of laboratory model ecosystems to evaluate the toxic effects of pesticides on a large variety of organisms; to study the degradation of pesticides in the environment; to determine the bioaccumulation and biodegradability of pesticides and their degradation products. (Katz)
W76-09643

THE ROLE OF BIOASSAYS IN ENVIRONMENTAL RESEARCH,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5A.
W76-09644

ECOSYSTEM MODELING,
Utah State Univ., Logan.
W. J. Grenney, and D. B. Porcella.
Available from the National Technical Information Service , Springfield, Va 22161, as AD-A011 852, $4.00 in paper copy, $2.25 in microfiche. Report AMRL-74-125, Paper No. 2, December, 1974. 28 p, 9 fig, 26 ref.

Descriptors: *Water quality, *Ecosystems, Methodology, Analytical techniques, *Biological communities, *Model studies, *Hydrologic models, *Estimating, Synthesis, Testing, Theoretical analysis, Water analysis.
Identifiers: Compartment models, Model limitations, Subcompartment models, Component modeling, Model application.

Ecosystems are systems of living organisms in a physical and chemical environment which have developed and adapted over long periods of time. They present unique problems for quantitative description and prediction. Mathematical models can be used to analyze these systems subject to many limitations. All models are less than perfect and their evaluations should be based on characteristics related to their proposed use. (Katz)
W76-09645

FFECTS OF DISCHARGE FROM A DREDGE POILS SITE ON CARROLL ISLAND, MARY-AND,
dgewood Arsenal, Aberdeen Proving Ground, d. Biomedical Lab.
G. Pearson, and E. S. Bender.
vailable from the National Technical Informa-on Service, Springfield, Va., 22161, as ADA012 6, $3.50 in paper copy, $2.25 in microfiche. echnical Report EB-TR-75030, June, 1975. 21 p., tab., 7 fig., 8 ref.

escriptors: Benthos, *Maryland, *Estuaries, cosystems, Biological communities, *Dredging, Spoil banks, *Bottom sampling, *Benthic fauna, lams, Annelids, *Crustacea, Storm runoff, Tropical cyclones, *Hurricanes, *Chesapeake ay, Invertebrates, Path of pollutants, Waste sposal.
lentifiers: Carroll Island(Md), Tropical Storm gnes, Rangia cuneata, Leptocheirus plumulosus, colecolepides, Dredge spoils, Dredge spoils ru-off.

enthic sampling of macroinvertebrate popula-ons was conducted 14 times from April to August 972 to determine the effects of a discharge from a redge spoils site on Carroll Island, Maryland, on e upper western shore of the Chesapeake Bay. uring the sampling period, 8.78 inches of rain fell n the study area from 21 to 23 June 1972 during opical storm Agnes. Nine samples were collected rior to Agnes and five were taken after the storm. wenty-two species (20 invertebrates and 2 ver-brates) were collected; 81.5% of the sample was epresented by three species: the brackish-water am, Rangia cuneata; the amphipod, Lep-ocheirus plumulosus; and the polychaete, colecolepides viridis. The number of small R. cu-eata (1.3 to 4.3 mm) increased significantly after ie storm, indicating that there was an influx of ju-enile clams. Despite the extreme temporary ydrologic occurrences caused by the tropical orm, most changes in the number of individuals nd species could be attributed to the effects of ie dredge spoils discharge on Station 3 and easonal changes in the species abundance during ie study period. In high siltation, L. plumulosus opulations declined, whereas S. viridis popula-ons remained relatively constant. Possible excep-ons are the freshwater snail, Hydrobia sp., which as found commonly after the storm but was col-cted only once before the storm; and Corophium acustre and Edotea triloba, which decreased in bundance after the stom, apparently being ashed down estuary. (Katz)
/76-09647

IICROBIAL DEGRADATION OF MODEL ETROLEUM AT LOW TEMPERATURES,
Iaryland Univ., College Park. Dept. of licrobiology.
D. Walker, and R. R. Colwell.
vailable from the National Technical Informa-on Service, Springfield, Va., 22161, as Ada009 58, $4.00 in paper copy, $2.25 in microfiche. licrobial Ecology, Vol. 1, p. 63-95. 1974. 16 fig., 8 ib., 18 ref.

escriptors: *Oily water, Oil, *Oil spills, Chesapeake Bay, *Microbial degradation, Marine bacteria, *Aquatic fungi, *Water tem-erature, Oil pollution, Oil-water interface, Or-anic wastes, Inlets(Waterways), Aquatic icrobiology, Biological treatment, Microorgan-ms, Marine fungi, Methodology, Pseudomonas, Vater pollution effects.
lentifiers: Petroleum degrading microorganisms, ibrio aeromonas, Acinetobacter, Hydrocarbons, lkanes, Baltimore Harbor, Branched alkanes, yclic alkanes, Aromatics, Polynuclear aromatics.

wo areas of Chesapeake Bay are presently under tudy, with routine sampling of water and sedi-ent for petroleum-degrading microorganisms acteria, yeasts, and fungi). Selected physical and hemical parameters are recorded for each sam-pling site, and water and sediment samples are extracted for hydrocarbons. Numbers of petroleum-degrading microorganisms enumerated by direct plating were found to correlate with the concentration of benzene-extractable material and were higher for the Colgate Creek than for the Eastern Bay site. Petroleum-degrading microorganisms were isolated from water and sediment samples at environmental temperatures of 0 degrees, 5 degrees and 10 degrees C. Higher growth yields and maximum hydrocarbon degradation were observed for microorganisms in a salts medium at 0 degree, 5 degree, and 10 degree C, although significant quantities of hydrocarbons were utilized in some samples grown in a medium for which Chesapeake Bay water was the diluet. Bacterial hydrocarbon degradation accounted for most of the model petroleum utilization at 0 degree and 5 degree C. However, oscillations of bacterial populations, with significant growth of yeasts, were observed at 10 degree C. Photomicroscopy and scanning electron microscopy revealed aggregates of bacteria, yeasts, and fungi associated with oil globules. From preliminary identification and classification of the hydrocarbon-utilizing bacteria, members of the genera Vibrio, Aeromonas, Pseudomonas and Acinetobacter were present in the enrichment cultures. From results of this study, it is concluded that utilization of model petroleum at low temperatures is a function of the types and numbers of microorganisms present in an original inoculum taken from the natural environment. (Katz)
W76-09648

PATHOLOGY OF ACUTE POISONING WITH THE INSECTICIDE SEVIN IN THE BENT-NOSED CLAM, MACOMA NASUTA,
Oregon State Univ., Newport. Marine Science Center.
D. A. Armstrong, and R. E. Millemann.
Available from the National Technical Information Service, Springfield, Va., 22161, as COM-75 10546, $3.50 in paper copy, $2.25 in microfiche. Journal of Invertebrate Pathology, Vol. 24, p. 201-212, 1974. 13 fig., 18 ref.

Descriptors: *Toxicity, *Insecticides, *Poisons, *Clams, Mollusks, Shellfish, Histology, Necrosis, Tissues(Biology), Cells(Biology), Animal pathology, *Fish diseases, Water pollution effects.
Identifiers: *Toxicity tests, *Sevin, Bent-nosed clams, Macoma nasuta, Cell damage.

Toxicity tests of 96-hr duration of the insecticide Sevin were done with adult bent-nosed clams, Macoma nasuta. Sevin concentrations of 15, 20, 25, and 30 mg/liter were used in duplicate tests. The criterion of 'death' was the inability of clams to retract siphons or to close valves. About half of the animals so affected were removed from the test solutions and returned to clean sea water to observe if recovery occurred, and others were preserved for histological examination. No 'dead' clams recovered within 96 hr after return to clean water. The histopathology consisted primarily of necrosis of epithelial tissue of the gill, mantle, siphon, and suprabranchial gland, and the severity of damage was directly related to the test concentrations. Vacuolization, rupture, and pycnosis of cells occurred. The gills were the most severely affected organs. Epithelial cells of the gill filaments bearing the frontal, latero-frontal, and lateral cilia were sloughed as early as 24 hr after the beginning of exposure to Sevin. About 50% if the exposed clams had lost one or both siphons and also the epithelia on still attached segments within 96 hr of exposure. There were no deaths of control clams, and their tissues were normal. (Katz)
W76-09649

SPECIES COMPOSITION AND DIVERSITY OF POLYCHAETES IN THE NEW YORK BIGHT,
Pacific Northwest Environmental Research Lab., Newport, Oreg. Marine Science Center.
J. R. Frey.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-241 191, $3.50 in paper copy, $2.25 in microfiche. EPA Report , Septmber, 1973. 17 p. 5 fig., 2 tab., 9 ref.

Descriptors: *Waste disposal, *Benthic fauna, Marine animals, *On-site investigations, *Benthos, Methodology, Annelids, Biota, New York, Atlantic Ocean, Continental shelf, Sea water, *Bioindicators.
Identifiers: *New York Bight, *Polychaetes, Indicator species, Bamboo worms, Maldanidae, Oweniidae, Faunal homogeneity indices.

This study is part of a larger investigation of the biological consequences of waste disposal in the New York Bight. Polychaetes from the samples of three cruises (December, 1972; February and May, 1973) in the Bight were identified. 'Bamboo worms' (families Maldanidae and Oweniidae) were the most abundant and ubiquitous polychaetes and would therefore be the best indicator species to monitor pollution in the area. No temporal changes in the densities of polychaete populations were evident, but summer and fall collections must be analyzed to complete the seasonal distribution. It is suggested that there is an optimal sediment size for polychaetes, above and below which the populations decrease. Faunal homogeneity indices for all pairs of samples were computed and plotted, giving a bimodal distribution. It is likely that the left peak of this graph is due to two aberrant samples, without which the data would be normally distributed. A normal distribution indicates an intergrading of polychaete species rather than the distinct communities indicated by a bimodal distribution. (Katz)
W76-09650

SUBSTITUTE CHEMICAL PROGRAM - INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF CAPTAN.
Midwest Research Inst. Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 559, $7.50 in paper copy, $2.25 in microfiche. Report EPA-540/1-75-012, April, 1975. 173 p, 30 tab, 75 ref.

Descriptors: *Toxicity, Fish, Laboratory animals, Domestic animals, *Bioassays, *Pathology, Water quality, *Minnows, *Salmonids, *Pesticides, Agronomic crops, Environmental effects, Physiological effects, Reviews, Economics.
Identifiers: Thalidomide, *Captan, *Histopathological observations, *Captan metabolites, Rabbits, Hamsters, Teratogenic activity, Mutagenic activity, Reconstituted water, EBDC fungicides, Ethylenebisdithiocarbamate, Public Law 93-135.

This is the 5th in a series of in-depth scientific literature searches which review the safety and efficacy of substitute chemicals registered by EPA as possible replacements for cancelled or suspended pesticides or pesticides in litigation. The review covers all uses of captan and is intended to be adaptable to future needs. Should captan be identified as a substitute for a problem pesticide other than ethylenebisdithiocarbamate (EBDC), as is now the case for certain uses of these fungicides, the review can be updated. The data contained in this report was not intended to be complete in all areas. Data-searches ended in January, 1975. (Katz)
W76-09651

ENVIRONMENTAL RESPONSES TO THERMAL DISCHARGES FROM THE CHESTERFIELD STATION, JAMES RIVER, VIRGINIA,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
L. D. Jensen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 671, $7.50 in paper copy, $2.25 in microfiche. Report

No. 13, December, 1974. 180 p, 50 fig, 50 tab, 195 ref. EPRI Project RP-49.

Descriptors: *Cooling water, Effluents, *Virginia, Plankton, *Phytoplankton, Water quality, *Primary productivity, *Zooplankton, Benthos, Benthic fauna, Animal groupings, Statistical analysis, Water chemistry, Water temperature, Sewage, *Thermal pollution, Water pollution effects, Entrainment, *Dissolved oxygen.
Identifiers: *James River(Va), Diversity Indices, Chesterfield Power Station(Va).

A study was made of the temperature and dissolved oxygen in the James River, Virginia, for more than 25 sampling stations, starting above the city of Richmond and extending to Hopewell. Fisheries data have been collected from the same stations on adult and juvenile fishes of both resident and transient species, and in the vicinity of the Chesterfield power station, on the benthic invertebrates. Planktonic investigations have involved population and diversity studies in the main river and Farrer Gut, and have been augmented by entrainment studies on the effect of passing microscopic organisms through the condenser system of the power station. In conclusion, the James River in the Chesterfield area seems to support a large, diversified population structure in the fisheries aspect. The impact of the city of Richmond appears to be the major factor in determining the nature and health of the fishes in the area; and the operation of the Chesterfield Power Station has a seasonal impact that does not appear to be much more than an alteration of the patterns of normal distribution. There is evidence of spawning, growth and development of many species of fish. (Katz)
W76-09652

A SCREENING BIOASSAY USING DAPHNIA PULEX FOR REFINERY WASTES DISCHARGED INTO FRESHWATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W76-09653

ENVIRONMENTAL QUALITY RESEARCH, FIRST ANNUAL REPORT,
California Univ., Irvine.
S. Lerman, R. Cooper, J. Scherfig, and G. Greenhouse.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A011 558, $4.50 in paper copy, $2.25 in microfiche. Air Force Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, AMRL-TR-74-82, February, 1975. 54 p, 10 tab., 13 fig., 17 ref.

Descriptors: *Gymnosperms, *Fish, Aquatic life, *Aquatic algae, *Periphyton, *Toxicity, *Bioassay, *Metabolism, *Inhibitors, Frogs, Acids, Laboratory procedures, Chlorophyll, Biomass, Biota, *Environmental effects.
Identifiers: *Aufwuchs, Angiospore, Leopard Frog, South African Clawed Toad, Hydrogen chloride, Hydrogen fluoride, RJ 4, RJ5, JP 4, N phenyl-a-naphthylamine, p,p' dioctyldiphenylamine, Octyl-phenyl-a-napthylamine, Teratogenesis, Ornamental plants.

This report for the period from February 1 to June 15, 1974, contains the results of research efforts of 4 projects concerned with defining the environmental effects of potential environmental contamination resulting from the use of certain Air Force materials. The 4 projects use different organisms as means of assessing effects. Project I uses the higher plants, the gymnosperms and angiosperms. Project II uses fish and aufwuchs. Project III utilizes unicellular algae and Project IV uses the eggs, embryo and larvae of the leopard frog. Materials being evaluated include hydrogen chloride, hydrogen fluoride, RJ 4, RJ 5, JP 4, N phenyl-a-naphthylamie, p,p' dioctyldiphenylamine, octyl-phenyl-a-napthylamine. Techniques for exposing organisms to these substances are discussed and the results of such exposures are presented. (Katz)
W76-09654

PHYSIOLOGIC RESPONSES TO WATER IMMERSION IN MAN: A COMPENDIUM OF RESEARCH,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 10C.
W76-09655

THE MICROBIOLOGICAL POLLUTION OF NORTH SEA AND ENGLISH CHANNEL SHORE, (IN FRENCH),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
C. Oger, A. Philippo, and H. Leclerc.
Ann Microbiol (Paris). 125B(4), p 513-528, 1974.

Descriptors: Microbiology, Water pollution, Streptococcus, Epidemiology, *Coliforms, Salmonella, Oil pollution, Methodology, Surfactants.
Identifiers: Fecal coliforms, North Sea(France), English Channel(France), Bonde's method.

In summer 1973 the microbiological pollution of the French beaches of the North Sea and the English Channel was studied. Fecal coliforms, fecal streptococci, salmonellae and amounts of surfactants and hydrocarbon matter were measured. Bonde's method was used to interpret the results; the epidemiological consequences of these are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-09657

GENERATION TIME, LENGTH OF LIFE, INSTAR DURATION AND FREQUENCY OF MOULTING, AND THEIR RELATIONSHIP TO TEMPERATURE IN EIGHT SPECIES OF CLADOCERA FROM THE RIVER THAMES, READING,
Reading Univ. (England). Dept. of Zoology.
H. H. Bottrell.
Oecologia (Berl.), Vol. 19, p 129-140, 1975, 9 tab, 31 ref.

Descriptors: *Environmental effects, *Growth stages, Juvenile growth stage, Mature growth stage, *Crustaceans, *Temperature, Eggs.
Identifiers: *River Thames(England).

Generation time, length of life, instar duration and moulting frequency of 8 species of epiphytic Cladocera were found to be inversely related to temperature. Numbers of juvenile instars varied between species with larger species tending to have more juvenile instars than smaller species. The number remained constant for a particular species. The size relationship was also found to hold for generation time. Except at low temperatures, adult instar duration was the same as egg development duration. Juveniles moulted more often than adults. Regression analysis of the relationships between the various dependent variables and temperature required a logarithmic transformation. (Chilton-ORNL)
W76-09658

THE RELATIONSHIP BETWEEN TEMPERATURE AND DURATION OF EGG DEVELOPMENT IN SOME EPIPHYTIC CLADOCERA AND COPEPODA FROM THE RIVER THAMES, READING, WITH A DISCUSSION OF TEMPERATURE FUNCTIONS,
Reading Univ. (England). Dept. of Zoology.
H. H. Bottrell.
Oecologia (Berl), Vol. 18, p 63-84, 1975, 4 fig, 13 tab, 59 ref.

Descriptors: Environmental effects, *Growth rates, Mathematical models, Growth stages, *Eggs, *Crustaceans, *Copepods, *Temperature.
Identifiers: *River Thames(England).

Duration of egg development at 5, 10, 15, and 20 degrees C for 8 Cladoceran and one cyclopoid copepod was investigated. Development time was inversely related to temperature; decreased temperature caused a marked increase in development time. Cladoceran eggs tended to take longer for development than copepod eggs; epiphytic species took longer than planktonic species, and the eggs of larger species took longer than smaller species. A curvilinear logarithmic model of the relationship between rate of egg development and temperature was found to be a more generally applicable model than a linear model. (Chilton-ORNL)
W76-09659

EFFECTS OF SHOCK TEMPERATURE ON BIOLOGICAL SYSTEMS,
Michigan Technological Univ., Houghton. Dept. of Civil Engineering.
J. L. Carter, and W. F. Barry.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 101, No. EE2,p 229-243, April 1975. 8 fig, 2 tab, 24 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Thermal stress, Bacteria, Chemical oxygen demand, Biochemical oxygen demand, Oxygen, Temperature, Water pollution effects, Activated sludge, Waste water treatment.

The solubility of oxygen and/or the bacterial activity in activated sludge systems may be affected as a result of sudden shifts in temperature. An increase in temperature may result in a lower saturation of oxygen. Reduction of oxygen transfer can result in poor treatment. Bacterial activity may be affected even if sufficient oxygen is present. Experimental data showed that uptake rates/gram of Mixed Liquor Volatile Suspended Solids (MLVSS) were equal at 35 - 50 degrees C but the total amount of oxygen required per gram of MLVSS at 50 degrees C was four times that required at 35 degrees C to achieve removal of soluble COD. The rate of initial soluble COD removal/gm MLVSS was six times greater at 15 degrees C than at 50 degrees C. More solids were produced per gram of soluble COD removed at 35 degrees C than at 50 degrees C. A BOD removal of 95% was achieved at 35 to 50 degrees C. (Chilton-ORNL)
W76-09660

NITROGEN IN THE SUBSURFACE ENVIRONMENT,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
For primary bibliographic entry see Field 5B.
W76-09662

LABORATORY EVALUATION OF THE COULTER ON-LINE PARTICLE MONITOR,
Welsh School of Pharmacy, Cardiff.
For primary bibliographic entry see Field 5A.
W76-09699

ACID-IRON WASTE AS A FACTOR AFFECTING THE DISTRIBUTION AND ABUNDANCE OF ZOOPLANKTON IN THE NEW YORK BIGHT: I. LABORATORY STUDIES ON THE EFFECTS OF ACID WASTE ON COPEPODS,
Harvard Univ., Cambridge, Mass. Biological Labs.
G. D. Grice, P. H. Wiebe, and E. Hoagland.
Estuarine Coastal Mar Sci. 1(1), p 45-50, 1973.

Descriptors: *Industrial wastes, *Acidic water, New York, Iron, *Zooplankton, Copepods, Mortality, Plankton, Toxicity, Sea water.

entifiers: New York Bight, Calanus-Finarchicus, PseudocalanuseSp., Temora-Longicors.

dividuals of Calanus finmarchicus, Temora loncornis and Pseudocalanus sp. were maintained in ttles containing varying dilutions of acid wastes sea water or control sea water solutions for 24 to h to examine survival of adults exposed to high ncentrations of waste. They were also mainined for time periods up to 18 days to ascertain fects on reproduction and survival of young. Inviduals of C. finmarchicus were transferred rough a series of increasing dilutions of acid astes and into filtered sea water to simulate the ort-term effects of acid waste concentrations in e wake of a discharging barge. Substantial morlity of adults of the above 3 copepods occurred concentrations of acid waste producing pH of proximately 6.5 and lower. This is not indicative mortality in the field as these concentrations d pH values exist for only a short time (less than min) due to rapid mixing of the acid waste with a water. Individuals maintained in buffered acid astes of comparable dilutions showed no mortali, while individuals maintained in test media ing sulfuric acid in place of acid waste showed gh mortalities at pH of 5.5 or less. Acidity of test lutions may be a principal cause of copepod ortality rather than some toxic component of the aste material. Inhibition of reproduction and leterious effects on survival of young were obrved in experiments of 18 days duration at conntrations of acid wastes which do not in fact perst for such periods on the acid grounds. No mortlity was observed when C. finmarchicus was ansferred through acid waste dilutions which ith pH values and time periods comparable to ose they would encounter on the acid grounds uring discharge of acid wastes. Acid waste scharges, were not responsible for the large riations in zooplankton biomass previously obrved in the survey area since mortality of spees due to short term exposure to high concentraons of waste appears small and little effect on dults or larval forms at great dilutions could be emonstrated.(See also N75-04574) Copyright 975, Biological Abstracts, Inc.
76-09700

OLLUTION INFLUENCE ON THE INFUSORIL FAUNA (PROTOZOA, CILIATA) OF BULARIAN RIVERS II. THE OGOSTA RIVER ND ITS EFFLUENTS,
or primary bibliographic entry see Field 5A.
76-09714

ATERIALS BUDGETS OF LAKE CHAMLAIN,
ermont Univ., Burlington. Dept. of Zoology.
or primary bibliographic entry see Field 5A.
76-09756

MPROVING WATER QUALITY BY CONTROL F ALGAE: CELLULAR AND EXTRACELLUAR BLUE-GREEN ALGAL OLYSACCHARIDES,
wa State Univ., Ames. Dept. of Botany and ant Pathology.
or primary bibliographic entry see Field 5G.
76-09760

LANKTON ANALYSIS TRAINING MANUAL.
nvironmental Protection Agency, Cincinnati, hio.
vailable from the National Technical Informaon Service, Springfield, Va. 22161, as PB-242 08, $9.00 in paper copy, $2.25 in microfiche. Reort EPA-430/1-75-004, March 1975. 260 p. 402 g., 15 tab., 317 ref.

escriptors: *Plankton, *Training, Analytical chniques, Distribution, Laboratory tests, Test-g procedures, Cytological studies, Varieties, Sewage bacteria, Sampling, Zooplankton, Cyanophyta, Bioindicators, Chlorophyta, Bacteria, Algal control, Diatoms, Environmental sanitation, Aquatic fungi, Intakes, Protozoa, Judicial decisions, Nematodes, Systematics, Rotifers, Organoleptic properties, Productivity, Growth rates, Actinomycetes, Algae, Water pollution effects, Organic wastes, Nutrients, Limiting factors, Eutrophication, Pollutant identification.
Identifiers: Amoebas, *Training manuals, Plankton identification.

This course is designed for professional personnel in the fields of water pollution control, limnology, and water supply. Topics covered are: Plankton limnology and ecology; biology of zooplankton communities; optics and the microscope; cell structure and function; algal types--blue-green, green, and pigmented flagellates; filamentous and coccoid green algae; diatoms; filamentous bacteria; fungi and 'sewage fungus'; protozoa; nematodes; rotifers; free-living amoebae; and animal plankton. Laboratory methods for diatom and animal plankton identification; preparation and enumeration; fundamentals, calibration, and use of plankton counting equipment; determination of odors and plankton productivity; proportional plankton counting; algal growth potential test; and algae and actinomycetes in water supplies are described. Guidance is given to use of algae as pollution indicators; odor production by algae and other organisms; plankton in oligotrophic lakes; effects of pollution on lakes; application of biological data; problem of synthetic organic wastes; significance of limiting factors for population variation; nutrients; algae and cultural eutrophication; algal control; control of interference organisms in water supplies; and case preparation and courtroom procedures. Keys to selected groups of freshwater animals and algae important in water pollution and a classification-finder are also included. (Buchanan-Davidson--Wisconsin)
W76-09782

IS THE EXAMINATION OF DRINKABLE WATER AND SWIMMING POOLS ON PRESENCE OF ENTEROPATHOGENIC E. COLI NECESSARY, (IN GERMAN),
Mikrobiologie Institut Medical Fakulteti, Ljubljana (Yugoslavia).
A. Z. Dragas, and M. Tratnik.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 160(1), p 60-64, 1975.

Descriptors: Potable water, E. coli, Enteric bacteria, Water analysis, Enteric bacteria, Swimming pools, Human diseases, Public health, Pollutant identification.

The examination of 1950 different water samples showed that 21.5% of them were micro-biologically unsafe and had a high MPN (most probable number) of E. coli; 2.3% of these strains belonged to enteropathogenic groups. The percentage depended on the character of water establishment, and was in small water supplies as high as 8%; in swimming pools, 11%. The following OK groups of enteropathogenic E. coli were identified: O25:K11, O28:K73, O55:K59, O78:K80,O115, O126:K71, O146, all known causes of acute enteric diseases of children and adults. During outbreaks or other epidemiological events, it is useful to examine the E. coli strains isolated from different water samples serologically, in order to eventually identify them as enteropathogenic.--Copyright 1975, Biological Abstracts, Inc.
W76-09785

MARINE SOIL POLLUTION AND SELF-PURIFICATION, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5A.
W76-09789

SEDIMENTATION AND PHOSPHORUS BALANCE IN LAKE LUCERNE (HORW BAY) AND IN THE ROTSEE, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
J. Bloesch.
Schweiz Z Hydrol. 36(1), p 71-186, 1974.

Descriptors: *Lake sediments, Lakes, *Phosphorus, Mesotrophy, Phytoplankton, *Eutrophication, Europe, Chemical analysis, Nutrients, Biomass, Nitrogen, *Cycling nutrients, *Nutrient requirements, Primary productivity.
Identifiers: *Rotsee(Switzerland), *Lake Lucerne(Switzerland).

In 1960/70, chemical and physical parameters, phytoplankton and recent sedimentation at different levels were investigated in the mesotrophic Lake of Lucerne (Horw Bay) and in the highly eutrophic Rotsee (Switzerland). The rates of sedimentation were 1277.4 g dry matter/m2. yr in Horw Bay and 879.3 g dry matter/m2. yr in the Rotsee. The chemical analysis of sediments included the following components: total organic substance (loss on ignition), organic C, clay minerals (HCl-insoluble fraction), Ca, Mg, P, N, Fe and Mn. The Rotsee is distinguished by higher nutrient concentrations, higher rates of sedimentation (exceptions: clay minerals, Fe and, to a certain extent, N and Mn) and by a greater biomass of phytoplankton. The distribution and succession of selected species and groups of phytoplankton are discussed, the velocity of sinking, the degradation, the growth dynamics and the measure of trophic state are calculated. For both sakes, a P and a N balance were drawn up. The N:P ratio continually decreases through the nutrient cycle from the input to storage in the bottom sediments. The intrabiocoenotic P cycle in the epilimnion is very intensive and supplies approximately 2/3 of the nutrient requirements for primary production in both Horw Bay and the Rotsee.--Copyright 1975, Biological Abstracts, Inc.
W76-09790

ROTIFER PRODUCTION IN LAKE BAIKAL, (IN RUSSIAN),
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).
G. L. Vasil'eva, and V. L. Nikulin.
Zool Zh. 53(8), p 1125-1132, 1974.

Descriptors: *Rotifers, Asia, *Biomass, *Plankton, *Production, Littoral, Lakes, Growth rates.
Identifiers: Filinia-Terminalis, Kellicottia-Longispina, Keratella-Cochlearis, Keratella-Quadrata, Notholca-Grandis, Notholca-Intermedia, Synchaeta-Grandis, Synchaeta-Pachypoda, Synchaeta-Stylata, *Lake Baikal(USSR).

Population density, biomass and production were studied in planktonic rotifers of Lake Baikal: Synchaeta pachypoda, S. stylata, S. grandis, Notholca grandis, N. intermedia, Kellicottia longispina, Keratella cochlearis, K. quadrata, Filinia terminalis. Material were collected near the Baikal Biological Station of the Irkutsk State University in the pelagic zone for 1 yr and in the littoral zone for nearly 3 yr. Production was studied by the Edmondson's method (1960). The yearly G/W (growth/weight) coefficient of rotifers-filtrators in the pelagic zone was 45, in the littoral zone-49, that of predators in the pelagic zone-14 and in the littoral zone-13. The average daily G/W coefficient of different species varied from 0.001-0.2 during the year.--Copyright 1975, Biological Abstracts, Inc.
W76-09791

HYGIENIC ASSESSMENT OF CHANGES IN MINERAL WATER PROPERTIES DURING ITS TREATMENT FOR USE IN INTERNAL BAL-

NEOTHERAPEUTIC PROCEDURES, (IN RUSSIAN),
Stavropol Territorial Medical Inst. (USSR).
P. I. Filippov.
Gig Sanit. 38(2), p 95-96, 1973.

Descriptors: *Bacteria, *Mineral water, Thermal water, *Water treatment, *Coliforms, Enteric bacteria, Public health, *Shigella.
Identifiers: *Enterococci, *Proteus, Therapeutic mineral waters, Balneotherapy(Human).

Delivery, conditioning and tapping of nonpotable mineral water intended for internal use in balneological therapy (enema) caused deterioration of the water with regard to bacteriological, chemical, sanitary and therapeutic properties. A low coliform titer, and the presence of enterococci, Proteus and Shigella were observed. The proliferation of bacteria was due to the high temperature of the mineral water, sometimes exceeding 40C.--Copyright 1975, Biological Abstracts, Inc.
W76-09795

HYGIENIC STANDARDIZATION OF TIN DIBUTYL DIISOOCTYLTHIOGLYCOLATE IN WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
A. S. Igumnov.
Gig Sanit. 2, p 13-17, 1975.

Descriptors: Public health, Water bodies, Organic compounds, Organoleptic properties, *Toxicity, *Pollutant identification.
Identifiers: Guinea pigs, Rabbits, Rats, *Tin dibutyl diisooctylthioglycolate.

Tin dibutyl diisooctylthioglycolate (TDDIOG) is highly toxic in rats, guinea pigs and rabbits and possesses pronounced cumulative properties. The threshold concentration of this substance according to the organoleptic index and its effect on the sanitary regimen of water bodies were found to be at a level of 0.05 and 0.5 mg/l. The ineffective dose of TDDIOG in a chronic sanitary toxicologic experiment amounted to 0.0004 mg/kg, which equaled its concentration in the water at a level of 0.01 mg/l. This concentration is suggested as its maximum permissible for water bodies.--Copyright 1975, Biological Abstracts, Inc.
W76-09797

AN OBSERVATION OF WATER QUALITY AND RED WATER IN STILL WATER FISH PONDS, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
I. B. Kim, and M. J. Park.
Bull Korean Fish Soc. 7(2), p 69-78, 1974.

Descriptors: Water quality, *Phytoplankton, Ponds, Fish hatcheries, Asia, *Eutrophication, *Cyanophyta, *Chlorophyta, Temperature, *Dissolved oxygen, Zooplankton, Oxygen.
Identifiers: *Korea, Synechocystis-Aquatilis, *Fish ponds, *Red water.

A study of the dissolved O2 and phytoplankton in the pond water was carried out to determine the water quality and to investigate the cause of red water in fish ponds at Pusan Fisheries College (Korea) in 1972-1973. Measured O2 content during the period from Aug. 6-7, 1972 and was 23.95 ppm (328% of saturation) in daytime and 0.39 ppm (5%) in the early morning in water containing a heavy bloom of phytoplankton; in clear water the range of O2 content was 8.72-6.58 ppm. The occurrences of red water in 1972-1973 were always caused by the sudden death of Synechocystis aquatilis (Cyanophyta) when the water temperature was very high (30-33.5C). High mortality of the fish being reared followed. The phytoplankton observed included 133 spp. belonging to 55 genera in 23 families. Chlorophyta was dominant in number of specis; Cyanophyta in quantity. The zooplankton observed included 12 spp. belonging to 11 genera in 11 families.--Copyright 1975, Biological Abstracts, Inc.
W76-09799

ON THE EXTERMINATION OF POLYCLADS: CALCIUM HYPOCHLORITE (CAOC12) TREATMENT IN THE PERIOD OF HIGH WATER TEMPERATURE, (IN KOREAN),
H. C. Yang.
Bull Korean Fish Soc. 7(3), p 121-125, 1974.

Descriptors: *Water temperature, *Oysters, *Lethal limit, Calcium compounds, *Water treatment.
Identifiers: *Polyclads, Pseudostylochus-Obscurus, Stylochus-Ijimai, *Calcium hypochlorite.

Polyclads (Stoylochus ijimai and Pseudostylochus obscurus) which damage oysters were treated with CaOCl2 to determine the TLm (mean lethal treatment) concentration. The TLm and the extermination density as well as the growth of the oyster after treatment were checked. The higher the temperature and the longer the period of treatment, the lower the TLm. The greater the concentration of sea water, the higher the TLm, because of the weakened action of CaOCl2. When the oyster is treated with CaOCl2 at the oyster farm, its extermination concentration is 2.4-7.1 times higher than the TLm in freshwater. The growth rate was not affected after the treatment.--Copyright 1975, Biological Abstracts, Inc.
W76-09801

THE MERCURY CONTENT OF INDUSTRIAL FISH PRODUCTS: ITS RELATIVE VARIATION WITH THE TREATMENT (COOKING IN SALT WATER, PICKLING AND FISH PRODUCTION), (IN SPANISH),
Instituto Espanol de Oceanografie, Madrid (Spain).
A. Arevalo, J. Aravio-Torre, C. Masso, and C. G. Fernandez.
Bol Inst Esp Oceanogr. 179, p 1-16, 1974.

Descriptors: *Mercury, *Preservation, Fish, *Commercial fish, Fish diets, Water treatment, Production, Industrial wastes.
Identifiers: Pickling, *Fish products, Fish meal, Tuna.

Commercially preserved fish products have a Hg content different from that of the raw fish, but this variation is only relative since none of the treatment processes eliminates Hg. Generally, as water is lost in cooking, and as more NaCl, acetic acid or oil is incorporated in brining, the 'relative' Hg content increases, although the increase depends on the treatment and the fish species. These variations are of little significance. In the production of fish meal, the variation in Hg content is appreciable. Tuna meals normally contain 1.40 ppm Hg but may attain higher values depending on origin of the fish, age and size. If, in the manufacture of this meal, it were possible to dry it at 175 C (in spite of the slight charring that would occur) the Hg content would drop, not relatively but absolutely. Instead of fixing an upper concentration limit for Hg in fish products, it may be more logical to inform the public how much of the product they can eat daily. The Swedes are pioneers with this idea; their expert committee established the concept of the daily permissible diet.--Copyright 1975, Biological Abstracts, Inc.
W76-09802

STUDY OF THE EFFECT OF IRON ON THE HUMAN BODY AND LIVING CONDITIONS, (IN RUSSIAN),
G. P. Zarubin, and I. K. Lysogorova.
Gig Sanit. 2, p 20-23, 1975.

Descriptors: *Iron, Water pollution effects, *Human diseases, Potable water, Public health.
Identifiers: Erythrocyte, Leukocyte, Pruritis, Skin diseases(Human).

A study of persons using water containing Fe levels of 1-5 mg/l revealed undesirable effects in 62-100% of the cases. Water with Fe content of 4-5 mg/l caused skin problems (dryness, desquamation, pruritis). A high Fe content in drinking water did not affect Hb erythrocyte of leukocyte content.--Copyright 1975, Biological Abstracts, Inc.
W76-09803

EFFECT OF HEATED WATER DISCHARGE OF THERMAL AND NUCLEAR POWER PLANTS ON INVERTEBRATES OF COOLING PONDS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
L. A. Kititsina.
Gidrobiol Zh. 9(5), p 104-120, 1973.

Descriptors: *Thermal pollution, *Heated water, *Invertebrates, *Cooling ponds, Thermal powerplants, Algae, Bacteria, Nuclear powerplants, Europe, Production, Protozoa, Fish, Water pollution effects.
Identifiers: Bulgaria, England, France, Hungary, Poland, Scotland, USSR, United States.

A review of the literature is given elucidating investigations conducted in the USSR, Poland, Bulgaria, Hungary, England, Scotland (United Kingdom), France and the USA on the effect of heated water discharges of thermal and nuclear power plants on the quantitative development of fauna. The biology and production of the invertebrates of cooling ponds and the accumulation of metals and radioactive substances in aquatic organisms in the heating zone are considered. It is important to know the possible reaction of the aquatic biota of a specific pond to heating of the water. This necessitates further study of the effect of heat on the ecology, physiology, production and behavior of the aquatic biota, including bacteria, protozoa, algae and fish.--Copyright 1975, Biological Abstracts, Inc.
W76-09811

THE ALGAL POPULATION OF DUEMMER LAKE IN THE YEARS 1970/71, (IN GERMAN),
Niedersaechsische Landesinstitut Marschen und Wurtenforsch., Wilhelmshaven (West Germany).
K. Behre.
Ber Naturhist Ges Hannover. 118, p 163-190, 1974.

Descriptors: *Plankton, *Algae, *Bacteria, Cyanophyta, Diatoms, Chrysophyta, Lakes, Production, *Eutrophication, Degradation(Decomposition).
Identifiers: Bacteriophyta, Chlorococcales, Conjugatae, Duemmer, *Germany, Heterocontae, Ulotrichales, Zooflagellata, Steinhuder Lake(West Germany), *Duemmer Lake(West Germany).

The numerous species found during monthly studies from May 1970-Sept. 1971 show that this is a very eutrophic sea. Plankton density was much greater than in the otherwise comparable Steinhuder Lake (West Germany), and the plankton was very uniform, indicating even water distribution. Numerous Bacteriophyta, Cyanophyta, Zooflagellata, Chrysophyta, Heterocontae, Ulotrichales, Conjugatae and Diatomeae were found. Maximum production occurred in late summer and the minimum occurred in winter. From Jan.-April, Diatomeae predominated, followed by Chlorococcales, Cyanophyta and Chlorococcales again. In the littoral reed-filled areas, 439 forms of plankton were found but the algal population was not as uniform. The algal population was eliminated totally during the warmer summer months along the shore due to the decomposition activity of bacteria.--Copyright 1975, Biological Abstracts, Inc.
W76-09812

ON-MANGANESE MICROORGANISMS STUED BY OVERGROWING TECHNIQUE, (IN SSIAN),
ademiya Nauk SSSR, Leningrad. Institute of kes Keeping.
r primary bibliographic entry see Field 5A.
76-09813

IARACTERISTICS OF THIONIC BACTERIA OM THE LAKES OF THE MARI ASSR, (IN SSIAN),
B. Vainshtein.
krobiologiya. 44(1), p 151-155, 1975.

scriptors: *Lakes, *Sulfur bacteria, Bacteria, tribution, Eutrophication, Sulfides, Dissolved ids, Spatial distribution.
ntifiers: Russian-SFSR, Thiobacillus-nitrificans, *USSR(Mari ASSR), Karst lakes, nitrifying bacteria, Thionic bacteria, Vertical tribution.

ve karst lakes were investigated in the Mari SR (Russian SFSR, USSR). The vertical dis-bution of sulfur bacteria in water was correlated the distribution and content of dissolved sul-es. The concentration of sulfur bacteria was her in more productive lakes. A symbiotic cul-e of sulfur and denitrifying bacteria (not iobacillus denitrificans) was isolated from these es.--Copyright 1975, Biological Abstracts, Inc.
76-09814

DUCED CHANGE OF NITRATE REDUCTASE CTIVITY IN MICROCYSTIS AERUGINOSA JTZ. EMEND. ELENK, (IN RUSSIAN),
ev State Univ. (USSR).
A. Sirenko, and N. I. Komarenko.
drobiol Zh. 10(3), p 73-75, 1974.

scriptors: *Nitrates, *Eutrophication, Water llution effects, Substrates, Enzymes.
ntifiers: *Microcystis-Aeruginosa, *Nitrate ductase activity.

e phenomenon of induction of nitrate reductase n be observed in natural populations of M. aeru-nosa, the main causative agent of bloom. It ap-ars with sufficiently high NO3 concentrations in e water and increases with increased NO3. The ncentration of the substrate plays a major role in e phenomenon of enzyme induction and explains e weak development of M. aeruginosa in natural ters with a dominance of nitrates.--Copyright 75, Biological Abstracts, Inc.
76-09816

IE ROLE OF MICROFLORA IN THE RODUCTIVITY OF A SALMON BREEDING AKE, (IN RUSSIAN),
ademiya Nauk SSSR, Borok. Inst. of Biology land Waters.
I. Sorokin, E. B. Pavel'eva, and M. I. Vasil'eva.
Obshch Biol. 36(1), p 126-134, 1975.

escriptors: Lakes, *Bacteria, *Microbial gradation, Organic matter, Algae, ecomposing organic matter, *Productivity, otozoa, Rotifers, Daphnia, Salmon, Europe, sh reproduction, *Mesotrophy, Eutrophication.
ntifiers: Daphnia, Diaptomus, Flagellate, Rus-n-SFSR, Stephanodiscus-Astraea, SSR(Dalnye Lake).

e number of bacteria in the lake water varied om 0.2-5.3 .106/ml. Microbial production and composition are maximal in the surface layer in dsummer and in the bottom layer in autumn en dead algae are subject to microbial action. e role of allochthonous organic matter in Dal-e Lake (Russian SFSR, USSR) was less signifi-nt compared to that in the mesotrophic lakes and er waterbodies in the forest zone of Europe. An portant role in the processes of mineralization organic production belongs to the animals popu-lation of the lake (Diatoms (Stephanodisces astraia), Daphnia, protozoans, flagellate, rotifers, Diaptomus are discussed.)--Copyright 1975, Biological Abstracts, Inc.
W76-09818

ANTHROPOGENIC EFFECT ON CONTINENTAL, MARINE, AND OCEANIC BIOHYDROCOENOSES, (IN RUSSIAN),
N. K. Deksbakh.
Gidrobiol Zh. 9(4), p 111-117, 1973.

Descriptors: *Reviews, Urbanization, Technology, *Hydrobiology, Oil pollution, Reservoirs, Lakes, Industrial wastes, Effluents, Rivers, Streams, Equilibrium, Hydrologic aspects.
Identifiers: *Anthropogenic effects, *Biohydrocenoses.

The athropogenic effect is a result of the technological revolution and universal urbanization which in recent times has affected biohydrocoenoses with increasing intensity. A review of the literature on man's effect on continental biohydrocoenoses (reservoirs, lakes, river, canals, ponds, streams) and marine and oceanic biohydrocoenoses via pollution by oil and industrial effluents is presented. The anthropogenic effect changes the nature of the planet and leads to disturbance of the dynamic equilibrium in biohydrocoenoses and sometimes to their destruction.--Copyright 1975, Biological Abstracts, Inc.
W76-09819

COMPARATIVE EFFECTS OF DIQUAT PLUS COPPER SULFATE ON AQUATIC ORGANISMS,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
B. E. May, R. S. Hestand, and J. M. VanDyke.
Weed Sci. Vol. No. 21(3), p 249-253, 1973.

Descriptors: *Herbicides, *Diquat, Copper sulphate, Fish, Aquatic animals, Toxicity.
Identifiers: Hydrilla-verticillata, TAC, CSP.

Effects of herbicide combinations on aquatic invertebrates were evaluated in Inglis Reservoir, which is located in west coastal Florida. The addition of 6,7-dihydrodipyrido (1,2-a: 2'1' - c)pyrazinediium ion (diquat) plus the triethanolamine complex of copper sulfate (TAC) and diquat plus copper sulfate pentahydrate (CSP) for control of hydrilla (Hydrilla verticillata Casp.) decreased the number of invertebrates inhabitating the treated areas. The diquat plus CSP combinattion exerted the greatest effect upon invertebrate numbers. Both herbicide combinations, however, did alter significantly the number of taxonomic groups in the areas. Invertebrate declines were due more generally to resultant habitat changes (i.e., loss of hydrilla) than to direct herbicide toxicity. The response of fish to the effects of the herbicide treatments on invertebrates could be ascribed to dietary changes, decreased growth rates, and possible mortality.--Copyright 1974, Biological Abstract, Inc.
W76-09821

BIOLOGICAL INDICATORS OF ENVIRONMENTAL QUALITY. A BIBLIOGRAPHY OF ABSTRACTS,
For primary bibliographic entry see Field 5A.
W76-09860

FEEDING HABITS OF THE POPULATION OF WHITEFISH (COREGONUS LAVARETUS (L.)) IN HAUGATJERN: A EUTROPHIC NORWEGIAN LAKE,
Tromsoe Museum (Norway). Dept. of Norway.
For primary bibliographic entry see Field 2H.
W76-09882

RESULTS OF HYGIENIC AND TOXICOLOGICAL STUDIES OF PESTICIDES IN COUNTRIES OF THE COUNCIL OF MUTUAL ECONOMIC ASSISTANCE IN 1962-1972, (IN RUSSIAN),
Ustav Hygieny, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5G.
W76-09884

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1975,
Southern California Coastal Water Research Project, El Segundo, Calif.
For primary bibliographic entry see Field 5B.
W76-09899

OIL IN THE ARCTIC,
Massachusetts Inst. of Tech. Cambridge.
D. P. Hoult, S. Wolfe, S. O'Dea, and J. P. Patureau.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A010 269, $6.00 in paper copy, $2.25 in microfiche. Department of Transportation, United States Coast Guard, Final Report No. CG-D-96-75, March 1975. 218 p, 13 fig, 42 ref, 3 append. DOT-CG-12438-A

Descriptors: *Arctic, *Oil spills, *Environmental effects, *Sea ice, *Cold regions, *Resources development, *Water quality, *water pollution sources, Ice, Tundra, Water resources, Continental Shelf.
Identifiers: *Outer continental Shelf, Environmental impact.

A description of the short term history of an oil spill - including the rate of spread, the area covered by the oil, and the effects of leads - is given. The stickiness of oil on sea ice was measured, and the results correlated with a theory which predicts how thick a layer of oil can stick to the ice in Arctic conditions. The evolution of an oil sill in the Arctic is a much slower phenomena than in temperate waters. The area covered, even from a supertanker spill, is quite small. The technological problem of combatting Arctic oil spills is much different than that in temporate water. It is not likely that barriers will be useful or needed. A system with rapid response time is not required. On the other hand, there seems to be no presently known way to locate easily, much less remove, oil trapped under oil in ice. The most important result of this work, which is substantiated by all the research to date, is that the oil in even a very large Arctic spill will be confined to a very small area due to natural processes. This conclusion is supported by both the spreading and pocketing experiments as well as the studies on oil evolution. As a corollary to this result, unlike the situation in temperate waters, there is little incentive to promptly clean up large oil spills, as the area of the oil spill will not measurably increase with time, while the oil remains in contact with sea ice. (Sinha - OEIS)
W76-09902

EFFECTS OF PETROLEUM POLLUTANTS ON ARCTIC MICROBIAL POPULATIONS,
Louisville Univ., Dept. of Biology.
R. M. Atlas, E. A. Schofield, F. A. Morelli, and R. E. Cameron.
Environmental Pollution, Vol 10, No 1, p 35-43, January 1976. 2 fig, 20 ref.

Descriptors: *Oil spills, *Water pollution effects, *Microbial degradation, Environmental effects, Resources development, Water resources, Continental shelf, *Alaska, Fossil fuels, Coasts, Ponds, Bacteria, Protozoa, Algae, Diatoms, Seepage, Fungi, Lichens, Microorganisms, Pseudomonas, Bays.
Identifiers: North Slope, Prudhoe Bay(Alas), Crude oil, Coastal ponds, Oil seepages, Sepcies diversity, Arctic, Environmental impact.

Microorganisms encounter oil in the Arctic from natural seepage and accidental spillages. Incubation of Prudhoe crude oil with water from coastal ponds along Prudhoe Bay resulted in several changes in the microbial communities. Bacterial populations increased by several orders of magnitude; ameoboid protozoa were replaced by flagellated protozoa; coccoid green algae completely disappeared; diatoms increased and blue-green and green filamentous algae appeared to be unaffected. The microbial populations associated with a natural oil seepage at Cape Simpson were markedly different from those of the adjacent areas. The seep was devoid of vascular plant cover and, in some areas, of bacteria. Fungi were found to be abundant in the bacteria-free regions. Lichens flourished in the older sections. Underlying oil slicks experimentally floated in Prudhoe Bay, the bacterial population increased, in large part attributable of oil degrading Pseudomonads, but species diversity appeared to be unaffected. (Sinha - OEIS)
W76-09909

ENVIRONMENTAL IMPACT STUDY OF OFFSHORE SAND AND GRAVEL MINING,
National Oceanic and Atmospheric Administration, Tiburon, Calif. Marine Minerals Technology Center.
For primary bibliographic entry see Field 6G.
W76-09910

BIOLOGICAL PRODUCTION PROCESSES IN THE URAL RIVER, (IN RUSSIAN),
Gosudarstvennyi Meditsinskii Institut, Orenburg (USSR).
G. N. Solovykh.
Gidrobiol Zh. 10(1), p 77-80, 1974.

Descriptors: *Primary productivity, *Decomposing organic matter, Industrial wastes, Domestic wastes, Effluents, Oxygen, *Biochemical oxygen demand, Photosynthesis.
Identifiers: *USSR(Orenburg), *Ural River.

The intensity of primary production and degradation of organic matter in a 35 km-long stretch of the Ural River below Orenburg (USSR) and the effect of industrial and domestic wastewaters on these processes were investigated. Data are given on the ratio of daily O2 consumption and total biological oxygen demand and seasonal dynamics of the intensity of photosynthesis and O2 consumption in the river water. The data show that the Ural River below Orenburg copes to a considerable extent with the effect of the city's effluents, but complete restoration of the biological production processes in the river is not occurring.--Copyright 1975, Biological Abstracts, Inc.
W76-09919

'TOXIC' OR 'POISONOUS' WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
S. V. Goryunova.
Izv Akad Nauk SSSR Ser Biol. 1, p 89-94, 1974.

Descriptors: Organic wastes, *Algae, *Toxicity, Algal toxins, Algal poisioning, *Poisions, Aquatic animals, *Water pollution, Industrial wastes.

Data are presented which reflect the interrelation between the mass pollution of natural waters with organic substances by uncontrolled industrial activity of man and the corresponding increasing development of toxic algal forms. The latter cause mass killing of aquatic animals either when being consumed as food or directly poisoning the water in places where domestic and wild animals come to drink and aquatic birds are present.--Copyright 1974, Biological Abstracts, Inc.
W76-09932

METABOLIC CYCLES FOR TOXIC ELEMENTS IN AQUEOUS SYSTEMS,
Minnesota Univ., St. Paul. Freshwater Biological Research Foundation.
J. M. Wood.
Rev Int Oceanogr Med. 31/32, p 7-16, 1973.

Descriptors: *Metabolism, *Toxicity, *Mercury, *Arsenic, Cycling nutrients, Elements(Chemical), Microorganisms, Systematics.

The elements are classified according to their toxicity and availability; toxic and relatively accessible elements such as Hg and As are studied in detail. Two types of equilibria, inorganic and organometallic, are considered. When an element is introduced into an environment rich in microbial activity, each valence state is made available for metabolic interconversions. The interconversion of inorganic complexes to organometallic complexes is important because the latter are readily transported and accumulated into tissues of high lipid content. This interconversion is made by methylating agents which are available for methyl transfer reactions in biological systems. The Hg and As cycles are summarized.--Copyright 1974, Biological Abstracts, Inc.
W76-09933

THE DISTRIBUTION OF COLIFORMS IN FRESH WATER, (IN JAPANESE),
Shimane Univ., Matsue (Japan). Faculty of Agriculture.
M. Matsumoto, Y. Nishitai, and A. Tanaka.
Bull Fac Agric Shimane Univ. 7, p 140-145, 1973.

Descriptors: *Coliforms, Freshwater, *Distribution, E. Coli, Streams, Euteric bacteria, Water pollution.
Identifiers: Enterobacter-aerogenes, *Japan.

The relationship between the degree of pollution and the types of coliforms in the water of the Mochida, a rural stream in Matsue City, Japan, was investigated. Water was sampled at 4 stations ranging from the nonsaprobic upper part to the saprobic lower part of the stream twice monthly from April 12, 1972-April 13, 1973. Coliforms were found in all samples, and the number of total bacteria, coliforms and Escherichia coli increased parallel to the degree of pollution. The ratio of coliforms to total bacteria was about 3:5% for all samples investigated. The ratio of E. coli to coliforms was 1:15%, and increased markedly with the degree of pollution. Intermediate types dominated over Aerobacter (Enterobacter) aerogenes in the nonsaprobic upper stream. Most of the E. coli and A. aerogenes isolates were identified as type I. Only 1 strain of pathogenic E. coli was found among the 259 strains examined.--Copyright 1975, Biological Abstracts, Inc.
W76-09934

USE OF THE PRINCIPLES AND METHODS OF RADIO-ECOLOGY IN SOLVING SOME URGENT PROBLEMS OF MAN'S EFFECT ON THE ENVIRONMENT, (IN RUSSIAN),
For primary bibliographic entry see Field 6G.
W76-09936

THE ACTION OF SOME POLLUTANTS ON THE GROWTH OF DAPHNIA MAGNA STRAUSS, (IN FRENCH),
Institutul de Medicina si Farmacie, Bucharest (Rumania).
S. Apostol.
Rev Roum Biol Ser Zool. 18(1), p 57-69, 1973.

Descriptors: *Daphnia, *Growth rates, Water pollution effects, Adaption, Inhibition.
Identifiers: Daphnia-Magna.

Different water pollutants inhibited the growth of young D. magna, especially in their 1st days of life. The organisms manifested an adaptation tendency, the normal growth values being attained more rapidly in lower concentrations. Under the influence of water pollutants, an increase of variance in the ensemble of populations was observed.--Copyright 1974, Biological Abstracts, Inc.
W76-09937

ORGANIC PRODUCTIVITY OF INSHORE AND OFFSHORE WATERS OF BARBADOS: A STUDY OF THE ISLAND MASS EFFECT,
Bellairs Research Inst., St. James (Barbados).
F. Sander, and D. M. Steven.
Bull Mar Sci. 23(4), p 771-792, 1973.

Descriptors: *Productivity, *Primary productivity, *Nutrients, *Diatoms, *Phytoplankton, Seasonal, *Copepods, Chlorophyll, Salts, Plant physiology.
Identifiers: *Barbados Island.

Repeated observations of primary and secondary production and related hydrographic and nutrient characteristics were made at inshore stations at Barbados from July 1968, to June 1970, for comparison with an offshore site. No evidence of regularly recurring variations of a seasonal nature was seen in the magnitudes of production and nutrient salts. Production showed progressive increase offshore to inshore consistent with an 'island mass' effect. Diatoms were consistently the most prominent phytoplankton group inshore. Increased primary production near land was mainly exploited by copepods. Assimilation numbers, which were considerably higher inshore than offshore, suggest that C fixation/unit of chlorophyll was less efficient in oceanic water and were indicative of the respective physiological states of the plant populations.--Copyright 1974, Biological Abstracts, Inc.
W76-09938

ESTUARINE ECOLOGIC SIMULATIONS,
Water Resources Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 2L.
W76-09950

THE AQUATIC AND SUBAQUATIC BRYOPHYTIC VEGETATION OF THE BELGIAN PART OF THE RIVER SAMBRE, RELATED TO ECOLOGICAL CONDITIONS AND WATER POLLUTION, (IN FRENCH),
Liege Univ. (Belgium). Dept. of Botany.
A. Empain.
Lejeunia. 69, p 1-58, 1973.

Descriptors: *Water pollution, Vegetation, Europe, Rivers, *Ecological distribution, Data collections.
Identifiers: *Bryophytic vegetation, *Hepaticae, Musci, Ordination, *Belgium(River Sambre).

The biotope is described, with its geographical and physico-chemical characteristics, to point out the main features of the ecological factors. A list of the bryophytes (Musci; Hepaticae), with some taxonomic comments and the distribution of the species, is established followed by a conspectus of the bryophytic communities. Quantitative methods, global covering of all the species, coefficient of development, coefficient of difference and principal components analysis were used to organize the data. The last method, based upon the correlations between the used variables, allowed ordering the stations on physico-chemical data and the biological data for comparison of the two.--Copyright 1974, Biological Abstracts, Inc.
W76-09986

QUANTITATIVE ASPECT OF THE PHYTOPLANKTON OF THE BAY DU LEVRIER (MAURITANIA), (IN FRENCH),
Museum National d'Histoire Naturelle, Paris (France). Laboratoire des Peches Outre-Mer.
J. Reyssac.

ll Mus Natl Hist Nat Ecol Gen. 5, p 101-112, 73.

escriptors: Bays, *Phytoplankton, Diatoms, lutrients, *Primary productivity, Dinoflagel-es, Gymnodinium, Red tide, Seasonal, trophication, Chlorophyll.
entifiers: Coccolithophorids, Levrier, lauritania(Bay du Levrier).

e quantitative evolution of phytoplankton was died during April-May 1972 in the Baie du vrier. Population vary strongly in time and ace but are always very abundant: 1 to 2 millions cells/liter in the south and more than 3 millions the north. The phytoplankton consists chiefly of ccolithophorids, diatoms and a dinoflagellate ymnodinium) the intense multiplication of hich has caused red water (red tide). Concentra-ns of chlorophyll a are very high: 5 to 6 /cubic meter in the north of the bay and equently more than 10 mg/cubic meter in the uth. The primary production is high in every sta-n. The monthly averages are included between 2 and 402 mgC/m3/j. The results show that the y has a high fertility.--Copyright 1974, Biologi-l Abstracts, Inc.
76-09987

IE VEGETATION OF THE 'LUKNIANY AKE' NATURE RESERVE IN THE MAZURI-N LAKE DISTRICT,(IN POLISH),
kademia Rolniczo-Techniczna, Olsztyn-Kor-wo (Poland). Inst. of Plant Biology.
Polakowski, J. Dziedzic, and E. Polakowska.
chr Przyr. 38, p 85-114, 1973.

escriptors: *Aquatic plants, Lakes, *Vegetation, urope, *Eutrophication, Water level fluctuation, ir temperature, Precipitation(Atmospheric), ant grouping, Lake beds.
entifiers: *Charales, *Poland(Lukniany Lake), ushes, Salix-Aurita.

he nature reserve covers an area of 623 ha and es in the district of Mragowo (Poland). It is a trophic lake, rather shallow due to deposits of lcareous gyttja. The differentiation of its ecolog-al conditions is not great. The records of air tem-eratures, precipitation and oscillations of the ater level in Lukniany Lake are presented. In 966-1970 floral, phytosociological and pedologi-l investigations were conducted. The plant as-ciations described and mapped are as follows: haretum aculeolatae, Charetum contrariae, haretum asperae, Charetum tomentosae, otametum lucentis, Scirpo-Phragmitetum, coretum calami, Caricetum paradoxae, aricetum Hudsonii, Salici-Franguletum, Carici ongatae-Alnetum, Lolio-Cynosuretum and the ommunity with Salix aurita. Associations of the harales play the most important part. They cover e bottom of the lake in compact and extensive atches. There is a broad and dense belt of rushes ong the shore line. The areal percentage and role all the other associations listed above is not eat.--Copyright 1974, Biological Abstracts, Inc.
76-09990

RIMARY PRODUCTION IN THE FROZEN AKE BALATON,
agyar Tudomanyos Akademia, Tihany. Biologi-l Research Inst.
Herodek, and J. Olah.
nn Inst Biol (Tihany) Hung Acad Sci. 40, p 197-06, 1973.

escriptors: *Primary productivity, Lakes, Light, Europe, Ice, Snow, *Chlorophyll, Spatial istribution, Phytoplankton, *Turbidity, Oxygen, Photosynthesis, *Benthos.
lentifiers: Carbon-14, *Hungary(Lake Balaton), rozen lakes.

ne 10th normal light level was transmitted by ice overed by 4 cm snow and 1/2 by snow-free ice. The water was rather clear under the ice, so surface light reached the bottom. This illumination is higher than that in the unfrozen Lake Balaton (Hungary), where due to the turbidity caused by waves the bottom illumination is usually less than 1%. The chlorophyll a content of the water increased downwards. Related to surface it was 1 micro g/cm2. Similar vertical distribution was observed in the micro-algae occurring in the water under the ice. The chlorophyll a content of the bottom was 6.6-8.5 micro g/cm2 on 31 Jan. and 15.1-15.5 micro g/cm2 on the 5 Feb. 1973. When the ice was covered by snow, the primary production of phytoplankton, measured by 14C method, was 4mg C/m2/h and decreased downwards. Under the snow-free ice it was 20 mg C/m2/h and increased downwards. The production of the microphytobenthos was measured by both 14C and O2 methods. No production was found in April-Sept. due to the turbidity of water. In the frozen lake when ice was covered by snow even the gross primary production in the benthos was very low. In case of snowfree ice, intensive benthic photosynthesis was found. The primary production at 3 different days was 36 mg C/m2/h, 122 mg O2/m2/h and 115 mg O2/m2/h. In the lake covered by snow-free ice, the total primary production of the plankton and benthos was amounted to 560 mg C/m2/day, which similar to the summer maximum of planktonic production. In the ice-covered lake, the O2 content of the water was with 9.6 mg/l higher than before freezing.--Copyright 1974, Biological Abstracts, Inc.
W76-09991

THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN LAKE BALATON APRIL-SEPTEMBER 1972,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
S. Herodek, and G. Tamas.
Ann Ins Biol (Tihany) Hung Acad Sci. 40, p 207-218, 1973.

Descriptors: *Primary productivity, Lakes, *Biomass, *Phytoplankton, *Algae, *Diatoms, Turbidity, Light, Eutrophication, Storms.
Identifiers: *Ceratium-Hirundinella, *Cyclotella-Bodanica, *Hungary(Lake Balaton).

The phytoplankton biomass, illumination and primary production were measured fortnightly at 4 depths in Lake Balaton (Hungary). In the samples 108 algal spp., 5 varieties and 1 form were found. The biomass of each species and the total phytoplankton were calculated from the number of algae and from the volume of individuals. Until the middle of July, the plankton was dominated by diatoms, the largest mass was formed by Cyclotella bodanica. Ceratium hirundinella became the dominating species first in the second half of the summer. The average biomass was 10.3 g/m2. Transparency is very unstable in the lake, due to the frequent swirling up of the mud. In storm, the primary production stops at 1 m depth because of light insufficiency while after a long calm period, in the clear water the deepest layer (3 m) exhibited the highest production. In general, at the surface the production is inhibited by excessive illumination, the maximum is found at 1 or 2 m, and at 3 m the same mass of algae produced 4 times less than at 1 m, owing to the insufficient light. The mean production and the standard error of the mean during 4 h were 118 + 8 mg C/m2. The average daily production was estimated to be 413 mg C/m2, the primary production during the half-year to 76 g C/m2. This primary production corresponds to that of the slight eutrophic lakes.--Copyright 1974, Biological Abstracts, Inc.
W76-09992

REACTION TIMES OF CERTAIN FRESHWATER FISHES TO A ROTENONE-CONTAINING PISCICIDE,
Natl. Parks Board, Pietermaritzburg, S. Afr.
D. T. Rowe-Rowe.
J South Afr Wildl Manage Assoc. 3(1), p 16-18, 1973.

Descriptors: Freshwater fish, *Rotenone, *Piscicides, *Fish control agents, Water temperature, Bass, Rainbow trout, Tilapia, Carp.
Identifiers: Barbus-Anoplus, Barbus-Gurneyi, Barbus-Natalensis, Barbus-Viviparus, Cent-Depress-Drug, Micropterus-Salmoides, Tilapia-Melanopleura, Tilapia-Mossambica, Yellowfish.

The reaction times (loss of equilibrium) for certain freshwater fishes were determined in laboratory tests (9 spp.) and in the field (10 spp.). Barbasco (6.8% rotenone) was used in all tests. Eight of the laboratory species were tested using 0.068 ppm rotenone concentration at approximately 21C. Field data were obtained from various size fish in water ranging from 13-26C and at concentrations of 0.034-0.136 ppm rotenone. The reaction time varied with size of fish and temperature of water. The following species were used in the experiments: Mozambique tilapia (or blue kurper) Tilapia mossambica; red-chested tilapia Tilapia melanopleura; Natal yellowfish or scaly Barbus natalensis; 3 spp. of minmow B. viviparus, B. gurneyi and B. anoplus; largemouth bass Micropterus salmoides; carp Cyprinus carpio; and rainbow trout Salmo gairdneri.--Copyright 1974, Biological Abstracts, Inc.
W76-09993

LABORATORY AND FIELD TESTS IN THE REVIVAL OF FISH AFFECTED BY ROTENONE,
Natal Parks Board, Pietermaritzburg, (South Africa).
D. T. Rowe-Rowe.
J South Afr Wildl Manage Assoc. 3(1), p 19-21, 1973.

Descriptors: *Rotenone, Laboratory tests, Fish control agents, Rainbow trout, Tilapia, Bass.
Identifiers: Barbus sp., Cent-Depress-Drug, Micropterus-Salmodies,

Various methods of reviving fish affected by rotenone were tested in the laboratory. The most successful method was simply to transfer affected fish (Barbus spp., Tilapia sp., Salmo gairdneri and Micropterus salmoides) to fresh water, as rapidly as possible after they lost equilibrium due to the rotenone. An alternative successful method was to add potassium permanganate simultaneously with the rotenone. These 2 methods, which gave success in the laboratory, also proved to be effective in the field.--Copyright 1974, Biological Abstracts, Inc.
W76-09994

5D. Waste Treatment Processes

EFFECTS OF STORM DISCHARGES ON RIVER WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5B.
W76-09401

POLYETHYLENE PIPE TACKLES DIFFICULT SEWER REPAIR JOB,
For primary bibliographic entry see Field 8G.
W76-09403

HOW MANY SEWER LEAKS CAN YOU AFFORD.
Weston (Roy F.), Inc., Houston, Tex.
For primary bibliographic entry see Field 8G.
W76-09404

ISOLATION OF SALMONELLA FROM SEWAGE AND SURFACE WATERS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene.
For primary bibliographic entry see Field 5A.
W76-09411

METHOD FOR ELIMINATING ORGANIC AND INORGANIC BOUND NITROGEN FROM DOMESTIC AND INDUSTRIAL WASTE WATER,
M. Dubach, and A. Scherler.
Canadian Patent 986,627. Issued March 30, 1976. Patent Office Record, Vol. 104, No. 13, p 83, March, 1976.

Descriptors: *Patents, *Nitrogen, *Ammonia, *Waste water treatment, *Municipal wastes, Industrial wastes, Nitrification, Denitrification, Sedimentation, Treatment facilities, Biological treatment, Aeration, Settling basins.

A method to eliminate organic and inorganic bound nitrogen from municipal and industrial waste water has been patented. A biological waste water treatment plant is utilized and consists of two stages connected in series. Each contains an aeration tank and a settling basin. Waste water entering the treatment plant will be aerated in the first stage aeration tank. It will subsequently be introduced into the settling basin where overflow is removed, free of oxygen. The mixture is then introduced into a second stage where it will again be aerated and subsequently introduced into a second stage settling basin. Favorable conditions for extensive nitrification of the ammonia are provided and a portion of the nitrified waste water is continuously recirculated from the settling basin of the second stage to the first stage. The recirculated portion of the waste water is denitrified in the settling basin of the first stage where ammonification of the organic bound nitrogen occurs as well as denitrification of the nitrate in the influent and the nitrate in the recirculated effluent. (Kramer-FIRL)
W76-09413

SANITARY WASTE TREATMENT PLANT,
Thetford Corp., Ann Arbor, Mich. (Assignee).
L. O. Eger, and S. C. Crosby.
United States Patent 3,950,249. Issued April 13, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 2, p 824, April, 1976.

Descriptors: *Patents, *Waste water treatment, *Biological treatments, Water reuse, Filtration, *Treatment facilities.

A plant for treating sanitary waste is patented. It comprises systems for delivery, biological treatment, and water recovery. The delivery system includes a flush-type toilet which has a demand actuator, a bowl for depositing sanitary waste, flush water supply means for transferring clear water from the water recovery system to the delivery system and for supply ing the clear water as flush water under pressure to the bowl when the demand actuator is actuated, and delivery means to deliver the sanitary waste adnd flush water to the biological treatment system when the demand actuator is actuated. The biological treatment system biologically reduces the sanitary waste it receives and discharges an effluent to the water recovery system. The water recovery system includes ultrafiltration means to separate the effluent into an effluent concentrate and a water permeate. The ultrafiltration means has a tubular semipermeable membrane. Effluent is introduced into its one end axially under pressure and effluent concentrate discharged from the other. The ultrafiltration means also has a permeate collector tube surrounding the tubular membrane to collect, at a lower pressure, permeate passing through the membrane, and recirculation means which include a pump to return a portion of the effluent concentrate to the biological treatment system and for returning the remainder of the effluent concentrate at the first pressure to the ultrafiltration means to be further separated into water permeate and effluent concentrate, water storage means, and secondary filtration means to receive and polish the water permeate, in communication with the ultrafiltration means allowing the permate to be discharged at the second pressure from the ultrafiltration means to the secondary filtration means for polishing and discharge as clear water to the water storage means. The water storage means communicates with the delivery system to transfer the clear water to it by flush water supply means. (Snyder-FIRL)
W76-09414

AERATED SEWERAGE DISPOSAL,
A. J. Smith.
United States Patent 3,951,804. Issued April 20, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 3, p 1347, April, 1976. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewage disposal, *Aeration, *Patents, Equipment, *Septic tanks.
Identifiers: Rotary agitators(Wastes).

An aerated sewage disposal system has been patented. It comprises a septic tank, an enclosed compartment for aeration, and a rotary agitator. The septic tank has an inlet for sewage and an outlet for discharging liquids. The enclosed aeration compartment has an inlet to receive liquids directly from the discharge outlet of the septic tank and an outlet for aerated liquids. The compartment has side wall structure, a bottom wall, and rounded corners that extend between the side wall structure and the bottom wall. The rotary agitator is located in the enclosed aeration compartment to agitate liquids and cause them to flow downward in the compartment. A tubular shaft extends downward to approximately the agitator's level to carry and rotate the agitator and conduct air downward into the downward flowing agitated liquid. It has an air outlet in the compartment at approximately the agitator depth. A motor is connected to the upper end of the tubular shaft to rotate it. The rounded corners are located laterally and below the agitator sufficiently close to it to turn the flowing liquid, which contains air, upward along the side wall structure. The aeration compartment has vent means to allow air to pass between its interior and exterior. The volume of liquid and sewage in the tank, filled to its outlet level, exceeds the volume of liquid and sewage in the compartment when filled to the level of its outlet and more than 50% of the sewage solids are trapped in the tank. Control means connect with the motor, operating it intermittently, with substantially more time off than time on. There is a smaller additional tank with an inlet connected to the compartment outlet; an outlet connected to the leach line; and means, which include a pump, to return aerated liquids from the additional tank to the compartment. (Snyder-FIRL)
W76-09415

SLUDGE REMOVAL SYSTEM,
Ecodyne Corp., Lincolnshire, Ill. (Assignee).
R. L. Shaffer, and D. G. Mason.
United States Patent 3,951,819. Issued April 20, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 3, p 1352, April, 1976. 1 fig.

Descriptors: *Waste water treatment, *Sludge treatment, Sludge, Equipment, *Patents, Settling basins.
Identifiers: Sludge removal, Clarification, *Clarifier tanks.

An improved assembly for sludge removal in a circular clarifier tank having an inlet for receipt of liquid influent with entrained solids, an upper overflow outlet for removal of clarified liquid, and a bottom surface on which settled solids deposit is patented. The sludge removal assembly comprises a suction arm, sludge conduits, vertical riser tubes, a sightwell assembly, and valve assembly means for flow control. The suction arm has self-supporting sludge conduits of differing lengths which extend outward from and are mounted for rotation around an axis which is substantially vertical extending through the tank's center. The sludge conduits are secured to each other in a horizontal plane above the bottom surface of the tank. The sludge conduits have suction ports for inlet along their bottom surfaces adjacent to their outer ends to receive sludge from the bottom surface of the tank. The lower ends of many riser tubes which are substantially vertical are secured to the corresponding sludge conduits' inner ends. The sightwell assembly is positioned above the riser tubes' upper ends. Its lower portion is below the tank's static liquid level, and its upper portion is above the liquid level. Valve assembly means for flow control are associated with each riser tube's upper end for controlling the flow rates from the riser tubes into the sightwell assembly. These valve assembly means include adjustable orifice means whose lower portion is below the tank's static liquid level and whose upper portion is above this level. (Snyder-FIRL)
W76-09416

SEWAGE TREATMENT TANK AND TUBE SETTLER,
Jet Aeration Co., Cleveland, Ohio. (Assignee).
J. R. Snyder.
United States Patent 3,951,817. Issued April 20, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 3, p 1351, April, 1976. 1 fig.

Descriptors: *Waste water treatment, Equipment, *Patents, *Settling basins, Sedimentation, *Sewage treatment.
Identifiers: Tube settlers.

A tube settler has been patented which include numerous generally parallel spaced plates. Each plate has two faces, an opposed side, and end edge portions. Each plate also has numerous generally parallel spaced deflector members which extend outwardly from and are integrally connected to its first face and terminate adjacent to and spaced from an adjacent plate's second face. Each deflector member has wall means defining an elongated chamber with side walls tapering toward each other as they extend away from the plate to which they are connected. The elongated chamber also has opposed end walls. The deflector members extend outwardly generally perpendicular to the plates and in a direction at an acute angle to the side edge portions of the plates. The invention also includes means for holding the plates in their generally parallel spaced relationship. (Snyder-FIRL)
W76-09417

MARINE SEWAGE DISPOSAL DEVICE,
N. H. Siegel.
United States Patent 3,951,803. Issued April 20, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 3, p 1346-1347, April, 1976. 1 fig.

Descriptors: *Sewage disposal, *Sewage treatment, Equipment, *Patents, Tanks, Filtration, Heat, *Waste water treatment.
Identifiers: Marine sewage disposal.

A device for sewage disposal, adapted to receive discharge from a marine toilet, was patented. It incorporates means to kill coliform bacteria in the sewage. Storage tank means with an inlet to receive untreated sewage are included. Septum means within the tank means define an enclosure, vertically oriented. The septum means have lower and upper openings which communicate with the storage tank means' interior for recycling nonparticulated sewage. There are macerator means disposed in the vertically oriented enclosure with an impeller at its lower end. The enclosure has fil-

ring screen means at its upper end, forming an utlet to pass particulated sewage impelled by the acerator. Pre-treatment storage means with an let bordering the screen which receives particu-ted sewage are also included. A compartment for ewage treatment is disposed beneath the pre-orage means. First valving means form an outlet the pre-treatment storage means' lower end and n inlet to the sewage treatment compartment, al-wing particulate sewage to pass by gravity from ie pre-treatment storage means to the treatment ompartment. Heating means are provided, in-uding two electrodes disposed within the treat-ent compartment which operate automatically hen sufficient particulate sewage is present, to orm an ionizable fluid. Second valving means are isposed at the lowest part of the treatment com-artment to form an outlet to drain it of treated aste. Thermostatic means are included for the eatment compartment, to determine completion f a treatment cycle and control operation of the alving means. (Snyder-FIRL)
V76-09418

LUDGE CONTROL AND DECANT SYSTEM,
larsco Corp., Harrisburg, Pa. (Assignee).
. D. Ward, and M. W. Ray.
Inited States Patent 3,951,788. Issued April 20, 976. Official Gazette of the United States Patent Office, Vol. 945, No. 3, p 1341-1342, April, 1976. 1 ig.

Descriptors: *Sewage treatment, *Patents, Biological treatment, Aeration, *Waste water reatment, Pumps, *Sludge treatment, Separation echniques.
dentifiers: *Decanting(Wastes).

A system for sewage treatment is patented, com-prising an aeration tank, a clarifier tank, a baffle etween the aerator tank and the clarifier tank, a ecant tank, gravity fluid flow communication neans between the aeration tank and the decant ank, a pump and means connecting it for remov-ng clarified liquid from the upper portion of the ecant tank and to deliver the clarified liquid to the eration tank, a sludge digester container, a sludge ischarge line with a second pump, and first and econd timer means. Means to aerate the waste ater are included in the aeration tank. Liquid lows over the upper edge of the baffle from the eration tank into the clarifier tank. The means for gravity flow communication have an intake at an elevation below that of the baffle's upper edge to prevent floating matter from entering the decant ank. The discharge line for sludge connects with the decant tank's lower portion and sludge digester container. The first timer means is connected to the first pump so that it will remove clarified liquid at selected intervals for selected time periods. The second timer means is connected to the second pump so that it will discharge sludge from the de-cant tank for selected time periods and at selected intervals to maintain the aeration tank's biological balance. (Snyder-FIRL)
W76-09419

APPARATUS FOR SEWAGE TREATMENT AND WASTEWATER RECLAMATION,
Hebrew Univ., Jerusalem (Israel); and Yissum Research Development Co., Jerusalem (Israel). (Assignee).
G. Shelef.
United States Patent 3,954,615. Issued May 4, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 1, p 246, May, 1976. 1 fig.

Descriptors: *Waste water treatment, Algae, Lagoons, *Aeration, *Biological treatment, *Patents, Recycling, Oxygen, Ponds, *Aerated lagoons, Water reuse, *Sewage treatment.

An improvement has been patented in a system to treat waste water using algae. The technology consists of a pond which contains means for channeling the waste water along an endless path and means to aerate and maintain the flow of waste water. According to the improvement, the pond is deeper beneath the aeration means than the path depth in the remaining parts of the pond. The greater depth provides a solubility gradient which increases the amount of oxygen than can be dissolved into the liquid by the aeration means. (Snyder-FIRL)
W76-09420

SEPARATION OF SLUDGE,
W. Aldag.
United States Patent 3,953,328. Issued April 27, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 4, p 1847, April, 1976. 1 fig.

Descriptors: *Sludge treatment, *Patents, *Separation techniques, Suspended solids, *Waste water treatment, Aeration, Equipment.
Identifiers: Clarification.

A method was patented for separating sludge and suspended material from the liquid being purified. Liquid flows into the clarification chamber by way of an aeration chamber. In the clarification chamber a rising liquid stream is established whose speed of flow decreases as this liquid rises. Suspended material in this rising stream is concentrated in an intermediate zone of the clarification chamber in which the tendency of the material to sink due to gravity is approximately equal to the tendency for it to be carried upward in the stream. The concentrated material is drawn off by suction means at the intermediate zone and at least partly fed back to the aeration chamber's upper zone. The suction means disposition is varied to the level of the intermediate concentration zone. The aeration chamber and the clarification chamber are in fluid communication to receive liquid in the rising stream from the former. The clarifying chamber is shaped to decrease the flow speed of the stream while the liquid rises. There are one or more pumps with an outlet in the aeration chamber and a suction pipe arranged with its inlet in the clarification chamber at an intermediate level between the outlet level and the fluid communication. The suction pipe inlet is at such a level that suspended material in the liquid stream, which concentrates at the intermediate zone, is drawn out of the clarification chamber with the pump to be at least partially returned to the aeration chamber at an upper level. (Snyder-FIRL)
W76-09421

SEWAGE TREATMENT PROCESS,
Central Contra Costa Sanitary District, Walnut Creek, Calif. (Assignee).
D. S. Parker.
United States Patent 3,953,327. Issued April 27, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 4, p 1847, April, 1976. 1 fig.

Descriptors: *Waste water treatment, *Patents, *Sewage treatment, *Aerobic treatment, Nitrification, Denitrification, *Nitrogen compounds.
Identifiers: Anoxic conditions.

A process has been patented for treating sewage which contains nitrogen compounds. First, nitrogen compounds are converted to the nitrate form by nitrification. The nitrified sewage is then subjected to substantially anoxic denitrification in the presence methanol. The denitrified sewage is then stabilized by thoroughly aerating it under agitation conditions. The sewage is then flowed from the stabilization step and clarified, producing an effluent and sludge. The sludge is recycled directly to the denitrification step so that it will also be subjected to substantially anoxic denitrification. The purified effluent is withdrawn from the process. (Snyder-FIRL)
W76-09422

SEWAGE TREATMENT AERATION SYSTEMS,
Water Pollution Control Corp., Milwaukee, Wis. (Assignee).
P. M. Thayer.
United States Patent 3,953,553. Issued April 27, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 4, p 1905-1906, April, 1976. 1 fig.

Descriptors: *Patents, *Aeration, *Sewage treatment, *Waste water treatment, Equipment.
Identifiers: Header-connector assembly(Tanks).

A prefabricated header-connector assembly adapted for inclusion in a sewage aeration tank by the attachment of a low pressure air supply and diffusers to several inter-connected header-connector assemblies has been patented. It maintains the attached diffusers properly aligned in a common plane. It comprises a header and numerous connectors secured to it at different locations. The header is of weldable material with numerous nipples outwardly projecting from it at spaced locations. Each connector is oriented transversely to the header. The connectors have means for coupling with diffusers. Each connector has nipples drawn from it with their open ends welded to different header nipples. (Snyder-FIRL)
W76-09423

METHOD AND APPARATUS FOR REJUVENATING A BED OF GRANULAR FILTER MEDIUM,
Hydromation Filter Co., Livonia, Mich. (Assignee).
G. Hirs.
United States Patent 3,953,333. Issued April 27, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 4, p 1849, April, 1976. 1 fig.

Descriptors: *Patents, *Filtration, *Suspended solids, Equipment, Recycling, Filters.
Identifiers: *Granular filters.

An improvement has been patented for a method of filtering lint-like and particulate contaminants from a contaminated liquid by passing it through granular filter medium in a bed contained in a housing where the contaminants accumulate and at least some particulate contaminants and the filter granules agglomerate. The improvement consists of renewing the filter medium bed after an appreciable quantity of contaminants accumulate. This is done by expanding the filter bed and violently agitating it to break the agglomeration into particulate contaminants and filter granules. The filter bed is reformed with the lint-like material predominantly in its upper portion, the larger broken-up particulates in the lowest portion, and the other particulate interspersed through the bed. Diluting liquid is introduced into the bed between its lower and upper surfaces. Simultaneously a portion of this liquid flows upward fairly rapidly through only the part of the bed above the point where the liquid is introduced to expand and upwardly backwash interspersed lint-like contaminants and particulates. A slurry of interspersed particulates and granular filter material mixed with the rest of the dilution liquid is separately withdrawn below a point where liquid is introduced and flows in a continuous path including a cleaning element which removes at least part of the particulates from the mixture. The filter material is returned to the bed in the liquid flow. The liquid flow is terminated after sufficient cleaning of the filter bed. The bed is then reformed for further filtration of dirty liquid. (Snyder-FIRL)
W76-09424

STABILIZATION OF WASTE MATERIAL,
General Signal Corp., Rochester, N. Y. (Assignee).
E. H. Bradley.
United States Patent 3,953,331. Issued April 27, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 4, p 1848, April, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Oxidation, Equipment, Aeration.
Identifiers: Tanks.

A system has been patented to purify wastes. It includes two reaction tanks, each internally unobstructed, and means to deliver waste material for purification to the first tank. The delivery means include a conduit and a pump means. Means are also provided to introduce an oxidizing agent in the conduit in front of the pump means. A mixture of chemical oxidizing agent and waste material is pumped into the first reaction tank. Discharge conduit means from the first tank are directly connected to the delivery means and to the second tank to recirculate a portion of the mixture through the first tank and to deliver the remainder of the mixture to the second tank. Pressure is maintained in the tank so that fairly rapid chemical oxidation can take place during the mixture's entire circulation through the tanks. A rotatable impeller tends to oppose the fluid flow from the second tank while the first pump pumps the pressurized fluid to the first tank. A method for stabilizing waste material is also included. An oxidizing agent is mixed with waste material to be stabilized, and the mixture is rapidly circulated under pressure in the second zone where the oxidation is permitted through the two zones. The conduit and the rotatable impeller simultaneously maintain pressure in these zones by engaging the rotatable impeller in the conduit so as to tend to oppose flowing of the mixture from the second zone to the conduit. (Snyder-FIRL)
W76-09425

SEPTIC TANK SYSTEM,
A. L. Wilkerson.
United States Patent 3,954,612. Issued May 4, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 1, p 245-246, May, 1976. 1 fig.

Descriptors: *Septic tanks, *Patents, *Sewerage, Waste disposal, Conduits, Equipment, Effluents, *Sewage treatment, Domestic wastes, *Waste water treatment.

A septic tank system has been patented. The septic tank has an inlet for receiving sewage and, just below its top, an outlet for the liquid effluent, with a tributary connected to it for the effluent, allowing it to soak into the ground. The tributary comprises an elongated ditch filled with a substance such as gravel to about the outlet's top and means in the tributary to indicate above the ground surface the effluent level in the tributary. The indicator facilities include a vertical conduit that extends from above the ground surface to the lowest part of the ditch that forms the tributary. The conduit has openings with the associated screen whose mesh size is selected to allow liquid entry into the conduit but not entry of gravel from the ditch into the pipe, allowing flow of effluent from the tributary into the conduit until the effluent level in the tributary is reached. A float in the conduit floats in the effluent. Means attached to this float extend above the surface of the ground to indicate the level of effluent in the tributary. Excess effluent can be pumped directly from the tributary before causing sewage back-up to the septic tank. This includes a second conduit that extends from the ground surface through the gravel to about the tributary bottom. This conduit has perforations adjacent to its bottom with the associated screen whose mesh size is selected to allow liquid effluent but not gravel from the ditch to enter the conduit. In this way, the effluent can be pumped from the tributary to substantially remove all the liquid effluent in the ditch. (Snyder-FIRL)
W76-09426

WASTE TREATMENT PLANTS,
Foster Wheeler John Brown Boilers Ltd., London (England). (Assignee).
For primary bibliographic entry see Field 5E.
W76-09427

PROCESS AND APPARATUS FOR THE INCINERATION OF AQUEOUS SEWAGE SLUDGE,
Myrens Verksted A/S, Oslo (Norway). (Assignee).
For primary bibliographic entry see Field 5E.
W76-09428

APPARATUS FOR TREATING INDUSTRIAL AND DOMESTIC WASTE WATERS,
Degremont, Rueil-Malmaison (France). (Assignee).
A. B. Turner.
United States Patent 3,956,128. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 731-732, May, 1976. 1 fig.

Descriptors: *Waste water treatment, *Patents, Domestic wastes, Industrial wastes, Equipment, *Aeration, Biochemical oxygen demand, *Filtration, *Filters.
Identifiers: *Combined treatment.

A system to treat domestic and industrial wastes has been patented. It includes a tank, a filter in the tank, and an aerated packed column mounted above the filter in the tank. The column includes bacteria support media with approximately 50 sq ft/cu ft surface area. Screened sewage with suspended solids is introduced into the tank via an inlet and passed downward through the column and filter. Effluent outlet means are included at the lowest part of the tank to remove effluent. By-pass passage facilities which include a pump extend from the outlet to the lower portion of the tank for recirculating some of the effluent into the tank. Means are connected to the by-pass passage to aerate the recirculated effluent, to cause the air upon entering the tank to separate as small bubbles from the recirculated effluent, and to force these bubbles upward through the support media, providing oxygen for microorganisms growing on it that biologically remove the biochemical oxygen demand (BOD) loading in the sewage. Means positioned on the tank receive and burn floc rising to the tank's surface from the support media. (Snyder-FIRL)
W76-09429

SEWAGE SEPTIC SYSTEM FOR A PLURALITY OF DRAIN FIELDS,
Langley Hill Quarry, Woodside, Calif. (Assignee).
J. G. Dempsey.
United States Patent 3,956,137. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 735-736, May, 1976. 1 fig.

Descriptors: *Patents, *Septic tanks, *Sewage treatment, *Drainage, Domestic wastes, Pipelines, Waste disposal, Treatment facilities, *Waste water treatment.

A septic sewage system has been patented. It comprises a septic tank, numerous septic drain fields, and diversion means to direct the effluent to the drain field or fields selected. The septic tank supports a bacteriological action. It includes a sewage settlement compartment and an effluent compartment that communicates with the settlement compartment. An inlet pipe communicates with the settling compartment to deliver raw sewage. An outlet pipe communicates with the effluent compartment to discharge effluent. Each septic drain field has a pipeline to convey effluent. Diversion equipment is connected between the outlet pipe of the effluent compartment and the septic drain field pipelines. This includes an enclosure into whose interior the outlet pipe passes, having a lid to facilitate access to its interior, and a gate valve within the enclosure for each drainage field connecting the outlet pipe with its associated field's pipeline. Each gate valve has a housing connecting the outlet pipe with the pipe line. A gate within the housing can be moved between a position blocking flow between the outlet pipe and the associated drain field pipeline, and a retracted position that permits effluent flow from the outlet pipe through the pipe line. (Snyder-FIRL)
W76-09430

WASTE PURIFICATION SYSTEM,
Bio-Kinetics Inc., San Rafael, Calif. (Assignee).
J. R. Hulls.
United States Patent 3,955,318. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 464, May, 1976. 1 fig.

Descriptors: Algae, *Patents, *Sewage treatment, *Waste water treatment, Nutrient removal, Aeration, Nitrogen, Phosphorus, Recycling, Water purification, *Biological treatment, Biodegredation.

A continuous method to grow substantially unicellular algae, simultaneously purifying biodegradable wastes that contain aerobic bacteria, has been patented. Such a waste material would be sewage after communication and removal of most particulate matter, including nonbiodegradable matter, and after being largely freed from turbidity so that light can effectively penetrate it. An aqueous mixture of the algae and waste material is prepared. The waste material provides nitrogen and phosphorous for the algae and is mixed in an amount sufficient to support its growth. The mixture is aerated, agitated, and supplied with air and carbon dioxide in an amount balancing bacterial and algal growth. The agitated mixture is circulated in many cycles. It is then exposed in each cycle for approximately 0.5 sec to 2 sec to light to induce photosynthesis and then subjected to a dark period. Photosynthesis is effected without excessive oxidation of thylakoids, which are an inherent part of algae. The dark period is sufficient for regenerating the thylakoids. Algae are grown and substantially all of the waste material is consumed. An algae product and purified water effluent are separately recovered, recirculating some of the algae product. (Snyder-FIRL)
W76-09431

WASTE TREATMENT APPARATUS,
Ecolotrol, Inc., Bethpage, N. Y. (Assignee).
J. S. Jeris, C. Beer, and J. A. Mueller.
United States Patent 3,956,129. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 732, May, 1976. 1 fig.

Descriptors: *Biological treatment, *Patents, *Denitrification, Equipment, *Waste water treatment, Separation techniques, Oxidation.
Identifiers: *Fluidized beds.

Equipment has been patented to biologically denitrify water that contains oxidized nitrogen. It comprises a substantially vertically disposed elongated container, a manifold that is disposed toward the bottom of the container to control passage of water, an inlet to allow the container to receive water for processing, a fluidized bed of denitrifying microorganisms attached to a solid particulate carrier disposed in the container above the manifold, and means to add a carbon source to the fluidized bed. The fluidized bed is arranged to receive the water from the manifold and convert biologically substantially all the oxidized nitrogen being removed to water, nitrogen gas, and cellular material. The container has outlet means for receiving the processed water and at least some particulate carrier having excess cellular material. Means are provided for separating the processed water from the carrier. Processing means are connected to the separating means to receive the separated carrier, and for separating the excess cellular material and the particulate carrier. (Snyder-FIRL)
W76-09432

WASTEWATER TREATMENT SYSTEM WITH CONTROLLED MIXING,
Air Products and Chemicals, Inc., Allentown, PA. (Assignee).

. S. Block, M. S. Chen, and O. J. Noichl.
Jnited States Patent 3,954,606. Issued May 4, 976. Official Gazette of the United States Patent Office, Vol. 946, No. 1, p 243, May, 1976. 1 fig.

Descriptors: *Patents, *Biochemical oxygen demand, *Aeration, *Oxygenation, *Waste water reatment, Equipment, Mixing, Control.

A method has been patented for oxygenating and educing the biological oxygen demand of a mixed quor. The mixed liquor flows through an aeration asin's elongated liquid zone. This zone is nonartitioned for 80% or more of the mixed liquor epth. Oxygen-rich aeration gas is introduced into he aeration basin. The mixed liquor is oxygenated vith the aeration gas by rotating numerous surface erators spaced along the length of the liquid zone. Surface baffles are provided between all or some f the surface aerators. The penetration depth of he surface baffles into the mixed liquor is mainained between 2 and 20% of the mixed liquor lepth. The mixed liquor backflow ratio is controlled to produce effective liquid staging in the rder of 30 to 80% or more by maintaining the erator mixing factor between 10 and 550. The erator mixing factor is revolutions per minute of he surface aerators multiplied by the ratio of the iameters to the linear velocity of the liquid hrough the liquid zone. (Snyder-FIRL)
W76-09433

CATIONIC ACRYLAMIDE-STYRENE COPOLYMERS AND FLOCCULATION OF SEWAGE THEREWITH,
American Cyanamid Co., Stamford, Conn. (Assignee).
A. T. Coscia, H. P. Panzer, and J. A. Sedlak.
United States Patent 3,956,122. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 730, May, 1976.

Descriptors: *Patents, *Waste water treatment, *Flocculation, *Polymers, *Separation techniques, Suspension, Suspended solids, Emulsions, Cations.
Identifiers: Cationic acrylamide-styrene.

A process has been patented to flocculate solids suspended in an aqueous medium. An effective but small amount of an aqueous dispersion of a cationic vinyl polymer is uniformly added to the medium as flocculant for the solids. The polymer comprises 40 mol percent or more of N-(di(C1-3alkyl)aminomethyl)acrylamide hydrophilic cationic linkages, at least 5 mol percent of vinyl hydrophobic linkages, and up to 10 mol percent of acrylic acid hydrophilic anionic linkages. The number of hydrophobic linkages is large enough for the polymer to be insoluble in pure water and small enough for the polymer to be auto-dispersible in pure water. The polymer is distributed through the medium, flocculating a substantial portion of the solids. The flocculated solids and the medium are separated. (Snyder-FIRL)
W76-09434

MICROBIAL REACTIONS IN FACULTATIVE OXIDATION PONDS -- I. THE ANAEROBIC NATURE OF OXIDATION POND SEDIMENTS,
Auckland Univ., (New Zealand).
O. D. Brockett.
Water Research, Vol. 10, No. 1, p 45-49, 1976. 4 tab, 11 ref.

Descriptors: *Anaerobic conditions, *Methane, *Oxidation lagoons, Microorganisms, Kinetics, Sulfide, *Waste water treatment, Bacteria, Sediments, Acids, Microbiology.
Identifiers: Volatile acids, *Microbial reactions.

Volatile acid production, sulfide levels, and methane fermentation were compared in deep and shallow areas of faculative oxidation ponds. Acids were measured by the column partition chromatography method, and methane was collected by displacement with a filter funnel. Volatile acid utilizing sulfide producing bacteria and total sulfide levels were determined by standard methods. Volatile acids concentration, methane production, and sulfate reduction all showed significant increase with increase in pond depth. These results indicate the formation of better anaerobic conditions in the deep areas of the ponds. Gas collected in different areas of the oxidation pond system at different times had essentially the same composition, indicating the uniformity of the anaerobic nature of the ponds. Seasonal changes in volatile acid concentration occurred when biological organic matter from waste fed to the ponds during the winter months and from the pond biomass rapidly decomposed. The volatile acid content returned to lower levels after the load disappeared. (Snyder-FIRL)
W76-09435

PHOSPHATE REMOVAL--TACKLING EUTROPHICATION FROM THE OTHER SIDE,
F. Roberts.
Surveyor, Vol. 147, No. 4370, p 25, March 12, 1976.

Descriptors: *Nutrient removal, *Waste water treatment, *Phosphates, *Nitrates, Eutrophication, *Sewage treatment, Chemical precipitation, Flocculation, Water pollution control, Biochemical oxygen demand.
Identifiers: *Chemical treatment.

While BOD removal has been the primary aim of waste water treatment in the United Kingdom, increasing attention in other European countries has been paid to phosphate removal and the control of eutrophication. Both nitrates and phosphates come from land drainage and sewage effluents. However, it is supposed that phosphates would be easier to control, since a larger proportion comes from the sewage effluent. Typically, 70% of nitrates comes from land drainage and 80% of phosphate from sewage effluent. Such countries as Switzerland, Sweden, and Canada have been developing phosphate removal as an integral part of sewage treatment. Phosphate control may be achieved either by reducing the phosphorus content of sewage (such as done in Canada by requiring that detergents should have a substitute for NTA) or alternatively, by chemical treatment at the sewage works. This involves the use of lime, aluminum salts or ferric salts; the dose for alum could be about 150 mg/liter. The chemical may be incorporated at the beginning of treatment or as an additional process. The effect of phosphorus removal efforts on an already heavily enriched lake or inland waterway are not clear, but experts who treat phosphate problems in an acute form believe that the effort is worthwhile. (Kramer-FIRL)
W76-09436

WHO SAYS SEWAGE TREATMENT PLANTS HAVE TO BE UGLY,
Texas Dept. of Health Resources, Austin. Div. of Wastewater Technology and Surveillance.
W. R. Dinges.
Water and Wastes Engineering, Vol. 13, No. 4, p 20-23, April, 1976. 2 tab.

Descriptors: *Sewage treatment, *Waste water treatment, *Biological treatment, Aquatic plants, Nutrient removal, Floating plants, Water hyacinth, *Treatment facilities.

Studies on the feasibility of using aquatic plants and animals to produce further reduction of undesirable suspended and dissolved substances from water following bacteria and algae treatment phases are being conducted at the Williamson Creek Wastewater Treatment Plant at Austin, Texas. The pilot system consists of an area of 0.14 acres divided into four ponds separated by crushed limestone rock barriers. Water hyacinths are cultured in the first two ponds while the last two ponds are used to permit the regrowth of other plant species and to evaluate the suitability of several fish species for consumption of vegetation produced. Water hyacinths accumulate heavy metals and trace organics from waters with contamination levels below detectable limits. The effluent from the hyacinth ponds is very clear and contains little total nitrogen. For the period June 1975 through January 1976, the average influent to the ponds contained 19 mg/liter BOD5, 70 mg/liter COD, 40 mg/liter total suspended solids, 1.3 mg/liter ammonia, and 14.7 mg/liter phosphate. During the same period, the average total suspended solids, less than 0.1 mg/liter ammonia, and 11 mg/liter phosphate. If the biomass produced in the hyacinth ponds is extrapolated to a one acre basis, then one acre would support a standing crop of an estimated 240 tons wet weight, or 12 tons dry weight and contain an estimated 4,500 pounds of mineral salts, 1,800 pounds of protein, and 16,800 pounds of carbohydrate. (Orr-FIRL)
W76-09437

SEWAGE TREATMENT FACILITY TO BE UPDATED AND EXPANDED AT KITCHENER ONTARIO,
Water and Pollution Control, Vol. 114, No. 1, p 23, January, 1976.

Descriptors: *Sewage treatment, *Treatment facilities, *Activated sludge, Sewers, Equipment, Aeration, Sludge treatment, Chlorination, Construction, Lagoons, Canada, *Waste water treatment.
Identifiers: Treatment facility upgrading, Ontario(Canada).

An extension to the Kitchener Pollution Control Centre facility, Ontario is described, which will bring the rated capacity of the plant from 11.5 million Igpd to 27 million Igpd. The facility is a conventional activated sludge plant with some original units that were built in the middle 1930's. Updating of the plant includes the building of a new overhead trunk sewer to bring raw sewage to the new plant; the demolition of the screen house and its replacement with a new screen and detritor building, capable of treating a peak flow of 43 million Igpd; and the upgrading of primary clarifiers, aeration units, and secondary clarifier units. New tanks are being designed for sludge treatment to mix and heat sludge with hydraulic gas guns. In addition, a new chlorine contact chamber is being added, which will provide a total detention time of 15 minutes a peak load. Other remodelling includes the replacement of the old boiler, the modification of the filter building to incorporate electrical and mechanical workshops, and the replacement of the present sludge lagoon area with a new sludge lagoon. (Kramer-FIRL)
W76-09439

WEED HOLDS PROMISE FOR POLLUTION CLEANUP,
C. Murray.
Chemical and Engineering News, Vol. 54, No. 12, p 23-24, March 22, 1976.

Descriptors: *Sewage treatment, *Waste water treatment, *Water hyacinth, Aquatic plants, Floating plants, Biological treatment, Lagoons, Aquatic weeds, Absorption.

The water hyacinth is being tested as a means of sewage treatment for small towns which can not afford the capital investment necessary with conventional treatment techniques. The water hyacinth is a vascular plant containing a system of vessels that transport nutrients from the roots through the leaves while absorbing large quantities of nutrients and pollutants found in domestic sewage. The hyacinth also has the ability to concentrate heavy metals and organic substances often present in industrial wastes. National Aeronautics and Space Administration (NASA) officials have been conducting research at Bay St.

Louis, Mississippi. In the spring of 1975, three acres of a 40-acre municipal lagoon that receives raw sewage from about 6000 households was planted with water hyacinths. Although three acres was insufficient to clean up the entire lagoon, planting 12 acres of the lagoon with hyacinths in summer of 1976 is expected to produce clean water in the lagoon. Uses for water hyacinths produced are also being explored. In a study at the Mississippi State University agricultural experiment station, hyacinths grown in municipal sewage were dried, ground into meal, and added to cattle feed. The hyacinth meal is high in minerals and protein and comparable to cottonseed meal or soybean meal as a feed supplement. NASA is researching the conversion of water hyacinths into methane by anaerobic fermentation. Residue produced by anaerobic digestion is an efficient fertilizer and soil conditioner. (Orr-FIRL)
W76-09440

CARBON WASTEWATER TREATMENT PROCESS,
Jet Propulsion Lab., Pasadena, Calif.
M. F. Humphrey, W. L. Dowler, and G. M. Simmons.
Public Works, Vol. 107, No. 2, p 62-63, February, 1976. 1 fig.

Descriptors: *Waste disposal, *Sewage sludge, *Recycling, *Activated carbon, Methane, Adsorption, Solids removal, *Waste water treatment.

It formerly was considered cheapest to dispose of sewage sludge. Now sludge can be recycled, producing methane and an activated carbon, used to purify more waste water. Many new processes use activated carbon to absorb contamination with or without chemical coagulating agents. In this new process, after the carbon adsorbs dissolved solids from water, it is recycled back into the untreated sewage and removed along with the sludge. Critical aspects of the process include using primary sludge solids to produce adsorbent carbon char and using it for promoting separation of suspended and settleable solids. After preliminary laboratory investigations of these steps and using the carbon char for removing dissolved solids, a pilot plant was designed, constructed, and placed in operation. The process involves absorbing most of the liquid wastes with the ash and carbon, and drying the mixture more completely and faster than is done in other processes, without adding any chemical agent. The pilot-plant demonstrated the potential to meet or exceed the federal and state requirements for water-disposal quality. Economic studies in progress indicate higher effluent qualities at costs competitive to those of conventional biological processes. (Snyder-FIRL)
W76-09441

COTTONVALLEY -- BRITAIN'S LATEST SEWAGE WORKS.
Water Services, Vol. 80, No. 959, p 49, 51, January, 1976.

Descriptors: *Sewage treatment, *Treatment facilities, Tertiary treatment, Methane, Incineration, Sludge treatment, *Waste water treatment.

The Cottonvalley Sewage Works, now under construction to serve all the needs of the new city of Milton Keynes, is designed to the same standards as other parts of the city as an integral part of the area. The works are expected to eventually serve a population of 275,000, including another town and surrounding villages, and will probably be completed by 1990. The Cottonvalley scheme is believed to be one of the most advanced purification works of its type anywhere in the world. The first of the three phases, designed to serve a population of 117,000, is nearing completion. Methane gas from sludge digestion is the main fuel for the two boilers and the sludge incinerator. When the incinerator is in use, heat from its waste gases is recovered by a heat exchanger for sludge digestion, heating domestic hot water, and space heating; at other times, these functions are assumed by the boilers. Administrative and laboratory areas are air conditioned. Building service are pneumatically controlled from a central panel. (Snyder-FIRL)
W76-09442

SLUDGE/ACTIVATED CARBON CYCLE TREATS SEWAGE.
Industrial Research, p 30, 33, January, 1976. 1 fig.

Descriptors: *Pilot plants, *Activated carbon, *Activated sludge, Recycling, California, *Waste water treatment.
Identifiers: *Pyrolysis.

If a pilot plant achieves projected 25% savings in costs, a new concept in technology for sewage treatment could be extensively used in treatment plants. A pyrolysis unit to manufacture activated carbon, for which sewage solids made a very good raw material, led to the use of the activated carbon produced to further treat waste water. This approach solves a problem common to most municipal sewage plants providing only primary treatment. The new process makes the solids that are normally difficult to dispose of into activated carbon, which is recycled with new solids and reactivated after use. Comparison studies found rotary calciners to be the best approach for the pyrolytic reactor. Data from a pilot plant test were used in designing the calciner being prepared for a million-gallon-a-day pilot plant at Huntington Beach, California. A gas drier is included to take exhaust gases from the burners to a flash drier to dry the filter cake before it goes into the calciner. (Snyder-FIRL)
W76-09443

CRAWLEY SEWAGE TREATMENT WORKS.
Water Services, Vol. 80, No. 959, p 39, January, 1976. 1 tab.

Descriptors: *Tertiary treatment, *Treatment facilities, *Sewage treatment, Biochemical oxygen demand, Suspended solids, Filtration, *Waste water treatment.

A plant for tertiary treatment is operating successfully at Tinsley Green. The treatment works, located near Crawley, was formerly under the control of the Crawley Urban District and now comes within the Thames Water Authority. The ever increasing demands on the original plant made it necessary for further extensions to be built; the tertiary treatment incorporates six gravity filters with equipment for automatic operation. The tertiary treatment plant was designed for dry weather flow of 23.64 million liters per day and peak flow of twice that amount. It was designed to treat sewage effluent already treated to the standards of the Royal Commission to under 10.0 ppm suspended solids and 5 day biochemical oxygen demand (BOD) in summer and under 15.0 ppm in winter. The influent and the final treated effluent were tested during mid 1974; the standards were met. Equipment for sequence control and automatic filter washing was designed to allow automatic washing of the filters when either a predetermined head loss through the filter occurred or a predetermined filter run terminated. (Snyder-FIRL)
W76-09444

OZONE PROVIDES ALTERNATIVE FOR SECONDARY EFFLUENT DISINFECTION. PART 1,
Welsbach Ozone Systems Corporation, Philadelphia, Pa.
C. Nebel, R. D. Gottschling, P. C. Unangst, H. J. O'Neill, and G. V. Zintel.
Water and Sewage Works, Vol. 123, No. 4, p 76-78, April, 1976. 7 fig.

Descriptors: *Sewage treatment, *Disinfection, *Ozone, *Waste water treatment, Tertiary treatment, Treatment facilities, Bacteria, Design criteria, Activated sludge.

Previous work has established that the effectiveness of ozone in secondary sewage effluent disinfection can be considered at several dosage levels. This study investigated the dosages of ozone required for disinfection in order to determine the effectiveness of removal of specific contaminants in the effluent. Secondary effluents were obtained from three types of sewage treatment plants in New Jersey and Pennsylvania--standard activated sludge, contact stabilization, and pilot plant oxygen enriched activated sludge Effluents were ozonized in a 6.5 inch I.D. Plexiglas ozone contact column. Samples were removed at specified times and analyzed for contaminant concentration. The amount of ozone required was found to vary, depending on the exact nature of the effluent. Data showed that the existence of ozone reaction products may be correlated to bacterial kill. A peroxide residual may be calculated as a quasi ozone residual, and may be used for the automatic control of an ozone disinfection system in an application similar to that of the chlorine residual method. (Kramer-FIRL)
W76-09445

WORKING TOWARDS TOUGHER ODOUR CONTROL STANDARDS.
For primary bibliographic entry see Field 5G.
W76-09446

DESERT AREA ACTIVATED SLUDGE PLANT.
Public Works, Vol. 107, No. 2, p 86, February, 1976.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, Slude treatment, Chlorination, Equipment.
Identifiers: Wet air oxidation.

The Indio, California, waste water treatment plant in the Southern California desert serves a population of 25,000 and industry. It includes primary and secondary settling, conventional activated sludge treatment, wet air oxidation of sludge, and chlorination. Diffused air aeration is important to proper operation of the activated sludge treatment process and, due to the high ambient temperatures, capability of the air compressor is more important than is usually true. Peak temperatures require higher air volumes. Two centrifugal blowers for normal operation are powered by electricity, and a third, which serves as a standby, is powered by an engine fueled by natural gas. The only unusual difficulties in nearly 2 yr of operation have been occasional sand storms that cause some problems in the lines. (Snyder-FIRL)
W76-09447

A COMPARISON BETWEEN THE EFFICACY OF SUBMARINE OUTFALL DISPOSAL OF ADVANCED PRIMARY EFFLUENT AND CONVENTIONAL TREATMENT,
Trieste Univ. (Italy). Istituto di Idraulica e Costruzioni Idrauliche.
For primary bibliographic entry see Field 5E.
W76-09448

OBJECTIVES AND COSTS OF ADVANCED TREATMENT TECHNIQUES FOR SEWAGE,
Balfour (D.) and Sons, London (England).
G. A. Truesdale, and M. R. G. Taylor.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p. 323-332, 1976. 1 fig, 24 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, *Irrigations, *Lagoons, Filtration, Costs, Nitrification, Denitrification, Chemical precipitation, Activated carbon, Ion exchange, Electrodialysis, Reverse osmosis, *Sewage treatment, *Operating costs.

dentifiers: Microstraining.

The uses of the receiving watercourse largely letermine effluent standards. Controling lischarges of suspended solids and oxygen conuming matter is fundametally important. Tertiary reatment is used to meet more stringent standards. Irrigation over grassland is such a process; ffluent is allowed to flow over graded land with a entle slope, then collected. Lagoons are another uch method; deeper lagoons with longer retention imes are more effective. Slow filtration through and is suitable for small works. Rapid sand filtraion uses thicker layers of sand, and the liquid may low either up or down. Microstraining forces effluent through a cylindrical surface of stainless teel fabric, in which solids collect. In gravel bed larifiers, effluent flows upward through a shallow gravel bed. A suitable tertiary treatment process an achieve effluent standards of 10:10. Percolatng filters operating at relatively low biochemical oxygen demand (BOD) loadings normally achieve high a degree of nitrification for ammonia emoval. Biological nitrification followed by lenitrification seems most promising for removing itrogen in the form of nitrate. Alum, lime, or iron alts can remove phosphate by precipitation, ither during primary treatment or as a tertiary rocess. Biological methods can produce effluents vith 5 mg/liter BOD, suspended solids, and ammonical nitrogen, but could probably not meet nore stringent standards. Activated carbon adsorption can remove residual organic matter, but ot inorganic constituents. Ion exchange usually requires activated carbon pretreatment to remove rganic matter, as would electrodialysis. Adding acid to sewage effluent minimizes problems posed by reverse osmosis. Much of the data on costs of these processes is based on limited operating experience. (Snyder-FIRL)
W76-09449

CARBON MADE FROM SEWAGE SOLIDS TREATS WASTEWATER.
Water and Pollution Control, Vol. 114, No. 1, p 31, January, 1976.

Descriptors: *Waste water treatment, *Activated carbon, *Pilot plants, *Sewage treatment, Suspended solids, Heavy metals, Odor, Treatment facilities.
Identifiers: *Pyrolysis, Sewage solids, Activated carbon manufacture.

A pilot plant is being constructed to test a system that uses a pyrolytic reactor for converting solid sewage materials into activated carbon, which then is used to treat incoming waste water. A mobile demonstration unit operated successfully at the sewage treatment plant at Huntington Beach, California, where the pilot plant will be installed. The system, as tested with the mobile unit, virtually eliminated sewage solids, delivered cleaner waste water to the ocean, removed heavy metals from the sewage, and eliminated odors. Design parameters will be determined by the pilot plant for larger facilities processing sewage to meet pending United States envionmental standards. The origin of the process was a pyrolysis unit to manufacture activated carbon. Later it was found that sewage solids were a very good raw material, and the resulting product was suitable for further treatment of sewage. After treating the waste water, activated carbon is recycled with the new sewage solids and reactivated. Eventual extraction of some ash and carbon from the process represents the system's only residue. (Snyder-FIRL)
W76-09450

NITRATES: WHAT'S HAPPENING IN BRITAIN,
Thames Water Authority, London (England).
W. Ray.
Water and Wastes Engineering, Vol. 13, No. 4, p 26-28, 30, 48, April, 1976. 3 fig.

Descriptors: *Nitrogen compounds, *Nitrates, *Denitrification, *Waste water treatment, Activated sludge, Treatment facilities, Nutrient removal, Bacteria.
Identifiers: Facultative heterotrophic bacteria.

Demand for water has increased, resulting in increased use of water from rivers. Increased detergent use and improved techniques for sewage treatment which oxidize ammonia are partially responsible for increases in phosphate and nitrate concentrations in natural waters. The major source, however, is agricultural fertilizer run-off. Nitrates cause most concern in the River Lee, an important tributary of the River Thames. Measures were taken to reduce the nitrate level in the effluent of a major sewage treatment works on the River Lee, at Rye Meads North of London. Laboratory work indicated that an anoxic zone in activated sludge plants could reduce the nitrogen concentration in the final effluent by about 40% under the proper conditions. Plant scale experiments are in progress. Attempts to create an anoxic zone by removing 75% of the diffusers to reduce air action to a level preventing settling were not entirely satisfactory; either some settlement occurred or a slightly greater air flow inhibited anoxic conditions. Substituting a stirring mechanism for the diffusers reduced nitrate from 29 mg/liter to 16 mg/liter in the final effluent. The original design of a new works at Borden, south of London, included denitrification based on these methods. Another new plant being constructed in the River Blackwater Valley near Farnborough provides in its original design for introducing settled sewage upstream of the aerators, creating a zone facilitating denitrification. Both methods are based on nitrate as an oxygen source for various facultative heterotrophic bacteria. Methanol was studied experimentally as a source of carbon for the biological process at Lee Bridge. Nitrate removal rates were consistently 70% to 90%. A new ion exchange process, using heated influent rather than an acid or base solution has been studied but not used commercially. (Snyder-FIRL)
W76-09451

PCS USES STUDY APPROACH FOR EFFLUENT TREATMENT.
Chemical Age, Vol. 112, No. 2950, p 15, January 30, 1976. 1 fig.

Descriptors: *Waste water treatment, *Treatment facilities, Biological treatment, Filtration, Flotation, Sanitary engineering, Bubbles.
Identifiers: Deep Shaft Process, Microflotation.

Pollution Control Systems (PCS) builds effluent plants, provides technical assistance, and studies the economics of treating effluent and recovering materials. PCS uses a set method in approaching effluent problems. First a study involving both field work and analysis is conducted, technically assessing the scale and nature of the problem. A process design team then considers hydraulic levels, pollution levels, and required discharge standards, and proposes a treatment system. Various products for low rate filtration and biofiltration and two treatment systems are currently available from the company. A deep shaft process was developed for biologically treating biodegradable industrial effluent or sewage. It supplies air more efficiently to micro-organisms, significantly increasing treatment rates. The microflotation process, licensed to PCS, couples the benefits from chemical flocculation technology and a simple air bubble generation method for removing suspended solids by flotation. First, oversized solids are removed, the effluent pH is adjusted, and any chemical precipitants required are added. Hydrostatic pressure dissolves air which is injected, aerating the effluent. Reduced hydrostatic pressure later releases the dissolved air as microscopic bubbles which float the stream's solid particles, to which they attach themselves, to the surface. (Snyder-FIRL)
W76-09452

NITRIFICATION STUDIES OF SHIP CHANNEL WATERS,
Texas Univ. at Arlington, Dept. of Civil Engineering.
Y. T. Hung, and W. W. Eckenfelder, Jr.
Water and Pollution Control, Vol. 114, No. 4, p 8-9, 11, 46-47, April, 1976. 4 fig, 2 tab, 5 ref.

Descriptors: *Nitrification, Rivers, Flow, Waste assimilative capacity, Self-purification, Nitrates, Nitrites, Dissolved oxygen, Nitrogen compounds, Texas, Channels, Channel flow.
Identifiers: *Houston Ship Channel(Texas).

A study was conducted on the Houston Ship Channel water to determine the nitrification of channel water samples and the effects of channel flow and degree of treatment on the nitrification process under simulated laboratory conditions. Houston Ship Channel water from various depths was aerated in the laboratory for 20 days and sampled every few days for nitrate and nitrite analysis. Simulation was performed by adding fresh water and waste water to a drum in proportion to the flow in the channel, and sampling before and after each input. Nitrification was not observed in the Houston Ship Channel waters at station Mile 10, the sampling location. This situation might be caused by the absence of dissolved oxygen in the channel waters. Nitrification of water samples taken in August at the same location started on the 12th day of aeration in the laboratory, with a nitrogenous biochemical oxygen demand (BOD) of 9.1 mg/liter. For samples taken in September, nitrification started between the 3rd and 7th days of aeration with a nitrogenous BOD of 0.7 to 1.8 mg/liter. The simulation seems to indicate that the degree of waste treatment increases nitrification, whereas the increase in channel water flow leads to a lesser extent of nitrification. (Snyder-FIRL)
W76-09453

THE WATER INDUSTRY: A REVIEW RELATING TO WASTE WATER TREATMENT,
M. A. Kershaw.
Process Biochemistry, Vol. 11, No. 2, p 37-39, 44, March, 1976. 14 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Tertiary treatment, Ion exchange, Electrodialysis, Reverse osmosis, Fertilizer, Treatment facilities.

The Water Resources Act of 1973 restructured water services in England and Wales to meet increasing demands for water, improve quality of effluent discharges, and protect fisheries and water amenities. In April 1974, 10 regional water authorities replaced 1600 separate bodies. Clean rivers and augmented water supply both depend on sewage and effluent treatment. Many of the actual sewage works inherited from local authorities were grossly overloaded and had worn out equipment. Because of this situation, research on improved waste water treatment is being conducted with a sense of urgency. Continuous monitoring of the stages of waste water treatment is emphasized because of the danger to fish posed by instantaneous discharges. Attempts are also being made to link weather conditions more closely with water treatment. There are many variations in sewage treatment processes, including small prepackaged units. In many instances increasing pressures for improved effluent quality require further stages of treatment, tertiary treatment for effluents already of good quality or advanced treatment, beyond the traditional methods. Advanced treatment methods usually involve further removal of suspended solids, chemical treatment, and removal of organic materials with activated carbon. Methods for removing dissolved salts include ion exchange, electrodialysis, and reverse osmosis. Well-digested sludge that does not contain residual heavy metals can be used as agricultural fertilizer. Automatic control is being used increasingly for routine operations. In some cases, industrial wastes are being recycled into new products. (Snyder-FIRL)

W76-09454

SOLUTION OF THE OPERATING PROBLEMS OF A MODERN SEWAGE TREATMENT PLANT,
J. Finch.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 207-214, 1976.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage treatment, Aeration, Sludge digestion, *Operations, Performance.

Possible solutions to various water pollution control problems were introduced into a modern sewage treatment plant at Slough, Great Britain, with very satisfactory operational characteristics. The plant uses reinforced fiberglass in the settling tank outlet trough/weirs. An aeration tank with a dynamic baffle-wall performed very similarly to a conventional tank, but cost less to construct. The floating roof type heated sludge digestion tanks were improved by installing a high-density polyethylene pipe line along the peripheral walkway at the top of the tank and blowing gas through spargers inserted between the floating roof and the digester sidewall. Partially dewatered sludge from the heated digestion plant, containing appreciable quantities of phosphorus and nitrogen, is used to fertilize grassland on which beef cattle are grazed. Sludge, soils, crops, and animals are monitored. The increasing demand for water requires improved quality of effluents discharged into rivers. In one instance, improved treatment was achieved by spreading the release of an industrial effluent into the sewage system over a longer period of time. Primary settlement may also achieve a good deal of balancing at the treatment plant. However, there has been little study of incorporating balancing into treatment plant operation. The Slough plant is essentially a high-rate surface aeration unit followed by nitrifying biological filters. It incorporates balancing by extended use of augmented existing storm water tanks to cut off peak flows and store and return them to fill in troughs at low flow. It is easier, more satisfactory, and less expensive to build automation into a process involving balancing. (Snyder-FIRL)
W76-09455

ACTIVATED SLUDGE PROCESS WITH ALUM ADDITION AND HEAT TREATMENT,
Gannett Fleming Corddry and Carpenter, Inc., Harrisburg, Pa.
A. C. Gray, Jr., H. B. Gerber, and P. E. Paul.
Journal Water Pollution Control Federation, Vol. 48, No. 1, p 163-178, January, 1976. 9 fig, 7 tab, 12 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, Phosphorus, Nutrient removal, Sludge treatment, Polyelectrolytes, Dewatering, *Heat treatment.
Identifiers: *Alum, High-purity oxygen, Sludge conditioning.

Combined high-purity oxygen activated sludge, phosphorus removal by aluminum sulfate precipitation, and thermal conditioning all sludges were studied for Harrisburg, Pennsylvania. Separate on-site pilot systems were used for the oxygen activated sludge and thermal conditioning processes. Treated primary effluent from existing facilities by high-purity oxygen activated sludge, under 2.0 hr aeration time produced 20 mg/liter effluent biochemical oxygen demand (BOD) concentration, even during storm loadings. At 0.5 lb BOD/day lb mixed liquor suspended solids (SS) biomass loading, 1.08 lb total solids/lb BOD removed were produced. An average 1.31 lb oxygen were consumed/lb BOD removed. Solids production varied directly and oxygen consumption inversely with biomass loading. Phosphate was removed to effluent concentrations of 6.0 mg/liter total and 3.0 mg/liter soluble phosphate with aluminum sulfate. About 1.8 mole aluminum ions/mole phosphorus was the optimum dosage, equivalent to adding about 5.6 lb alum/lb influent phosphate. It is necessary to acclimate the biological system to the alum, or the effluent phosphate will increase due to the SS increase. Mean SS concentrations in the effluent were 20 mg/liter before chemical addition at rates of clarifier surface loading between 641 and 694 gal/day/sq ft. Effluent SS increased and observable pin floc formed in the final clarifier after alum addition. For this reason the final design includes polyelectrolyte addition. Thermally conditioning combined sludge increased dewaterability. Filter yields between 3 and 9 lb/day/sq ft and optimum dewatering were compatible. Decant liquor from thermal sludge conditioning did not change effluent quality. While the pilot plant operated, up to 30% of the oxygenation tank's BOD loading was recycled decant liquor. Recycled liquor will probably account for between 10 and 15% of the BOD loading to the oxygenation tanks in the full-scale system. (Snyder-FIRL)
W76-09456

SOME CRITICAL VIEWS OF SELECTED PROCESSES FOR THE BIOLOGICAL TREATMENT OF SEWAGE,
H. J. Schmidt-Holthausen.
Process Biochemistry, Vol. 11, No. 2, p 27-30, March, 1976. 4 fig.

Descriptors: *Activated sludge, Treatment facilities, *Aeration, *Waste water treatment, Oxygen, Bubbles, *Biological treatment, *Sewage treatment.
Identifiers: Aerators, UNOX, Bioxon, Marox, Lindox, High-purity oxygen.

Although the aerated sludge process always uses an aeration tank followed by a final settling tank, there are many variations in the way in which sewage, oxygen, and activated sludge are brought into contact. In two process methods, raw sewage and activated sludge are completely and immediately mixed throughout the tank. One of these uses fine bubble aeration, while the other uses surface aerators. The piston flow feed method also provides complete mixing, but sludge loading decreases and oxygen concentration increases in the direction of flow. Another method feeds return sludge at the inlet end of the tank and sewage and sludge along the lateral sides. The Bioxon process includes incremental sewage feed and tapered feed of air along the lateral sides of the aeration tank. Activated return sludge is fed at the inlet end, resulting in a very high concentration of solids at the front of the tank. This high concentration leads to increased biological activity and metabolism, requiring an increased oxygen demand which is met by tapered aeration. Pure oxygen has been used for aeration in pilot plants. The advantages of using pure oxygen are offset by the disadvantages. The three main methods of using pure oxygen include the Marox process, which uses very fine bubbles and an open tank. The Unox process uses several tanks, and feeds the oxygen from the gas space above one tank to the next tank. The Lindox process uses a blower to recirculate oxygen not used. The most suitable activated sludge process must be selected for each application. (Snyder-FIRL)
W76-09457

REMOVAL OF PHOSPHATE FROM WASTE WATER,
Rockwell International Corp., El Segundo, Calif. (Assignee).
E. V. Kleber, and H. L. Recht.
United States Patent 3,956,118. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 728-729, May 11, 1976. 1 fig.

Descriptors: *Waste water treatment, *Chemical precipitation, *Patents, *Phosphates, *Anions, Chemical wastes, Cations, Chemical reactions, Separation techniques, Treatment facilities.
Identifiers: Rare earth cations, Anion removal.

A patent for a chemical treatment process whic removes phosphate-containing anions from wast water is presented. The process involves adding trivalent rare earth cation in soluble form to th waste water to form an insoluble rare eart precipitate of the trivalent rare earth cation an the phosphate-containing anions in the wast water. This precipitate is then separated from th waste water. (Kreager-FIRL)
W76-09458

POLYETHYLENE PIPE INSERTION REHA BILITATES OLD SEWERS,
Freeport Public Works, N. Y.
For primary bibliographic entry see Field 8G.
W76-09459

SEWER INSPECTION: CHECKING IT OUT,
For primary bibliographic entry see Field 8G.
W76-09460

GIVE STORMWATER POLLUTANTS TH SPIN,
Municipal Environmental Research Lab., Edison N.J. Storm and Combined Sewer Section.
R. I. Field, P. E. Moffa, and J. M. Karanik.
The American City and County, Vol. 91, No. 4, 77-78, April, 1976. 2 fig, 1 tab.

Descriptors: *Sewerage, *Waste water treatment *Overflow, *Combined sewers, Storm water Storm runoff, Flow measurement, Flotation.

A simple swirl regulator controls combined sewe overflows for a Syracuse residential complex concentrating and retaining waste water solid while diverting excess storm water away from th treatment plant. During dry weather, when th flow is below the downstream capacity of the in terceptor, a pump conveys the entire flow to th treatment plant. A flowmeter deactivates th pump when the flow exceeds this capacity. Th waste water then flows by gravity through th swirl chamber, which diverts the storm water i excess of the treatment capacity. The systen reduces settleable solids and floatables over a wide range of overflow rates. Biochemical oxyge demand (BOD) removals greater than 50% and gri reductions up to 90% are achieved. The pump use for dry weather flows would not be necessary i an ideal installation. During overflows, floatable are contained by the scum ring in the outer ring o the chamber and forced into a floatables trap. Dur ing subsequent dry weather, they are drawn down and removed. (Snyder-FIRL)
W76-09461

GRP LAUNDERS AT SEWAGE TREATMENT PLANT.
For primary bibliographic entry see Field 8G.
W76-09462

SUMMARY OF MUNICIPAL WATERSHED MANAGEMENT SURVEYS IN EASTERN UNITED STATES,
Southeastern Area State and Private Forestry, Atlanta, Ga.
For primary bibliographic entry see Field 4D.
W76-09466

NEW TECHNOLOGIES IN WATER PURIFICATION AND THEIR APPLICATION TO ARID LANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 3A.
W76-09481

OPTIMAL GROUND WATER QUALITY MANAGEMENT: WELL INJECTION OF WASTE WATERS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis.
Water Resources Research, Vol. 12, No. 1, p 47-53, February, 1976, 2 fig, 3 tab, 24 ref.

Descriptors: *Mathematical models, *Aquifers, *Waste water treatment, *Water quality, Water treatment, Cost-benefit analysis, Groundwater, *Injection wells.
Identifiers: *Groundwater quality and quantity model, Minimized surface waste treatment cost.

A mathematical model for optimal conjuctive utilization of the ground water quality and quantity resources of unconfined aquifers was constructed. The saturated zone of the ground water system was considered a component of a regional waste treatment system. The model was designed so as to minimize the cost of surface waste treatment while maintaining acceptable water quality levels throughout the aquifer. Results indicate the feasibility of using secondary waste water treatment (trickling filter) in conjunction with the assimilation capacity of the unconfined aquifer for waste water degradation and disposal. (Heiss-NWWA)
W76-09511

RADIATION FOR A CLEAN ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
STI/PUB/402, Proceedings of a symposium held in Munich on March 17-21, 1975. 672 p.

Descriptors: *Environmental sanitation, *Waste water treatment, Sewage treatment, Sludge, *Radiation, Recycling, Pollutants, Economics, Pilot plants, *Conferences, *Water reuse.

The symposium was sponsored by the IAEA in cooperation with the Government of the Federal Republic of Germany and the Bayerische Landesanstalt fur Bodenkultur und Pflanzenbau. Forty eight papers were presented in eight sessios covering the current technology of waste-water treatment and re-use, radiosensitivity of micro-organisms, disinfection and micro-biological control, physical and chemical modification of aqueous pollutants, technological and economic aspects, pilot plant design and operating experience and radiation of non-liquid wastes. In a panel session the previous sessions were summarized and discussed. (See also W76-09513 thru W76-09556) (Chilton-ORNL)
W76-09512

TYPES AND TREATMENT OF SEWAGE SLUDGES PRACTICE IN THE FEDERAL REPUBLIC OF GERMANY,
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wassergute-wirtschaft.
M. O. Tabasaran.
In: Radiation for a Clean Environment, Proceedings of a Symposium held at Munich, March 17-21, 1975. IAEA-SM-194/101, p 3-18, 3 fig, 2 tab.

Descriptors: *Sewage disposal, *Environmental sanitation, *Sewage treatment, Sludge treatment, Anaerobic digestion, Bacteria, Drying, Inhibitors, *Waste water treatment, *Sewage sludge.
Identifiers: *Germany.

Sewage treatment plants produce sludge which contains small amounts of solids in large amounts of water. The first step in the treatment of this sludge is a de-watering process. Several processes can be used to increase the solid content of the sludge from the usual 5 - 10%; gravity thickening increases to 15%, centrifuging or straining-band-pressing to 30%, and pressure-filtration to 40%. Drying produces an almost moisture free substance. Before de-watering, the sludge may be mixed with coagulating agents, or preheated, or its colloidal components biochemically oxidized. These processes accelerate de-watering. Sludge which is disposed of along with solid refuse in land fills should not be more than 60-70% moisture. Sludge which has been composted with a carbon carrier can be used as a soil improver. Anaerobic alkaline digestion of sludge is the most common process in use. (See also W76-09512) (Chilton-ORNL)
W76-09513

METHODS FOR REDUCING THE INFECTION HAZARD OF WASTE-WATER SLUDGE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. B. Farrell, and G. Stern.
In: Radiation for a Clean Environment, Proceedings of a Symposium held in Munich, March 17-21, 1975. IAEA-SM-194/102, p19-28, 5 tab, 1 fig, 12 ref.

Descriptors: *Environmental sanitation, *Sludge treatment, Sewage treatment, Sewage disposal, Sludge, Waste water(Pollution), *Infection, Hazards, Irradiation, *Disinfection, *Waste water treatment, Waste water disposal.

The processes in use for stabilizing sludge include anaerobic or aerobic digestion and, for disposal procedures such as disposal to landfills, incineration or disposal to oceans, these processes may be adequate. About 25% of the sludge produced in the United States is used for agricultural purposes and this sludge requires further reduction in the numbers of infectious organisms. Methods for reducing infection hazards are pasteurization, long-term lagooning, thermophilic anaerobic digestion, thermophilic aerobic digestion, and high energy irradiation. The high energy radiation method has several advantages, mainly high reliability, but its greatest disadvantage is its high cost. (See also W76-09512) (Chilton-ORNL)
W76-09514

CURRENT TECHNOLOGY AND ADVANCES IN TRUE RE-USE OF EFFLUENTS,
National Inst. for Water Research, Pretoria (South Africa).
G. G. Cillie.
In: Radiation for a Clean Environment, Proceedings of a Symposium held in Munich, March 17-21, 1975. IAEA-SM-194/103. p 29-43, 7 fig, 8 ref.

Descriptors: *Environmental sanitation, *Water reuse, *Irradiation, Public health, Technology, Disinfection, Waste water treatment, Water treatment.

Water reclamation and re-use is a practical solution to water scarcity in most conditions if adequate precautions are taken in the design and operation of systems to protect public health. Reclaimed water may prove to be a safer and more reliable water supply than those of doubtful origin. Improved radiation technology can ensure complete sterilization and breakdown of organic radicals which may be potentially carcinogenic. The present high costs of radiation and unfavourable economics must be overcome by continuous improvement in nuclear technology. (See also W76-09512) (Chilton-ORNL)
W76-09515

PUBLIC HEALTH ASPECTS OF WASTE-WATER TREATMENT,
Royal Veterinary and Agricultural Coll., Copenhagen (Denmark). Dept. of Veterinary Virology and Immunology.
E. Lund.
In: Radiation for a Clean Environment, Proceedings of a Symposium held in Munich, March 17-21, 1975. LAEA-SM-194/104. p 45-60, 6 tab, 26 ref.

Descriptors: *Environmental sanitation, Waste water(Pollution), *Public health, *Waste water treatment, Pathogenic bacteria, Virusses, Enteric bacteria, Paratitism, Pathology, Disinfection.
Identifiers: Pasteurization.

Reviews are presented of the various bacteria, viruses and parasites found in waste water and polluted waters which are pathogenic to man and the conventional methods for the treatment of these waters. It is concluded that by conventional secondary biological treatment a waste-water may be obtained that contains a very reduced number of pathogens. Chlorination may almost eliminate the bacteria and also influence the amoeba cysts, but the enteric viruses and the parasite eggs are not influenced. In sludges, even after digestion, viruses, some bacteria, and parasite eggs may still be present. Pasteurization may render all these pathogens harmless. (See also W76-09512) (Chilton-ORNL)
W76-09516

RADIATION TREATMENT OF WASTES, A REVIEW,
Atomic Energy Research Establishment, Harwell (England).
F. S. Feates, and D. George.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. LAEA-SM-194/405. p 61-72, 57 ref.

Descriptors: *Environmental sanitation, *Waste treatment, *Irridation, *Reviews, *Ozone, Disinfection, Radiation, Industrial wastes, Sewage sludge.

It has been shown that radiation is effective in degrading organic matter in wastes, destroying pathogenic organisms, and enhancing the sedimentation and filterability of sludges but at an extremely high cost. Since 1973, changes in world energy supplies which affect economic assessments made previously and the environmental hazards of pollution are receiving increased attention so that existing technologies are being re-examined. Ozone produced by gamma-irradiation of air is being used as an alternative to chlorine for sterilization. Radiation presents a possible solution to specific problems associated with industrial wastes. A prototype plant for complete sterilization of sewage sludge in operation. It is seen that there is considerable scope for future work which could affect the economics of radiation treatment. (See also W76-09512) (Chilton-ORNL)
W76-09517

THE NEED FOR THE USE OF HIGH-LEVEL RADIATION IN WATER TREATMENT AND IN WASTE-WATER (SEWAGE) TREATMENT,
Aqueonics, Inc., Los Altos, Calif.
N. E. Nielson.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. LAEA-SM-194/602. p 73-82, 14 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, Water pollution, *Irradiation, Sewage treatment, Gamma rays, Disinfection, *Water treatment.

The need for use of radiation in water treatment is discussed in light of the fact that even after primary and secondary treatments and chemical disinfection, significant quantities of contaminants are still present in sewage. The paper points out that a great deal of energy is required in the use of known techniques for the removal of these contaminants and that a more complex set of conditions must be considered in effective water pollution elimination. Gamma radiation is identified as the most reliable cost-effective, generally efficient technique in the tertiary stages and that its effectiveness can be expanded with the addition of

select chemicals to increase the number of ionizations and/or to capitalize upon surface charge phenomena. (See also W76-09512) (Chilton-ORNL)
W76-09518

SURVEYS ON RADIATION-RESISTANT ASPOROGENIC BACTERIA IN NATURAL ENVIRONMENTS,
Tokyo Univ. (Japan). Lab. of Radiation Genetics.
For primary bibliographic entry see Field 5C.
W76-09519

VIRUSES AND IONIZING RADIATION IN RESPECT TO WASTE-WATER TREATMENT,
Massachusetts Institute of Technology, Cambridge, Massachusetts, Department of Nutritution and Food Science.
H. S. Lemke, and A. J. Sinskey.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. LAEA-SM-194/203. p 99-120, 7 tab, 8 fig, 73 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Radiation, *Viruses, Disinfection, *Ions.
Identifiers: *Ionizing radiation.

A survey is presented on viruses, the diseases they can cause in man, and the effects of ionizing radiation on viruses. In conclusion it was stated that ionizing radiation inactivates viruses by direct and indirect effects. The radiosensitive target is the nucleic acid and the degree of radiosensitivity is affected by temperature and the suspending menstruum. The role of oxygen in radiosensitization of viruses remains unclear. The effective application of radiation treatment of waste-waters requires information on the number of plaque-forming units per ml for dose determination. (See also W76-09512) (Chilton-ORNL)
W76-09520

DISINFECTION OF SLUDGE AND WASTE-WATER BY IRRADIATION WITH ELECTRONS OF LOW ACCELERATING VOLTAGE,
Polymer-Physik G.m.b.H., Co., Kg., Tuebingen (West Germany).
P. Holl, and H. Schneider.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/301. p 123-138, 7 fig, 8 tab, 9 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Irradiation, *Sludge treatment, Costs, Disinfection.
Identifiers: Low accelerating voltage, *Electron accelerator.

The use of natural ionizing radeation or electron radiation of high accelerating voltage has encountered some opposition because the radiation cannot be stopped, and the investment cost of electron accelerators having an accelerating voltage of more than 1 MV is very high. These disadvantages may be overcome by using an electron accelerator of low accelerating voltage. Agitation of the substrate during irradiation allows a thick layer of sludge to be irradiated. The advantages of this method are less costly radiation shielding, complete absorption of the radiated energy by the substrate, and low investment and operating cost. The sterilizing effect of the process is produced by secondary reactions that take place in the water in addition to the primary reactions. (See also W76-09512) (Chilton-ORNL)
W76-09521

BIOLOGICAL EFFECTS OF HIGH-ENERGY ELECTRON IRRADIATION OF MUNICIPAL SLUDGE,
Massachusetts Inst. of Tech. Cambridge.
For primary bibliographic entry see Field 5C.
W76-09522

TREATMENT OF SEWAGE SLUDGE WITH COMBINATIONS OF HEAT AND IONIZING RADIATION (THERMORADIATION),
Sandia Labs., Albuquerque, N. Mex.
H. D. Sivinski.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/303. p 151-167, 16 fig, 32 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, *Sludge treatment, *Irradiation, Heat, Time, *Heat treatment, Waste treatment, Pathogenic bacteria.
Identifiers: *Thermoradiation, Synergism, Sewage pathogens.

This research deals with inactivation of sewage pathogens by means of heat and ionizing radiation (gamma) applied singly and thermoradiation, heat and ionizing radiation applied simultaneously. The data indicated treatment time at temperature can be reduced with ionizing radiation or radiation dose can be reduced significantly by adding heat. When thermoradiation combinations are properly chosen, synergism is observed with aerobic and anaerobic spores, vegetative cells, viruses and enzymes which can result in up to 30-fold reduction in treatment times. (See also W76-09512) (Chilton-ORNL)
W76-09523

SYNERGISTIC EFFECTS OF IRRADIATION OF WASTE-WATER.
Florida Inst. of Tech., Melbourne. Univ. Center for Pollution Research.
D. D. Woodbridge, P. C. Cooper, A. J. Van den Berg, H. D. Musselman, and H. N. Lowe.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/304. p 169-189, 20 fig, 2 tab, 10 ref. DAAK-02-71-C-0296.

Descriptors: *Environmental sanitation, *Waste water treatment, *Irradiation, Aqueous solutions, Bacteria, *Bactericides.
Identifiers: Synergism, Hydrated electron.

A mathematical/statistical analysis of the data indicates that irradiation kills bacteria more readily in a large aqueous environment than in a normal radiation chamber. These results can be best explaned by the creation of the hydrated electron which acts as a highly reactive negative ion. The reducing effects of this ion can account for many of the organic and inorganic reactions observed in aqueous solutions. Comparison of the effectiveness of irradiation on a solution of buffered distilled water containing bacteria and secondary effluent showed a shielding condition with the more turbid effluent. Small amounts of chlorine in the effluent appeared to produce a reduction in the effectiveness of the irradiation but large doses of chlorine produced a definite synergistic effect. (See also W76-09512) (Chilton-ORNL)
W76-09524

GAMMA IRRADIATION FOR SEWAGE TREATMENT AT US ARMY FACILITIES,
Army Facilities Engineering Support Agency, Fort Belvoir, Va. Research and Technology Div.
A. J. Van den Berg, H. D. Hollis, H. D. Musselman, H. Lowe, and D. D. Woodbridge.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/305. p 191-196, 12 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, *Irradiation, Radioisotopes, Gamma rays.
Identifiers: *Synergism, Electron accelerators.

Initial investigations in the laboratory assessed the effects of gamma radiation from a cobalt-60 source on fecal coliform, M-pyogenes and M-smematis organisms and on such common constituents of sewage as phenol, surfactants, and pesticides. Current research uses effluent from a municipal sewage plant and substitutes fecal streptococcus for M-smegmatis as a test organism. The previously noted synergistic effect of chlorine was achieved only in the presence of relatively large concentrations of chlorine at tthe time of irradiation. The work is directed toward the effects of gamma irradiation alone and in combination with chlorine and oxygen on sewage sludge and on the cyst stage of protozoa. High-energy radiation from isotopic sources or from electrically powered accelerators would be equally effective but isotopic sources are recommended for installations the size of US Army posts. (See also W76-09512) (Chilton-ORNL)
W76-09525

SCOPE FOR UTILIZING GAMMA RADIATION FOR MICROBIOLOGICAL CONTROL OF SEWAGE WASTE-WATER IN INDIA,
Bhabha Atomic Research Centre, Bombay (India). Biochemistry and Food Technology Div.
N. F. Lewis.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/307. p 197-202, 1 tab, 2 fig, 10 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Irradiation, Agriculture, Gamma rays, Sewage treatment, Water reuse.
Identifiers: *India.

In sewage treatment plants in India, conventional methods of treatment are used, the secondary effluent is emptied into the sea or, after treatment with chlorine, may be used for land irrigation. However, these methods do not adequately render the effluent safe for agricultural use. The secondary effluent has a comparatively low microbial count and preliminary studies indicate that radiation doses in the range of 0.1-0.3 Mrad would suffice for elimination of pathogens. The dose of radiation required can be reduced several fold if irradiation is carried out in the presence of certain chemicals. (See also W76-09512) (Chilton-ORNL)
W76-09526

SANITARY EFFECT OF GAMMA IRRADIATION ON SEWAGE SLUDGE,
Zurich Univ. (Switzerland). Veterinary Bacteriological Inst.
E. Hess, and C. Breer.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/308. p 203-308, 4 fig.

Descriptors: *Environmental sanitation, Sewage treatment, Irradiation, *Pathogenic bacteria, *Salmonella, Bacteria, Sewage sludge, Gamma rays, Enteric bacteria.
Identifiers: Pasteurization.

It was found that neither aerobic stabilization nor anaerobic digestion significantly reduced sludge contamination with Salmonellae which was present in more than 90% of the samples. Salmonellae in sewage sludge spread on grass survived up to 72 weeks. In a model experiment of the sanitary effect of pasteurization and gamma irradiation, 259 samples from 44 different sewage disposal plants were examined. A linear reduction of Enterobacteria was found with increasing doses of gamma radiation. The sanitary effect of gamma irradiation with 300-350 krad was equivalent to the effect of heat treatment by pasteurization. (See also W76-09512) (Chilton-ORNL)
W76-09527

ATA ON THE DISINFECTION OF LIQUID IANURE BY GAMMA IRRADIATION AT AJA, HUNGARY,
eterinary Sciences Univ., Budapest (Hungary).
Simon, and G. Tamasi.
n: Radiation for a Clean Environment, roceedings of a symposium held in Munich, larch 17-21, 1975. IAEA-SM-194/306. p 209-216, fig, 2 tab, 13 ref.

escriptors: *Waste treatment, *Farm wastes, Irradiation, Aerobic bacteria, Anaerobic bacria, Salmonella, Clostridium, *Disinfection.
lentifiers: Radiosterilization, *Hungary.

he disinfection of liquid manure by gamma irdiation was investigated. Aeration of the sample id not increase the effectiveness of the adiosterilization treatment. No great differences ere observed in the radiosensitivity of the aeroic and anaerobic microbes. Aerobic spores were ore sensitive than the vegetative Clostridia. elatively low radiation doses were needed to liminate Salmonellae in liquid manure. Gamma terilization cannot be used as a practical operaon against Mycobacteria because too high radiaon doses are needed for the total elimination of ese micro-organisms. (See also W76-09512) Chilton-ORNL)
V76-09528

QUEOUS RADIATION CHEMISTRY IN RELATION TO WASTE TREATMENT, AN INTRODUCTORY REVIEW,
Edgenoessische Technische Hochschule, Zurich Switzerland). Inst. for Aquatic Sciences and Water Pollution Control.
. Hoigne.
n: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/401. p 219-232, fig, 2 tab, 24 ref.

Descriptors: Chemistry, *Radiation, Waste treatment, Chemical reactions, Radiation.
dentifiers: *Radiation chemistry.

Because of possible competing reactions, the adiation sequences initiated by radiation do not roduce efficient pathways for solving chemical roblems in waste treatment. The reagents formed y the primary radiolytic species are too expensive o compete with conventional chemical reagents. Radiation chemistry is of interest in discussing waste problems because of its contribution to knowledge about reaction kinetics in water and because chemical effects are the basis of biological effects caused by radiation. (See also W76-09512) (Chilton-ORNL)
W76-09529

RADIATION CHEMICAL DESTRUCTION OF PHENOL IN OXYGENATED AQUEOUS SOLUTIONS,
Institut za Nuklearne Nauke Boris Kidric, Belgrade (Yugoslavia).
D. I. Micic, M. T. Nenadovic, and V. M. Markovic.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/402. p 233-239, 1 fig, 1 tab, 20 ref.

Descriptors: Chemistry, *Chemical degradation, Organic compounds, *Phenols, Radiation, Aqueous solutions, *Oxygenation.

The purpose was to study the reaction mechanism of phenol decomposition in irradiated aqueous solution to obtain information necessary to evaluate the applicability of this method to processing phenol waste-waters. The study showed the possibility of a significant increase in the phenol decomposition yield in aqueous solutions. The low dose rate, high phenol concentrations and presence of oxygen are conditions under which the chain reaction occurs and result in high decomposition yield, up to several hundreds. Because of the concentration dependence of G(-phenol) the method can only be used for a relatively low factor of destruction. The presence of other organic compounds probably has no significant influence on the decomposition yield but inorganic ions terminate the chain reaction. A very low dose rate has to be used and this necessitates a long treatment time. (See also W76-09512) (Chilton-ORNL)
W76-09530

EFFECTS OF GAMMA RADIATION FROM CO60 ON DILUTE AQUEOUS SOLUTIONS OF LINEAR ALKYL SULFONATE SURFACTANTS AND OTHER ORGANIC POLLUTANTS,
Florida Inst. of Tech., Melbourne.
D. M. Rohrer.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/404. p 241-248, 3 fig, 17 ref.

Descriptors: *Biodegradation, Chemistry, *Chemical degradation, *Radiation, Organic compounds, Surfactants, *Linear alkylate sulfonates, Detergents, Pesticides, Cobalt radioisotopes.
Identifiers: *Cobalt-60.

Linear Alkyl Sulfonate Surfactants are considered biodegradable but the time required for biodegradation is impractical within the present environmental guidelines. The paper presents research findings on alternate techniques of treatment for the destruction of Linear Alkyl Sulfonate Surfactants. The effect of radiation on the surfactant solution was greatly affected by the initial concentration of the test solution. Solutions of greater concentrations than 15 mg/l gave erroneous results due to the small amount of dissolved oxygen available within the fluid. Data indicated that while there was a small increase in the destructive powers of the gamma radiation at lowered dose rates the increase was not significant from a treatment standpoint. In studying the effects of ionizing radiation on pesticides, it was found that there was a reduction in ethyl parathion concentrations of 26% at the end of 8 hours irradiation and of 32% after 24 hours. A substantial ability for radiochemical destruction of this pesticide was indicated. (See also W76-09512) (Chilton-ORNL)
W76-09531

EFFECTS OF GAMMA IRRADIATION ON THE DEGRADATION OF DYES,
Politecnico di Torino (Italy). Instituto di Chimica Industriale.
N. Piccinini, and F. Ferrere.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/407. p 249-264, 3 tab, 6 fig, 24 ref.

Descriptors: Chemistry, *Chemical degradation, *Irradiation, Gamma rays, Organic compounds, *Dyes, Biodegradation.

The effects of gamma irradiation versus the dose, the dye concentration, the pH and the oxygen content of aqueous solution of several classes of dyes was investigated. Anthraquinonic dyes were irradiated in a wide range of doses up to 5 Mrad. It was found that the decolorization process with gamma radiation occurs by radical reactions caused mainly by primary radiolytic species. The highest degradation yields were obtained at low doses and high concentrations; the dissolved oxygen develops a synergic effect and the pH conditions differently influence the degradation according to the dye type. The degradation is associated with oxidation processes and enhanced by solution aeration. (See also W76-09512) (Chilton-ORNL)
W76-09532

POSSIBLE USE OF HIGH-LEVEL RADIATION FOR THE DEGRADATION OF SOME SUBSTANCES PRESENT IN URBAN AND INDUSTRIAL WATERS,
Palermo Univ., Italy, Istituto di Applicazioni e Impianti Nucleari.
C. Cappadona, P. Guarino, E. Calderaro, S. Petruso, and S. Ardica.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/408. p 265-284, 6 fig, 6 tab, 11 ref.

Descriptors: *Waste water treatment, *Chemical degradation, Pollutants, Gamma rays, Organic compounds, *Irradiation, Dyes, Pesticides, Solvents, Industrial wastes.

Tests were conducted on solutions or suspensions of organic solvents, dyes, pesticides and chlorophenols in static and in dynamic aerated systems using commercial products immersed in liquids drawn from industrial waters. Treatment with gamma radiation caused a degradation of these substances which was related to pH, oxygenation and composition of the medium and to the mixture of commercial products. It was generally concluded that benefits from the use of ionizing radiation in the ecological field will be dependent upon the cost of plant and radioactive sources. (See also W76-09512) (Chilton-ORNL)
W76-09533

DEGRADATION OF PERSISTENT ORGANOCHLORINE POLLUTANTS BY GAMMA RADIATION AND ITS POSSIBLE USE FOR WASTE-WATER TREATMENT,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Okologische Chemie.
L. Vollner, H. Rohleder, and F. Korte.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/409. p 285-296, 6 fig, 2 tab, 10 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, Pollutants, Organic compounds, Gamma rays, *Radiation, Chemical degradation.

Radiation yield and degradation chemistry of some organochlorine pesticides, polychlorinated biphenyls and related chemicals subjected to gamma radiation were investigated. It was found that the pattern of hexane extractable compounds obtained from acetone-water and from pure water solutions are not very different when compared by GC-analysis; no distinct main degradation product was detectable in any of the investigated solute-solvent systems but a number of compounds formed simultaneously; and dechlorination and dehydrochlorination were found to be the most important mechanisms of the first attack. Persistent polychlorinated compounds in solution were found to be affected by gamma radiation and if the radiation dose is high enough, these compounds are totally decomposed. (See also W76-09512) (Chilton-ORNL)
W76-09534

COMPARISON OF THE CHEMICAL EFFECTS OF OXONE AND OF IRRADIATION ON ORGANIC IMPURITIES IN WATER,
Edgenoessische Technische Hochschule, Zurich (Switzerland). Inst. for Aquatic Sciences and Water Pollution Control.
J. Hoigne.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/410. p 297-305, 3 fig, 1 tab, 21 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Irradiation, Chemical degradation, Gamma radiation, *Ozone, Oxidation.

In either radiation or ozone treatment of aqueous oxygenated solutions the hydroxyly radicant can become the main species for the oxidation of organic impurities. The oxidizing intermediate produced by ozone was identified by comparing its reaction selectivities with those known for the hydroxyl radicals initiated by high-speed irradiation. From cost comparisons of the two methods it was concluded that ozone is a much cheaper oxidant than radiation and that radiation has to provide other advantages if it is to be considered as an oxidant for the removal of dissolved organics in waste waters. (See also W76-09512) (Chilton-ORNL)
W76-09535

ALTERNATIVE HIGH-LEVEL RADIATION SOURCES FOR SEWAGE AND WASTE-WATER TREATMENT,
Division of Biomedical and Environmental Research (USERDA), Washington, D. C.
D. S. Ballantine.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21 1975. IAEA-SM-194/501. p 309-323, 4 tab, 5 fig, 9 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Radiation, Gamma rays, Radioisotopes, Cost-Benefit analysis, *Sewage treatment.
Identifiers: Electron accelerators.

An electron accelerator or a gamma-ray source of radioactive cobalt or caesium are the present choices of an energy source for the radiation treatment of waste-water or sludge. Several factors will affect the ultimate choice and the potential future adoption of radiation as a treatment technique. The paper reviews these factors and emphasizes the following points: (1) Gamma-ray sources offer advantages of deep penetration capability and adaptability to a variety of geometries; (2) accelerators are characterized by low penetration capability, high dose rates and inflexibility to facility design; (3) the supply of radiosotopic power is contingent upon the growth of nuclear power plants and fuel separation plants; (4) accelerators offer a six- to ten-fold advantage in initial capital cost and a two-fold advantage in overall operating cost and could provide unlimited radiation power; and (5) applications will be limited to areas that can tolerate costs in the range of $1-2 / 1000 gallons. (See also W76-09512) (Chilton-ORNL)
W76-09536

USE OF HIGH-POWER ELECTRON BEAM RADIATION FOR THE TREATMENT OF MUNICIPAL AND INDUSTRIAL WASTES,
Radiation Dynamics, Inc., Westbury, N. Y.
M. R. Cleland, J. P. Farrell, R. L. Malnati, and K. H. Morganstern.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. LAEA-SM-194/502. p 325-342, 6 fig, 3 tab, 1 append, 17 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Radiation, Industrial wastes, Costs, Municipal wastes, Water quality.
Identifiers: Electron accelerators.

The technology involved in the recent development of electron beam accelerators can be applied to the irradiation of waste materials. These accelerators can provide 150 kW of useful beam power for continuous service and could process 3.1 million gallons daily of water to an average dose of 0.1 Mrad at a unit cost of about $0.22 per 1000 gallons. Systems for large-scale application delivering up to a megawatt of power would further reduce the radiation processing cost and increase the capacity to about 22 million gallons daily. While the cost would not be competitive with conventional treatment methods, the improved quality of the effluent material and the reduced burden on the environment may justify the use of this kind of radiation in advanced waste treatment processes. (See also W76-09512) (Chilton-ORNL)
W76-09537

PROSPECTS FOR HIGH-ENERGY ELECTRON IRRADIATION OF WASTE-WATER LIQUID RESIDUALS,
Massachusetts Inst. of Tech., Cambridge.
J. G. Trump, K. A. Wright, E. W. Merrill, A. J. Sinskey, and D. Shah.
In: Radiation for a Clean Environment, Proceeding of a symposium held in Munich, March 17-21 1975. LAEA-SM-194/503. p 343-354, 5 fig, 17 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Radiation, Radioisotopes, Safety factors, Costs.
Identifiers: *Electron accelerators.

A proposal is presented to set up a high-energy electron research facility at Boston's MDC wastewater treatment plant. The system, powered by a commercial 50kW electron accelerator, could treat 100 kilogallons of selected materials to a dose of 400 kilorads daily. The penetration, irradiation time, safety, flexibility and availability of the ionizing energy produced by electron accelerators is compared to that from radioisotopes. High-energy electrons from machine source are believed to possess the greatest advantages in safety, adequacy and economy for waste treatment. (See also W76-09512) (Chilton-ORNL)
W76-09538

AN ELECTRON ACCELERATOR WITH ELECTRONS OF LOW-ACCELERATING VOLTAGE FOR IRRADIATING SEWAGE SLUDGE AND WASTE WATER,
Polymer-Physik G.m.b.H., Co., Kg., Tuebingen (West Germany).
P. Holl, and H. Schneider.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21 1975. LAEA-SM-194/506. p 355-358, 3 fig.

Descriptors: *Waste water treatment, *Irradiation, Sewage treatment, Sludge treatment, Sewage sludge.
Identifiers: *Electron accelerators.

An accelerator with high-vacuum insulation and an operating voltage of 400 kV is described. The high-voltage strength of an accelerator is achieved by the interposing of screen cylinders maintained on definite potentials by resistors. Insulating pressure gas is not required. Findings have shown that such beams will be sufficient to irradiate liquid materials if the sewage sludge or waste water is mixed thoroughly during the irradiation process. (See also W76-09512) (Chilton-ORNL)
W76-09539

PRACTICAL ASPECTS OF THE PASTEURIZATION OF SEWAGE SLUDGE BY ELECTRON IRRADIATION,
Allgemeine Elektricitaets-Gesellschaft, AEG-Telefunken, Hamburg (West Germany).
M. Tauber, E. G. Hofmann, and B. P. Offermann.
In: Radiation for Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/509. p 359-366, 4 tab, 1 fig, 5 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, *Irradiation, Safety, Economics, *Disinfection, Waste treatment.
Identifiers: *Electron accelerators, *Pasteurization.

Investigations have shown that radiation pasteurization is the most preferable treatment for disinfection of sewage sludge. Irradiation doses in the region of 200 krad achieve high degrees of bacterial disinfection and the filterability increases with this method. It is stated that radioisotope sources are considered to be neither economic or safe. The practical aspects of commercial process lines for electron irradiation are considered in terms of the effectivity of the electron radiation process, limited penetration of electrons into material, beam power of electron accelerators, safety aspects, economics, and environmental aspects. (See also W76-09512) (Chilton-ORNL)
W76-09540

FISSION PRODUCT GAMMA-RAY SOURCES AS AN ALTERNATIVE TO COBALT-60 SOURCES FOR SEWAGE SLUDGE STERILIZATION,
Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen (Switzerland).
V. R. D. Herrnberger.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/505. p 367-389, 8 fig, 10 tab, 13 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, Sludge treatment, *Gamma rays, *Irradiation, Disinfection, Costs, Cobalt radioisotopes, Sewage sludge, *Waste water treatment.
Identifiers: *Cobalt-60.

The types of sources considered as alternatives to Co 60 for sterilization of sewage sludge were spent fuel elements, mixtures of solidified fission products, and isolated solidified fission products such as Cs 134,137. Costs of these types is compared to Co 60 costs for specific plants. The results indicate that the profitability of fission products as gamma sources cannot be questioned when compared with Co 60. Results depend on encapsulation costs and on the amount of self-absorption losses. The integrated facilities and caesium versions appear to be most attractive from the viewpoints of cost and safety. (See also W76-09512) (Chilton-ORNL)
W76-09541

COSTS AND HYGIENIC NECESSITY OF SEWAGE SLUDGE PASTEURIZATION IN SWITZERLAND,
Edgenoessische Technische Hochschule, Zurich (Switzerland). Inst. for Aquatic Sciences and Water Pollution Control.
W. Obrist.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/507. p 391-397, 2 tab, 3 fig, 4 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, Sludge treatment, Disinfection, *Costs, Public health, Sewage sludge, Waste treatment, Heat treatment.
Identifiers: *Switzerland, *Pasteurization.

Cost factors of six different plants using heat treatment methods for pasteurization of sewage sludge were determined. Data indicated the specific cost figures were between S.Fr. 3.- and 14.- per cubic metre, depending mainly on capacity and actual output of the plant. In the question of the necessity of pasteurization, energy, economic and ecological aspects were considered. It was stated that stabilized but not disinfected wastewater sludges may be applied to crop land and intensive farming throughout the year after harvesting and to grassland during the winter season. Only in regions with predominantly grassland agriculture may pasteurization of sludge be generally introduced. (See also W76-09512) (Chilton-ORNL)
W76-09542

ONSIDERATIONS IN THE PUBLIC ACEPTANCE OF SEWAGE SLUDGE IRRADIAION SYSTEMS,
tomic Energy Commission, Washington, D. C.
. P. Dix.
: Radiation for a Clean Environment, roceedings of a symposium held in Munich, arch 17-21, 1975. IAEA-SM-194/508. p 399-408, fig, 5 ref.

escriptors: *Sanitary engineering, *Irradiation, Sewage treatment, Safety, Information xchange, Sewage sludge, *Attitudes, Waste treatent.
lentifiers: Public acceptance(Wastes).

ludge irradiation have a high potential for benefit hen viewed from the standpoints of reduced conmer costs, minimization of public risk and nhancement of the quality of life and the environent. Design, procedural and administrative afeguards of the plant must be fully explained to ispel public concern in these areas and particurly the concern that the contents of the source an be released to the sludge accidentally. This is een as the main issue in public acceptance. (See lso W76-09512) (Chilton-ORNL)
/76-09543

HE WASTE-WATER AND SLUDGE RE-USE ROJECT BY GAMMA IRRADIATION AT ECSKEMET, HUNGARY, SOME APROACHES AND INVESTIGATIONS,
hylaxia Vaccine and Feedstuff-Producing Enterise, Budapest (Hungary).
. Simon, F. Gacs, and A. Urban.
n: Radiation for a Clean Environment, roceedings of a symposium held in Munich, larch 17-21, 1975. IAEA-SM-194/603. p 411-417, fig, 2 tab, 4 ref.

Descriptors: *Sanitary engineering, *Waste water reatment, *Sludge treatment, *Irradiation, Disinection, Gamma rays,.Water reuse, Gamma rays, Cobalt radioisotopes.
dentifiers: Hungary, Cobalt-60.

Before the start of the gamma radiation project, he waste-water samples were found to be positive n regard to Salmonella bacteria and to Staphylococcus aureus, Pseudomonas aeruginosa nd bacteria from the Proteus group. After irradiaion the samples were investigated and generally it vas established that, parallel with the increasing lose of Co 60 gamma radiation, the values of the nvestigated parameters(biological, bacteriological nd chemical) decreased significantly. The most ignificant reduction was found in the numbers of nyco-bacteria, faecal coliforms, and in the Pseudomonas aeruginosa. The irradiation facility combines the advantages of continuous operation vithout dead time with a high utilization factor of he energy emitted and a proposed good nomogeneity of the irradiation. (See also W76-09512) (Chilton-ORNL)
W76-09544

PILOT PLANT EXPERIENCE IN THE TREATMENT OF INDUSTRIAL AND MUNICIPAL WASTE-WATER BY MEANS OF RADIATION-INDUCED OXIDATION,
nternational Purification Systems, Inc., Atlanta, Ga.
W. C. Hay.
n: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/601. p 433-446, 7 tab, 2 fig, 3 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, Radiation, *Oxidation, Bacteria, Recycling, Chemical oxygen demand, Biochemical oxygen demand, *Pilot plants, Disinfection, *Irradiation, Treatment facilities.

The pilot plant utilizes the principle of adsorption of organics from waste-water to activated carbon and dynamic regeneration of the carbon by radiation induced oxidation. Operations of a pilot plant designed and constructed to process wastewater bearing an organic concentration of 100 ppm at a flow rate of 5000 gallons daily required strict adherence to and consideration of the design capacity. Variations in flow rate must be made in direct proportion to the organic contents of the wastewater. COD and BOD reduction, colour and odour elimination were found to be directly related to the quantity of dissolved oxygen in the waste-water and the radiation dose. Bacteria kills ranged above 95% with the coliform bacteria kill being 99%. The primary goal of the work was to reduce COD, BOD and bacteria content to a level acceptable for discharge into navigable waters but it was found that the process yields a water product suitable for recycle. (See also W76-09512) (Chilton-ORNL)
W76-09545

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE; DESIGN, OPERATION EXPERIENCE AND COST CALCULATIONS AFTER 18 MONTHS OF CONTINUOUS RUNNING,
Planungs-und Betriebsbure des Abwasserverbandes Ampergruppe, Eichenau (West Germany).
T. Lessel, H. Motsch, E. Hennig, A. Suess, and A. Rosepule.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/604. p 447-464, 4 tab, 9 fig, 6 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Irradiation, *Pilot plants, *Sewage treatment, Design, Operations, Costs, Performance, Treatment facilities, Sewage sludge.

Although the plant was intended to carry a daily load of 150 cubic meters of sludge to be irradiated at a dose of 300 krad, for testing purpose the load has been only 30 cubic meters per day. Difficulties were encountered with dirt accumulating in the filter of the cooling circuit and with the formation of chemical deposits in the plant. Significant alterations were made and a regular weekly rinsing to prevent the dirt accumulation is carried out. Results show that the plant can be operated economically as compared with heat treatments and without specially trained personnel. (See also W76-09512) (Chilton-ORNL)
W76-09546

DOSIMETRY AT A HIGH-ACTIVITY CO60 WASTE TREATMENT FACILITY,
Gellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany).
Institut fuer Strahlenschutz.
D. F. Regulla, G. Schurmann, and A. Suess.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/605. p 465-476, 11 fig, 1 tab, 6 ref.

Descriptors: *Environmental sanitation, *Waste treatment, *Irradiation, Radioisotopes, Treatment facilities, Cobalt radioisotopes.
Identifiers: Dosimetry, *Cobalt-60.

The pilot study was performed at a radiation waste treatment facility which used a 150 kCi Co60 source. The dosimetry problem arose from the radiation field being highly discontinuous in dose-rate and unknown with respect to the effective photon energy distribution. Difficulties also existed in determining the degree of dose homogeneity over the whole sludge filling and the fact that the dose meters passed a turbo pump. The discoloration of silver-activated metaphosphate glass was the method used for the dosimetry program and for purposes of energy-independent reference dosimetry, a TL technique using lithium was employed. Both systems were checked against a chemical dose meter on an iron sulfate basis for control purposes. (See also W76-09512) (Chilton-ORNL)
W76-09547

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, BACTERIAL AND PARASITOLOGICAL STUDIES AFTERIRRADIATION.
Institut fur angewandte Hygiene, Munich (West Germany).
I. Wizigmann, and F. Wursching.
In: Radiation for a Clean Environment, Proceedings of a symposium held at Munich, March 17-21, 1975. IAEA-SM-194/606. p 477-484, 5 tab, 7 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, *Waste treatment, *Irradiation, Radioisotopes, Bacteria, Disinfection, *Parasitism, *Pilot plants, Bactericides, Sewage sludge, Treatment facilities.

Mechanical-biological treatment of sewage sludge reduced the total bacterial count and that of the Enterococces by 2 log and the Enterobacteria by 3 and 4 log. In 25 unirradiated samples of digested sludge, Salmonella was present in 16. With irradiation, further reduction of viable micro-organisms was attained. Of 40 samples, after irradiation 38 were free of Salmonella. The results of the model experiments showed that susceptibility of micro-organisms varies with different species. In parasitological experiments, after irradiation no visible microscopic change was found in the eggs of Ascaris suum. Segmentation was delayed and further development of the egg ceased after the morula formation. Segment outlines were hazy after three weeks of incubation and the segments themselves showed degenerative changes. (See also W76-09512) (Chilton-ORNL)
W76-09548

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, EXPERIMENTS ON THE INACTIVATION OF VIRUSES IN SEWAGE SLUDGE AFTER RADIATION TREATMENT,
Landesuntersuchungsamt fuer das Gesundheitswesen Sudbayern, Munich (West Germany).
C. Epp.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/607. p 485-490, 3 tab, 13 ref.

Descriptors: *Environmental sanitation, *Waste treatment, *Sewage treatment, *Irradiation, *Pilot plants, *Viruses, Disinfection, Sewage sludge, Treatment facilities.

Depending on the time of the year samples were taken, the presence of one or more virus types was found in impure sewage water. Viruses were determined eight times with 33 digested sludge samples before hygienization and twice with the 33 samples after hygienization. One radiation volume was infected with attenuated polio virus type I packed into capsules. After hygienization, the capsules were recovered and the virus content was found to have been reduced more than 90%. (See also W76-09512) (Chilton-ORNL)
W76-09549

EFFECTS OF GAMMA RADIATION AT PILOT PLANT LEVEL COMPARED WITH THE EFFECTS OF PASTEURIZATION ON THE DEWATERING OF SEWAGE SLUDGE,
Association Euratom-ITAL, Wageningen (Netherlands).
A. F. Groneman.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/608. p 491-502, 4 tab, 3 fig, 12 ref.

Descriptors: *Waste treatment, Chemical properties, Physical properties, Sludge, Filtration, *Irradiation, Disinfection, Sewage sludge, *Pilot plants, Treatment facilities, *Dewatering, Gamma rays.
Identifiers: *Pasteurization.

Results of this investigation indicated that gamma irradiation considerably improved the dewatering characteristics of two anaerobically digested sludges. The specific resistances of sludges were significantly reduced by 300 krad of gamma irradiation in laboratory experiments as well as in full-scale experiments. Information obtained from filterability tests was confirmed by plant operators. The conditioning effect of gamma radiation persisted for more than 20 days, indicating permanent changes in the physical-chemical sludge properties that govern the dewatering of sludge. Pasteurization deteriorated dewatering characteristics, increasing the specific resistance to values that were roughly four times as high as the values in irradiated sludge. (See also W76-0951) (Chilton-ORNL)
W76-09550

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, RESULTS ON THE EFFECT OF DIFFERENTLY TREATED SEWAGE SLUDGE ON PLANTS AND SOIL,
Bayerische Landesanstalt fuer Bodenkultur Pflanzenbau und Pflanzenschutz, Munich (West Germany).
A. Suess, A. Rosopule, H. Borchert, T. Beck, and J. Bauchhenss.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/609. p 503-533, 9 fig, 14 tab.

Descriptors: *Environmental sanitation, *Waste treatment, Sewage sludge, *Irradiation, Heat treatment, Soils, Plant physiology, Treatment facilities.

Experiments indicated that the treatment of sewage sludge may be less important than soil properties and water capacity. Greenhouse studies indicated that there is a slightly better effect from irradiated sludge than from untreated sludge but that heat-treated sludge gives a decrease of desireable effects. Smaller microbial activites were usually found after applications of heat treated sludge but there was little difference noticed between activity with untreated and irradiated sludge. Depending on the type of soil, studies showed an increase in the effective field capacity after the application of sewage sludge with the best effects often occurring with irradiated sludge. (See also W76-09512) (Chilton-ORNL)
W76-09551

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, ANALYTICAL STUDIES ON SEWAGE SLUDGE AND PLANT MATERIAL,
Technische Universitaet, Munich (West Germany). Institut fuer Radiochemie. Bayerische Landesanstalt fuer Bodenkultur, Pflanzenschutz, Munich (West Germany).
A. Rosopule, I. Fiedler, H. Staerk, and A. Suess.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/610. p 535-551, 10 tab, 2 fig.

Descriptors: *Analytical techniques, *Sewage treatment, Sludge, Heat treatment, Radiation, Nutrient removal, Treatment facilities, *Pilot plants, Trace elements, Sewage sludge, *Irradiation, Waste treatment.

Analytical studies conducted over a year's time showed that there is little difference in mineral contents and trace elements occurring in the sludge. Heat treatment tended to increase the ammonium content up to 70% over untreated sludge. Radiation treatment showed no changes in the sludge up to a pH of 8 and above that pH losses of ammonium were observed. Dewatering decreased the content of alkali elements, potassium, sodium, and ammonium, in the sludge but no change was found in other materials. (See also W76-09512) (Chilton-ORNL)
W76-09552

RECENT ADVANCES IN THE TREATMENT OF SOLID WASTES,
Technion-Israel Inst. of Tech., Haifa.
G. Shelef, and M. Lapidot.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/702. p 555-577, 7 fig, 1 tab, 128 ref.

Descriptors: *Solid wastes, *Recycling, *Waste treatment, *Reviews, Economics, *Bibliographies, Waste disposal.

This review paper discusses sanitary and safe disposal of solid wastes from the view point of resource recovery of raw material and energy. Conventional disposal methods such as landfilling, incineration and composting are described as well as comminution and separation techniques. The separation techniques include gravity separation, aerodynamic separation and magnetic and electrostatic separation. It is emphasized that the inherent values of the various components of solid wastes, in the form of recoverable, recyclable, and re-usable materials and energy, can provide the basis of an economic and safe solution to the disposal. (See also W76-09512) (Chilton-ORNL)
W76-09553

USE OF SEWAGE SLUDGE AS FODDER,
Batelle-Institut e.V., Frankfurt am Main, (West Germany).
W. Schonborn.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/701. p 579-588, 6 tab, 2 fig, 24 ref.

Descriptors: *Environmental sanitation, *Sewage sludge, Sewage treatment, *Foods, Nutrients, *Disinfection, Waste treatment.

One possible way of utilizing the protein and vitamin content of sewage sludges would be their use as fodder. It is recognized that a number of objections, (the presence of pathogenic bacteria, toxic substances (especially carcinogens), quantities of heavy metals, and some species of microorganisms,) exist to the use of sludge as fodder. The author feels that these objections can be overcome by disinfection of the sludge and cites instances of successful feeding experiments. (See also W76-09512) (Chilton-ORNL)
W76-09554

POTENTIAL OF RADIATION STERILIZATION IN SOLID WASTE TREATMENT, A STATUS REPORT,
Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Centre.
R. Padova, M. Lapidot, M. Molco, and I. Ross.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/703. p 589-599, 3 tab, 38 ref.

Descriptors: *Environmental sanitation, *Solid wastes, Radiation, Disinfection, Foods, Animals, Reviews, *Waste treatment, *Irradiation.

The particular character of household garbage and of agricultural wastes renders it unsuitable for solid waste resource recovery techniques at present in use but the high nutrient content of the putrescible matter contained in the garbage render it particularly suitable for direct conversion into animal feeds. Sterilization by steam autoclaving is unsatisfactory because of the unpredictable penetration of the steam and the frequent re-contamination during cooling. Gassing with methyl bromide is not safe because of the absorption of methyl bromide in some of the components of the product. The high potential of ionizing radiation in the processing of putrescible matter into animal food is, thus, clearly indicated although not yet permitted in many countries. A pilot plant which processes 200-300 tons/day demonstrates the economic and technological feasibility of the ionizing radiation process. (See also W76-09512) (Chilton-ORNL)
W76-09555

RADIATION RECYCLING PROCESS OF WASTE POLY(TETRAFLUORETHYLENE) SCRAP,
Kyoto Univ., (Japan). Faculty of Engineering.
V. T. Kagiya, and M. Hagiwara.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/704. p 601-612, 6 tab, 4 fig, 4 ref.

Descriptors: *Solid wastes, *Radiation, Gamma rays, *Recycling, *Plastics, *Waste treatment, Industrial wastes.
Identifiers: Poly(Tetrafluorethylene).

Conventional methods for recycling of poly(tetrafluorethylene) (PTFE) are unsatisfactory for chemical and physical reasons. The paper describes a radiation procedure which produces PTFE in the form of a fine powdery wax. The decontaminated PTFE is irradiated with gamma rays up to 5-20 Mrad at room temperature and is then heated at 250-300 degrees C for 5-10 hours. The product is easily pulverized to a fine powder. The radiation process reduces the evolution of toxic fluorine-containing compounds which result from thermal decomposition. Irradiated scrap is more easily pulverized than non-irradiated scrap. (See also W76-09512) (Chilton-ORNL)
W76-09556

OPTIMAL ACTIVATED SLUDGE DESIGN UNDER UNCERTAINTY,
Auburn Univ., Alabama. Dept. of Chemical Engineering.
A. R. Tarrer, C. P. L. Grady, Jr., H. C. Lim, and L. B. Koppel.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE3, Proceedings paper No. 12207, p 657-673, June 1976. 5 tab, 2 fig, 28 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Design, *Optimization, *Economic analysis, *Computer programs, Capital costs, Operations research, Effects, Constraints, Mathematical models, Algorithms, Equations, *Risks.
Identifiers: Sensitivity analysis.

Designers of wastewater treatment processes must recognize and deal with the interactions among individual operations in the process stream if optimum designs are to be achieved. Care must be exercised in the use of sophisticated optimization techniques, however, if realistic as well as economic designs are to result. This article describes a mathematical model of the liquid process train (primary settler, aeration basin, final settler, chlorination) of the activated sludge process and its use to obtain the optimum design required to meet specified criteria for effluent soluble organics and suspended solids concentrations with a desired degree of confidence. Provisions were made for incorporating the uncertainty associated with experimentally determined parameters. The final settler model included both clarification and thickening functions and it was found that the clarification term exerted a strong

ffect upon the final design. Liquid-solid separaon parameters were found to be as important as iological kinetic parameters in determining the ptimum design. Treatment cost was found to be elatively insensitive to the mean cell residence me or the suspended solids removal efficiency, lthough those items exerted significant effects pon the sizes of the individual unit operations. Bell-Cornell)
V76-09628

EAST COST DESIGN OF ACTIVATED LUDGE SYSTEMS,
Cornell Univ., Ithaca, N. Y. Dept. of Environmenl Engineering.
. C. Middleton, and A. W. Lawrence.
ournal Water Pollution Control Federation, Vol. 8, No. 5, p 889-905 May 1976. 11 fig, 11 tab, 17 ef.

Descriptors: *Activated sludge, *Design, *Waste vater treatment, *Optimization, *Costs, Operaon and maintenance, Constraints, Cost allocaon, Mathematical models, Systems analysis.
dentifiers: *Cost minimization.

resented is a realistic, comprehensive approach or the cost optimization of an integrated activated ludge system consisting of a liquid treatment rocess train and a sludge disposal process train. he method is based on the most recent steadytate unit process models and leads to rational esigns. Biological solids retention time is used as he primary independent design variable. The opimization problem is formulated by combining the quations for the various unit process models with he cost equations into an objective function. The bjective function is then minimized within the aceptable design range of the independent variales. Optimal designs to several treatment situaions are presented and discussed. Specifically, he change in the optimal design with changes in nfluent waste strength, influent waste flow, ludge settling characteristics, and sludge dispoal rocess trains is given. Analysis of the optimal lesign emphasizes the allocation of costs to the arious unit processes. (Bell-Cornell)
V76-09638

ANAEROBIC TREATMENT OF LEACHATE WITH HIGH SODIUM CONCENTRATIONS,
Northeastern Univ., Boston, Mass. Dept. of Civil Engineering.
. W. Holmes, and F. C. Blanc.
ournal of the Boston Society of Civil Engineers ection, American Society of Civil Engineers, ol. 62, No. 3, p97-114, October 1975. 9 fig, 10 tab, 5 ref.

Descriptors: *Leachate, Control, *Waste water reatment, *Water quality control, *Anaerobic igestion, Landfills, Cations, Chemicals, Methane, Fermentation, Toxicity, Research, Biochemical oxygen demand, Chemical oxygen lemand.
dentifiers: Sodium.

eachate production is one of the effects of sanary landfill operations which must be controlled. or many landfill sites, collection, treatment, and isposal of the leachate which drains from the fill re used to insure groundwater protection. eachate may be treated and dispersed into the enironment in a harmless manner as other wastevaters are. Treatment could be achieved by a umber of different methods. Despite some inestigations, the design engineer is generally faced vith limited information and data on the treatabiliy of this strong, variable wastewater. This paper xamines anaerobic decomposition as a leachate reatment process. In addition to presenting data or operating criteria, this research also inestigates the effect of sodium, the cation present n highest concentration in leachate, on the effiiency of the anaerobic leachate treatment rocess. Information presented in this paper is also applicable to an understanding of anaerobic decomposition and the inhibition of methane fermentation in landfills. This information would be of value in cases where methane is collected from the fill on a commercial basis. (Bell-Cornell)
W76-09641

EFFECTS OF SHOCK TEMPERATURE ON BIOLOGICAL SYSTEMS,
Michigan Technological Univ., Houghton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-09660

REVERSE OSMOSIS -- CAN IT REPLACE DISTILLATION,
C. F. Frith.
Chemical Processing, p 19, 21, January, 1976. 3 fig, 2 tab, 8 ref.

Descriptors: *Reverse osmosis, *Filtration, *Waste water treatment, Treatment facilities, Membrane processes, Desalination.

Consolidating engineering, production, and maintenance personnel in treatment plants has improved efficiencies, but quality is more variable. Central system maintenance affects every user, downtime stops all production, the method of sanitizing or chemical cleaning may adversely affect special end products, the main system's quality problems have tremendous implications for every process that requires water and, most importantly, those processes for which superior quality is justified are often compromised by emphasis on budget restrictions. For these reasons, compact, point-of-use reverse osmosis (RO) systems were developed. The Milli-RO 15, a 15 liter/hr system operating from municipal supply, can be quickly converted into a 4 liter/hr unit by replacing the reverse osmosis cartridge, or modified to increase production rates by adding a pump module. Milli-RO systems employ prefilter and reverse osmosis modules, with a pump module between the two in the Milli-RO 40. Reverse osmosis removes many contaminants. These units can be selected, installed, and operated at the point-of-use, allowing control by the user. Eighty liters/hr can be produced by increasing pressure. Replacing the cartridge in a very short time when the system had been fouled was an important advantage to one user whose feed water quaity was very poor. RO is satisfactory as an alternative to the traditional distillation method for purifying water. (Snyder-FIRL)
W76-09667

DEVELOPMENT OF A CONTINUOUS INCLINED SAND BED FILTER,
Simon-Hartley Ltd., Stoke-on-Trent, (England).
J. T. Allanson, and E. P. Austin.
Filtration and Separation, Vol. 13, No. 2, p 165-166, 168-169, March-April, 1976. 6 fig, 5 tab, 3 ref.

Descriptors: *Filtration, Laboratory tests, *Suspended solids, *Sewage treatment, Equipment, Costs, Biological treatment, *Waste water treatment, *Filters.
Identifiers: *Sand bed filters, Filler backwashing.

A low-cost continuous filter has been developed which employs a moving sand bed in which the flows of sand and water have been arranged to minimize the possibilities of blockage. Sand is withdrawn from the center of the bottom of a cylindrical container, creating an inclined surface with the largest particles at the lowest part in the center. Liquid enters at the center and leaves from the periphery, and the sand withdrawn is cleaned and added to the edge at the top of the container. A laboratory bench model, a pilot filter, and a prototype filter were tested. The results from all were satisfactory. The laboratory model removed equal or greater amounts of suspended solids when compared to a static sand bed. The pilot filter was tested on the overflow from the biological treatment plant humus tanks at a paper mill and the final effluent from a mechanical-aeration plant treating mainly domestic sewage. Techniques for backwashing the filter were developed in case a slug of solids should enter the filter. The prototype filter was similar to the pilot plant, but larger, and it operated similarly. A standard range of such filters has been designed, using the diameter of the filter as the basic dimension. This type of filter saves civil engineering costs as compared to rapid gravity and pressure filters, because it operates continuously and therefore does not need storage facilities for use while backwashing. In a specific example analyzed, the motor horsepower needed for the pump was less than for either of the other systems, and, unlike the other systems, no automatic control was required. (Snyder-FIRL)
W76-09668

THE OPERATION OF A SIMPLEX ACTIVATED SLUDGE PILOT PLANT IN AN ATMOSPHERE OF PURE OXYGEN,
Greater London Council (England).
L. B. Wood, R. P. King, M. K. Durkin, H. J. Finch, and D. Sheldon.
The Public Health Engineer, Vol. 4, No. 2, p 36-43, March, 1976. 2 fig, 4 tab, 10 ref.

Descriptors: *Sludge treatment, *Activated sludge, *Aeration, Oxygen, *Pilot plants, Nitrification, Biochemical oxygen demand, Treatment facilities, *Waste water treatment.
Identifiers: *Oxygen activated sludge.

Replacing air with oxygen in the activated sludge process has been studied. In the first stage of the work, two sludges were treated at retention times of 4 to 8 hr at a small modified diffused air pilot plant. The second stage, using an adapted single aerator plant, included the following phases: preliminary studies to gain experience with the pilot plant; chemical adjustment of the mixed liquor pH; acclimatization of nitrifying sludge from a diffused air plant; operation with a nitrifying sludge; studying the mixed liquor suspended solids (MLSS) build-up rate by operation without withdrawing sludge; comparing retention times of 6.9, 3.9, 2.4, 1.7, and 1.2 hr, including nitrification and ratio of volatile suspended solids (VSS) to total suspended solids (TSS) at different retention times; treatment of crude sewage; and addition of ferric iron. Replacing air with oxygen did not increase the growth rate of organisms responsible for carbonaceous and ammonia oxidation or their oxidation rate for a unit mass of organisms. The maximum growth rate of Nitrosomonas can be reduced in single stage systems by low pH in mixed liquor where the latter is enclosed with oxygen, and carbon dioxide allowed to build up in the gas space. However, the greater facility provided by oxygen use in allowing high MLSS concentrations to be maintained, offers the possibility of greater hydraulic loading and smaller volumetric capacity for plants aimed only at removal of biochemical oxygen demand (BOD) load. Sludge quantity was not reduced. The growth rate of organisms oxidizing carbonaceous substrate was similar to that with air-based sludge and produced a similar sludge yield. Generally sludge settlement, as measured by the standard procedure and used to calculate linear settlement rate, revealed no special advantage to oxygen use. (Snyder-FIRL)
W76-09669

WASTEWATER TREATMENT IN NEW ZEALAND,
Auckland Univ., (New Zealand). Dept. of Civil Engineering.
I. W. Gunn.
The Public Health Engineer, Vol. 4, No. 2, p 49-55, March, 1976. 1 fig, 7 tab.

Descriptors: *Waste water treatment, *Design, *Treatment facilities, Industrial wastes, Biological treatment, Water pollution control.
Identifiers: *New Zealand.

Considerable experience has been gained in the design and operation of treatment plants for a population of less than 5000 in New Zealand. Public sensitivity to effluent discharge is high, since most population centers are near major rivers or the coast, and estuaries and coastal waters are used for recreation and shellfishing. Farm wastes posing pollution problems include artificial fertilizers as well as animal wastes. Meatworks and dairy factories have been slower than municipalities to invest in pollution control equipment, although this type of industry produces a greater waste load. Individual household disposal systems designed according to the 1961 Codes of Practice have not been successful, and such individual systems are discouraged. The 'Imhoff' tank has been widely used for settling and sludge stabilization in small plants prior to biological treatment. Variations of the 'Pasveer Ditch' process have been used in some areas. Package plants are used in a few communities and for private treatment plants; extended aeration is the most common process. Lagoons are the most widely used method of treating community waste water. Fifteen communities use tertiary treatment after conventional biological treatment, predominantly bacterial reduction lagoons. Most treatment plants are designed empirically, with allowance for future growth. The Central Government runs programs to train operators. (Snyder-FIRL)
W76-09670

FLUIDIZED BED TO HANDLE COMBINED WASTE SLUDGES,
Public Works, Vol. 107, No. 5, p 108, May, 1976. 1 fig.

Descriptors: *Sludge treatment, *Waste treatment, *Industrial wastes, Pulp and paper industry, Municipal wastes, Treatment facilities, Dewatering, Centrifugation, Design criteria, Pulp wastes, Waste water treatment.
Identifiers: Fluidized bed reactor, Municipal-industrial wastes, Combined treatment.

The waste water treatment facility being built for the Tyrone Borough Sewer Authority in Blair County, Pennsylvania, has been designed to receive white-water sludge from a nearby paper mill. The plant is modular design, will include space-saving features to accomodate plug flow or complete mix operation, and is flexible enough for varying industrial and seasonal changes. Solids load is expected to be 7900 lb/day primary sludge and 3100 lb/day secondary sludge at full capacity. Sludge, both primary and secondary, will be dewatered in a fluidized bed process, by means of a solid bowl centrifuge with the aid of a cationic polymer. In the fluidized bed reaction, fluidizing and combustion air are preheated to 1000 F by extracting waste heat from the reactor gases. Excessive particulate emissions in the exhaust gases are prevented by a high-energy wetted wall venturi scrubber followed by a packed secondary scrubber-cooler. (Kramer-FIRL)
W76-09671

VALUE ENGINEERED SEWAGE PLANT MOVES FAST,
Engineering News-Record, Vol. 196, No. 17, p 22, April 22, 1976. 2 fig.

Descriptors: *Costs, Construction, *Sewage treatment, *Treatment facilities, *Tertiary treatment, *Construction materials, Engineering, Design criteria, Waste water treatment.
Identifiers: *Value engineering.

Time and cost savings were effected in the value engineered construction of a sewage treatment plant in Concord, California. The 30 mgd tertiary treatment plant will recycle effluent from an upgraded secondary treatment plant, producing industrial cooling and process water. Due to weather and other delays, the project began behind schedule. Engineers agreed to change the foundations specification for the structure set in clayey soil when a sand lens was located about six feet below the elevation of the valve structure floor slab. The sand lens was an acceptable bearing for the structure, and excavation of only 21 feet in depth needed to be made. With the raised elevation, open cutting could be performed on three sides for the excavation on a 1.5:1 slope to install the outfall line. By eliminating the building of a cofferdam for excavation, work was completed in one, rather than five weeks. Other innovative construction techniques included the shop fabricating of 18 to 72-inch steel piping, rather than field welding; the preassembly of intake and discharge manifolds up to 60 ft long and 30 ft high; and the use of modular steel panels to assembly forms for placing wall structures. (Kramer-FIRL)
W76-09672

ANAEROBIC TREATMENT OF DILUTE WASTE WATERS,
Technische Hogeschool, Delft (Netherlands). Lab. of Chemical Engineering.
R. R. Van Der Meer, J. Van Brakel, and P. M. Heertjes.
Delft Progress Report, Vol. 1, No. 5, p 143-149, 1976. 6 fig, 4 tab, 23 ref.

Descriptors: *Anaerobic digestion, *Waste water treatment, *Sludge treatment, *Recycling, Chemical oxygen demand, Equipment, Sludge digestion.
Identifiers: Stirred up-flow reactor(ISUR).

The application of anaerobic digestion to purification of dilute waste water was studied. Five reactors were used: a packed up-flow reactor (PUR) filled with high porosity polymer objects, a PUR filled with 2 to 3 cm gravel, an intermittently stirred up-flow reactor (ISUR), an ISUR with a device to break floating sludge, and an ISUR with sludge recycling. Simple substances such as acetate, glucose, and beet sugar were used to simulate waste water. An anaerobic up-flow reactor can reduce the chemical oxygen demand (COD) of these model waste waters to 10%. Two to 5 kg COD/cu m day is the maximum organic loading, corresponding to 7 to 18 hr retention times. Twenty to 50 days are required for a system to completely adapt to a particular feed. After adaptation, it adjusts easily to changing conditions and recovers rapidly from short disturbances such as a pH drop. There were no significant differences between the behavior of the packed bed and the ISURs. (Snyder-FIRL)
W76-09673

A STUDY OF ROTATING-DISC TREATMENT UNITS OPERATING AT DIFFERENT TEMPERATURES,
Loughborough Univ. of Technology (England). Dept. of Civil Engineering.
K. V. Ellis, and S. E. I. Banaga.
Water Pollution Control, Vol. 75, No. 1, p 73-91, 1976. 13 fig, 5 tab, 20 ref.

Descriptors: *Biological treatment, Hydraulics, Laboratory tests, *Biochemical oxygen demand, *Temperature, *Waste water treatment, Performance, Operations, Design, *Treatment facilities.
Identifiers: *Rotating discs treatment.

The optimum mode of operation of a rotating-disc unit (RDU) and the effects of three different temperatures on its efficiency were studied. For a 14 week preliminary period, the specially designed laboratory RDU's were operated to establish the general capabilities of the design, to gain reasonable experience in operating the unit, and to establish an optimum rotational speed for the discs. During the principal investigation, the three RDUs were operated at 11 C, 18 C, and 27 C. Various hydraulic retention periods and liquid levels were investigated. A disc rotation speed of about 4 rev/min produced the best results, and was used throughout the principal investigation. Laboratory scale RDUs were able to remove 97.5% of the biochemical oxygen demand (BOD) loading applied, and operated efficiently at over 20 g BOD/sq m d. BOD removal ability appreciably increases with temperature from 10 C to 20 C and less dramatically from 20 C to 30 C. The rotating discs should optimally be immersed 26% into the reaction vessel liquid. With the discs 26% immersed, 4 rev/min disc speed, and 97 min liquid retention, units operating at all three temperatures tested, produced effluents well within the Royal Commission standard. Effluent recirculation failed to appreciably improve the effluent. The concentration of mixed liquor suspended solids (MLSS) in the reaction vessel was about 23,000 mg/liter. This individual small unit may be between 3 and 7 times as efficient as the activated sludge process and 40 to 60 times as efficient as a conventional biological filter. (Snyder-FIRL)
W76-09674

PURIFICATION OF WASTE WATER BY POLYMER EXCHANGERS (JATEVESIEN PUHDISTAMINEN POLYMEERIVAIHTAJILLA),
E. Pulkkinen.
Kemia-Kemi, No. 1, p 6-11, January, 1976. 11 fig, 3 tab, 8 ref.

Descriptors: *Activated sludge, *Colloids, *Coagulation, *Polymers, *Polyelectrolytes, *Flocculation, *Waste water treatment, Sludge treatment, Cations, Anions, Municipal wastes, Costs, Chemical precipitation, Ion exchange, Europe.
Identifiers: *Finland.

Colloidal hydrophobic particles in water are negatively charged and it is this charge that keeps them dispersed. They can be stabilized by adding an electrolyte, which causes the ion cloud surrounding the particles to shrink; by adding an electrolyte that neutralizes the negative charge; by adding an anionic polyelectrolyte that causes the particles to bunch together; or by destabilizing the pH of the particles so that they lose their charge and coagulate. In treating domestic waste water by the activated sludge process, sludge settlement takes place more rapidly with the addition of cationic polyelectrolytes. Anionic polyelectrolytes are suitable for thickening primary waste water, whereas secondary sludge or the activated sludge is best thickened through the action of cationic polyelectrolytes. The concentration of primary sludge with anionic polyelectrolyte in the vacuum filter process works well; however, the addition of a small amount of anionic polymer (HPAM) followed by cationic polyamines works better for activated sludge. Cationic polymers have proven indispensable in concentrating municipal waste water by the centrifugal process. The cost of electrolytes has remained relatively high in Finland, which is one reason that they are not widely used in that country. Recently, the Oulu University Chemistry Department has been studying water soluble polymers, with the objective of explaining the effects of cationic polymer structures on the precipitation ability of colloids. (Reich-FIRL)
W76-09675

ASSESSMENT OF VIRUS REMOVAL BY A MULTI-STAGE ACTIVATED SLUDGE PROCESS,
Industrial Environmental Research Lab., Cincinnati, Ohio.
R. S. Safferman, and M-E. Morris.
Water Research, Vol. 10, No. 5, p 413-420, 1976. 3 fig, 6 tab, 22 ref.

Descriptors: *Viruses, *Activated sludge, *Biological treatment, Chemical precipitation, *Waste water treatment, Effluents.
Identifiers: *Virus removal.

The virus removal capacity of a complex multistage biological system combined with ap-

propriate chemical additives and final filtration was studied. The indigenous viral population in the primary effluent and after each stage of treatment were determined. The system was then seeded with phage f2 and sampled again at the same locations. The treatment process effectively reduced the seeded viruses. The highest reduction was in the high-rate activated sludge and denitrification modules, both averaging over 95% virus removal. Virus reduction for the treatment system as a whole was calculated at 99.97%. The indigenous viruses present after primary settling illustrated the wide diversions that can occur in waste waters during a 24 hr period and the necessity of collecting temporally related samples within the treatment system. There was apparently no direct relationship between the quantities of enteroviruses and coliphages present in primary effluent. (Snyder-FIRL)
W76-09676

INDUCTIVE CAVITATOR KEEPS FILTER GRATINGS CLEAR OF DEBRIS,
R. F. Stengel.
Design News, Vol. 31, No. 9, p 19, May 10, 1976. 2 fig.

Descriptors: *Filtration, *Filters, *Waste water treatment, Effluents, Equipment, Flow, Energy.
Identifiers: *Filter gratings, *Inductive cavitators.

Effluent in process plants sometimes contains solid debris that should not enter sewage lines. Installing a filter grating with suitable mesh width traps the debris, clogging the filter. Periodical shutdowns are usually used to clean the grating. Periodical or continuous mechanical means work poorly with some grating types. A solution involves a main outflow line below the grating carrying clean effluent and a secondary stream directly above the grating flushing off the debris. A mechanical oscillator at the lowest part of the tank acts through the liquid, shaking debris from the grating. The inductive cavitator is purposely run not at resonance, unlike many previous sonic systems. The off-resonance driving frequency permits precisely controlling vibratory energy delivered to the liquid. The direction of the externally polarized motion is adjustable, if needed, to distribute energy more uniformly through the liquid volume. (Snyder-FIRL)
W76-09677

EFFLUENT DETENTION PONDS DECHLORINATE WASTEWATER,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
R. Stone, H. Smallwood, and L. Bennett.
Public Works, Vol. 107, No. 5, p 90-91, May, 1976. 1 fig.

Descriptors: *Waste water treatment, *Chlorine, *Biochemical oxygen demand, Suspended solids, Analytical techniques, Treatment facilities, California, Pollutant identification.
Identifiers: *Chlorine analyzer, *Dechlorination, *Detention ponds(Wastes), Ventura River(Calif).

The Oak View Sanitary District installed a unique facility for waste water dechlorination at a minimum cost to meet the California and United States requirements for no free chlorine discharge into the Ventura River. In 1975, the optimum dosage of chlorine to the effluent was about 165 lbs per day, producing a residual 2.5 to 3.0 mg/liter at the outlet of the chlorine contact chamber. Two dechlorination ponds with a capacity of about one million gallons each provided an average retention time of over one day at the 1975 flow rate. These ponds have concrete-lined slopes and unlined floors and an average operating depth of 5.5 ft. Longitudinal baffles to improve velocity distribution restrict the flow channel width to 25 ft. The dechlorination ponds reduce 5 day biochemical oxygen demand (BOD) and suspended solids as well as reducing chlorine residuals to less than 0.1 mg/liter. Since the probe of a chlorine analyzer becomes insensitive to chlorine if it is not periodically exposed to a chlorine solution, the required residual monitor samples the chlorine contact chamber effluent and the final effluent alternately. (Snyder-FIRL)
W76-09678

SLUICE GATES HELP REGULATE PLANT'S HYDRAULIC FLOWS.
For primary bibliographic entry see Field 8C.
W76-09680

DEWATERING OF SEWAGE SLUDGE VIEWED AS PART OF THE PURIFICATION PROCESS -- PLANNING CRITERIA (KLAERSCHLAMMENTWAESSERUNG ALS TEIL DER GESAMTEN KLAERAUFGABE BETRACHTET -- PLANUNGSKRITERIEN),
G. Henseler.
Wasser, Energie, Luft, Vol. 68, No. 1, p 17-23, 1976. 7 fig, 4 tab, 13 ref.

Descriptors: *Dewatering, *Sewage sludge, *Fertilizers, *Land use, Odor, Flocculation, Oxidation, Filtration, Filters, Centrifugation, Sludge disposal, Landfills, *Waste water treatment, Sewage disposal.

Different methods for sewage sludge dewatering for subsequent distribution on farmlands or disposal on sanitary landfills are reviewed. To avoid malodorous emissions, only thoroughly digested sludge with a minimal dry matter content of 50% should be distributed on farmlands. Dewatering requires cold chemical conditioning by flocculation and oxidation, or hot conditioning at 200 C under increased pressure, which is also suitable for sludge sterilization. Low-pressure band and drum filters, vacuum filtration, high-pressure filtration and centrifugation are described. Worm centrifuges with solid jackets, operating at accelerations as low as 400 g, are able to separate over 95% of water from the sewage sludge. (Takacs-FIRL)
W76-09681

THE EFFLUENT LAGOONS GREIFSWALD-LADEBOW (DAS ABWASSERTEICHSYSTEM GREIFSWALD-LADEBOW),
S. Schwarz.
Wasserwirtschaft-Wassertechnik, Vol. 26, No. 3, p 94-96, 1976. 6 fig, 4 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Biochemical oxygen demand, *Treatment facilities, *Lagoons, Effluents, *Ventilation, Temperature.
Identifiers: *Turboventilators.

The effect of two turboventilators installed in the first member of a lagoon series with a capacity of 8,000 cu m/day and a flowthrough time of 9.3 days was studied by investigation of chemical, biochemical and biomass parameters. The observed rapid equalization of the temperatures of freshly admitted waste water and of lagoon water implies reduced heat losses to the air, and consequently high bacterial activity even during the winter period. Ventilation resulted at best in a negligible rate of activated sludge formation. The increase in the BOD5 level was due only partly to the overloaded ventilated system. Ventilation at the same time intensified the enzymatic degradation of organic substances in contact with sludge-covered surfaces. (Takacs-FIRL)
W76-09682

POSSIBILITIES AND LIMITS OF EXTENDED WASTE WATER PURIFICATION (MOEGLICHKEITEN UND GRENZEN DER WEITERGEHANDED ABWASSER-REINIGUNG),
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft.
F. Poepel, and I. Sekoulov.
Umweltschutz-Staedtereinigung, No. 4, p 76-80, 1976. 1 tab, 9 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Biochemical oxygen demand, *Nitrification, *Denitrification, Oxidation, Chemical precipitation, Phosphorus, Suspension, Filters, Sands, Percolation, Organic matter, Hydrogen ion concentration.
Identifiers: Nitrification/denitrification.

Possibilities and limitations of the final purification of waste water in biological treatment plant for the protection of recipients and to guarantee an adequate water quality for drinking-water preparation are described. The BOD5 level of the purified waste water can be substantially reduced by the removal of suspended matter, for which process sand filters flushed with hydrogen peroxide-treated water, and microstrainers with 20-25 micron-mesh are available. Nitrification can be intensified by the use of porous percolation bodies and sand filtration, using oxygenated water. The subsequent biological denitrification in sand filters is performed without oxygen, and the oxygen liberated from the nitrates is used for the oxidation of other organic substances. Phosphorus can be eliminated from waste waters by chemical precipitation with trivalent metal salts or lime, or by increasing the pH value by means of flue gases, sodium hydroxide, or a biological process using algae which liberate oxygen from carbon dioxide. It is possible to reduce the phosphorus level to below one mg/liter. (Takacs-FIRL)
W76-09683

THE CHEMISTRY OF OZONE IN THE TREATMENT OF WATER,
Hebrew Univ., Jerusalem (Israel). Graduate School of Applied Science and Technology.
For primary bibliographic entry see Field 5F.
W76-09684

THE RELATIONSHIP BETWEEN DISSIMILATORY NITRATE REDUCTION AND OXYGEN UPTAKE BY CELLS OF AN ALCALIGENES STRAIN IN FLOCS AND IN SUSPENSION AND BY ACTIVATED SLUDGE FLOCS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Microbiology.
J. M. Krul.
Water Research, Vol. 10, No. 4, p 337-341, 1976. 7 fig, 1 tab, 17 ref.

Descriptors: *Oxygen, Nitrates, *Flocculation, *Bacteria, Anaerobic conditions, Nitrogen, Analytical techniques, Sludge treatment, Activated sludge, *Waste water treatment, *Denitrification, Absorption, Biological treatment.
Identifiers: Oxygen uptake.

The effect of oxygen concentrations on the oxygen uptake and the dissimilatory nitrate reduction by anaerobically grown cells in flocs and in suspension was studied. A number of isolated bacteria of a denitrifying Alcaligenes strain were tested for ability to form flocs, the floc's sensitivity toward dispersion by cellulase, and denitrifying ability. Nitrate reduction by cells in flocs increased considerably at oxygen concentrations below 1.5 mg/liter. For cells in suspension, nitrate reduction increased at oxygen concentrations below 0.1 mg/liter. Cells grown anaerobically became sensitive to inhibition of respiration by nitric oxide from nitrate reduction after 24 hr of aeration in a medium free of nitrogen. As a result, nitrate reduction increased below 2.5 mg oxygen/liter for cells in flocs and below 0.1 mg oxygen/liter for cells in suspension. (Snyder-FIRL)
W76-09686

PROBLEMS CONCERNING THE CHARACTER OF OXIDIZABILITY OF CERTAIN ORGANIC SUBSTANCES IN WATER TREATED WITH

OZONE (PROBLEMES LIES A L'EVOLUTION DU CARACTERE D'OXYDABILITE DE CERTAIN CORPS ORGANIQUES PRESENTS DANS L'EAU TRATEE PAR L'OZONE),
J. C. Block, M. Morlot, and J. M. Foliguet.
Techniques et Seiences Municipales--L'Eau, Vol. 71, No. 1, p 29-34, January, 1976. 8 fig, 1 tab, 14 ref.

Descriptors: *Organic compounds, *Waste water treatment, *Ozone, Water treatment, *Oxidation, *Pollutant identification, Color, Turbidity, Biological treatment, E coli, Soils, Detergents.
Identifiers: Organic carbon, Malathion.

While the action of ozone on organic products in water produces impressive changes in such parameters as color and turbidity, it is not necessarily indicative of in depth or complete structural modifications. The evolution of biodegradability and oxygen demand, both of which vary considerably depending on the substances being treated, can impose certain constraints upon treatment such as the possible proliferation of microorganisms in the distribution network or a significant chlorine demand following ozonation. It is difficult to evaluate the efficacy of treatment or the quality of a sample due to the disparity of measures. Thus, in the case of 4 samples tested -- an E. coli suspension, a 300 ppm anionic detergent solution, a 123 ppm malathion solution, and a soil extract solution of a yellow-brown color--an identical 20% elimination of organic carbon was expressed by a disappearance of 50% color from the soil extract, of 95% turbidity of the bacterial suspension, of 96% of malathion molecules, and only of 10% of detergent. (Waltner-FIRL)
W76-09692

BIODEGRADABILITY AND PROCESS FOR BIOLOGICAL PURIFICATION OF WASTE WATER (LA BIODEGRADABILITE ET LES PROCEDES D'EPURATION BIOLOGIQUE DES EFFLUENTS),
P. Laboureur.
Techniques et Sciences Municipales L'Eau, No. 2, p 45-51, 1976. 1 fig.

Descriptors: *Biological treatment, *Biodegradation, *Waste water treatment, *Measurement, Oxygen, Organic compounds, Microorganisms, Analytical techniques, Organic matter.
Identifiers: Organic carbon.

The assessment of biodegradation is discussed. Biological degradation is a process which occurs naturally to prevent accumulation of organic matter; its agents are aerobic microorganisms. General methods of assessment are based on measurement of oxygen (respirometric method) or organic carbon. In any waste water treatment method, it is important to know the biodegradation rate. Because no known organisms are able to thrive on synthetic organics, alternative treatment methods to biological treatment must be employed. (Kramer-FIRL)
W76-09693

TURBIDIMETER LIGHTS THE WAY TO ACCURATE PROCESS CONTROL,
For primary bibliographic entry see Field 5A.
W76-09694

DEVELOPMENT OF A MEASUREMENT METHOD FOR THE TOTAL ACTIVITY RATE OF ACTIVATED SLUDGE (CONTRIBUTION A LA MISE AU POINT D'UNE METHODE DE MESURE DU TAUX D'ACTIVITE TOTALE DES BOUES ACTIVEES),
Montpellier-2 Univ. (France). Laboratoire de Genie Chimique.
J. P. Legeron, and R. B. Aim.
Water Research, Vol. 10, No. 4, p 273-278, 1976. 10 fig, 4 tab, 28 ref.

Descriptors: *Activated sludge, *Measurement, *Enzymes, *Analytical techniques, Organic compounds, Oxidation, Waste water treatment, Pollutant identification, Temperature, Incubation, Hydrogen ion concentration.
Identifiers: *Dehydrogenase activity(Sludge), TTC measurement, Triphenylformazan extraction.

An examination was made of the total dehydrogenase activity of activated sludge, according to an enzymatic reaction. Such parameters as pH, temperature, incubation time, and TTC were discussed. The extraction of triphenylformazan and the blank procedure were discussed. The extraction of triphenylformazan and the blank procedure were discussed, along with factors which influence the test. For the control of activated sludge facilities, a modified procedure for the TTC-test was provided. This takes into account organic substrate oxidation and the activity of the different dehydrogenases. (Kramer-FIRL)
W76-09695

STEROIDS IN EFFLUENTS,
Clyde River Purification Board, Glasgow(Scotland).
For primary bibliographic entry see Field 5A.
W76-09696

HOW TO BUILD A BETTER BENCH SHEET,
Las Cruces Water Quality Lab., N. Mex.
D. W. Clark.
Water and Sewage Works, Vol. 123, No. 4, p 69-71, April, 1976. 2 fig.

Descriptors: *Laboratory tests, *Data processing, *Waste water treatment, Analytical techniques, *Pollutant identification, Water analysis.
Identifiers: *Bench sheet records.

Laboratory data is valuable in waste water treatment, and a bench sheet has been developed that provides maximum assurance that each test has been properly performed while containing sufficient information that results can be rechecked. Although the bench sheet is the most important repository of laboratory information, the value of a good bench sheet is often overlooked. Bench sheets should be kept separate from interpretations of results and should be of an appropriate size for handling and filing. A bench sheet should provide spaces for complete sample identification and logical development of test data. It should also include auxiliary information and formulas and space for calculations. There should be space for comments and, where more than one person works in the laboratory, a method of accountability. Bench sheets can be designed to show either one determination for all samples or all tests performed on a single sample. A sample bench sheet provides for recording date and time, location, nature of the sample, the person collecting it, dissolved oxygen, temperature, pH, and solids determinations. Most of the data is entered in the order in which it is accumulated. Space for data on percent volatile material is included with the solids data, and for biochemical oxygen demand (BOD) on the reverse side of the bench sheet. The sample volumes most often needed to determine compliance with standards are printed on the sheet, and places are provided to indicate the individuals performing the tests. When completed, the bench sheet records the condition of the effluent on a given day. (Snyder-FIRL)
W76-09701

HOW TO DESIGN AERATED LAGOON SYSTEMS TO MEET 1977 EFFLUENT STANDARDS,
South Carolina Dept. of Health and Environmental Control, Columbia.
S. C. White, and L. G. Rich.
Water and Sewage Works, Vol. 123, No. 4, p 82-83, April, 1976. 1 fig, 1 tab.

Descriptors: *Suspended solids, *Lagoons, *Aeration, Biochemical oxygen demand, *Waste water treatment, Effluents, *Design criteria, *Aerated lagoons, *Water quality standards, *South Carolina, Treatment facilities.

As part of a four-part series on experimental studies conducted in South Carolina on the control of suspended solids in aerated lagoon effluents, this paper shows how the results of the studies are used in the design of aerated lagoon systems with effluent standards. Two classes of aerated lagoons currently in use are the completely-mixed (or completely-suspended) and the facultative (or partially-suspended) types. The completely mixed type is discussed in detail. An equation is provided to demonstrate how the residual substrate found in the effluent from a completely mixed system is based on a steady-state mass balance of an organic substrate. Temperatures of aerated lagoons can be estimated with a relationship derived from a thermal energy balance across a completely-mixed system; the appropriate equation is provided. A graph compares power-level requirements for oxygen and solids suspension in a completely-suspended aerated lagoon fitted with surface aerators to treat a typical domestic waste water. In a partially-suspended (facultative) aerated lagoon, oxygen requirements increase, due to BOD feedback from the deposited solids. Oxygen requirements may be estimated for such lagoons, with the value of the BOD removed varying from winter to summer conditions. (Kramer-FIRL)
W76-09703

LABORATORY CENTRIFUGE SAVES TIME AND MONEY,
California State Water Resources Control Board, Sacramento.
S. Martinson, and D. G. Deaner.
Water and Sewage Works, Vol. 123, No. 1, p 61-63, January, 1976. 3 fig, 1 tab, 6 ref.

Descriptors: *Analytical techniques, *Centrifugation, *Activated sludge, Suspended solids, Control, *Waste water treatment, *Gravimetric analysis.
Identifiers: Gravimetric analysis, Mixed liquor suspended solids.

Centrifugal and gravimetric analyses of activated sludge and mixed liquor suspended solids were compared for controlling the activated sludge process. Grab samples from the Sacramento County's Central Treatment plant were analyzed by both methods. The fundamental problem with using the centrifuge is that the percent centrifuge concentration is constant only for a given sludge. However, except for modes of operation such as contact stabilization and activated sludge with reaeration, the mixed liquor suspended solids and the return sludge concentration are the same sludge, and the return rate can be calculated. For an example with actual data, return rates of 27% and 26% were calculated by centrifugal and gravimetric means, respectively. However, the gravimetric results took several hours to obtain, while the centrifugal results were available in 15 min. The shorter time required for analysis enables the operator to respond more quickly to changes in the process. (Snyder-FIRL)
W76-09704

TECHNIQUE ALTERNATIVES FOR A PACKAGE STABILIZATION PLANT,
E. C. C. Li.
Water and Sewage Works, Vol. 123, No. 5, p 60-61, May, 1976. 3 fig, 2 tab, 2 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Activated sludge, *Biochemical oxygen demand, *Treatment facilities, Stabilization, Aeration, Suspended solids.
Identifiers: *Contact stabilization, *Package plants.

efficiency of activated sludge in package contact abilization was studied. In this process, activated udge adsorbs small solid particles and absorbs issolved matter in the presence of oxygen in the ontact zone, is separated from the treated sewage a clarifier, is pumped to the reaeration zone here the bacteria grow and reproduce, and eturns to the contact zone. Package plants en-ountered process problems, mostly concerned ith the activated sludge, caused by such factors a hydraulic overload, a frequent waste shake, sufficient waste nutrients, and unbalanced tur-ulence. An attempt was made to correct these roblems by increasing the activated sludge con-nt and operating as an extended aeration rocess, but the biochemical oxygen demand BOD) and total suspended solids (TSS) in the ef-uent increased significantly. The use of aeration ontrol to build up the activated sludge was also ttempted. A third alternative involves acclimating e activated sludge before adding it to the reaera-on zone and adding a filter to prevent carry-over f finely divided solids into the effluent. (Snyder-IRL)
/76-09705

NCREASING THE CAPACITY OF SEDIMEN-ATION TANKS BY MEANS OF SLOPING LATES,
Vater Pollution Research Lab., Stevenage England).
1. J. D. White, R. C. Baskerville, and M. C. Day.
Vater Pollution Control, Vol. 75, No. 1, p 21-30, 976. 6 fig, 16 ref.

Descriptors: *Flocculation, *Sewage treatment, edimentation, Equipment, Efficiency, Installa-ion, *Settling basins, *Waste water treatment.
dentifiers: Sloping plates.

A module of inclined tubes was installed in one of wo identical humus tanks at a sewage treatment vorks serving a population of about 1800. Sewage vas pumped intermittently, producing a cyclic low variation in the tanks. Sloping tubes can in-rease the capacity of a conventional horizontal low sedimentation tank by an amount directly roportional to their projected surface area. The emperature of the influent should not be more han 0.2C higher than that of the bulk liquid, and he module should be washed down once every ne or 2 weeks. Sloping tubes appear suitable for prating humus tanks, but less suitable for primary anks and probably not suitable for tertiary treat-ent tanks without use of a flocculant. Installing loping tubes in an existing tank is expected to be ess expensive than building a new tank of the ame surface area, but the plastic tubes will robably not last as long as a new tank. (Snyder-FIRL)
W76-09706

DEVELOPMENT OF EDINBURGH'S SEWAGE DISPOSAL SCHEME,
Lothian Regional Council (Scotland).
A. S. Crockett, and J. Dugdale.
Proceedings of the Institution of Civil Engineers, Vol. 60, Part 1, p 53-78, February, 1976. 20 fig, 2 ab.

Descriptors: *Waste disposal, *Outfalls, *Sewage isposal, Storm water, Sedimentation, Effluent, nterceptor sewers, Sludge disposal, Construc-ion, Europe, Sewers, Waste water treatment, Estuaries.
dentifiers: Scotland(Edinburgh).

A conditional consent given by the Lothians River Purification Board to continue existing discharges rom Edinburgh required an improvement to be ompleted by May 1976. The existing system in-olves discharge of crude sewage into the Forth stuary through a number of short outfalls. The ew system devised includes interceptor sewers, rimary treatment on a site reclaimed from the stuary, and disposal of the effluent through an outfall and of the sludge at sea. Geological conditions in the area are quite varied. Interception will be through storm sewage overflows with storm sewage allowed to continue down the existing sewers. Because many of the routes lie through built-up areas, much of the construction must be done in tunnels. The site for reclamation is ideal; it is well situated with respect to the outfalls, near an industrial area, under shallow water, and angularly shaped to allow for a shorter sea wall. Four large sedimentation tanks will be used for treatment. Four very large storm tanks are also provided, in which material can be held for return to sedimentation. Effluent will be discharged through 20 vertical diffuser feed pipes rising from the latter part of the outfall tunnel. It is predicted that the E. coli concentration at emenity beaches under worst conditions will be no greater than 1000/100 ml. Sludge will be discharged at sea by gravity from a moving vessel. The cost of the full scheme is estimated at 26.04 million pounds. Construction of the system is progressing, and a reduced scheme is expected to operate by autumn 1976. (Snyder-FIRL)
W76-09707

SLUDGE HEAT TREATMENT: OPERATION AND MANAGEMENT,
Peterborough Sewage Div. (England).
C. R. Whitehead, and E. J. Smith.
Water Pollution Control, Vol. 75, No. 1, p 31-39, 1976. 1 fig, 7 tab, 4 ref.

Descriptors: *Heat treatment, *Sludge treatment, *Waste water treatment, *Methane, Biological treatment, Treatment facilities, Operations, Management.

The former Urban District of Havant and Waterlooville, Great Britain, treats sludge by heated digestion followed by heat treatment, with any surplus digested sludge being treated on drying beds. Sludge was treated on drying beds and in lagoons until 1961, when experimental work and cost investigation indicated that heat treatment would be the most economical process. Methane is collected and used as the main boiler fuel for heat treatment. Several modifications have been made to the system since it was commissioned. The plant was designed for treating 145.5 cu m/d of digested sludge at 5% dissolved solids (DS) or less. The filter presses will produce a cake of at least 50% DS in a pressing period of 2 hr or less. Variations in sludge consistency and significant changes in the rate of heat absorption led to the need to chemically clean the heat exchanger. Since March 1971 the plant has been run continuously until conditions indicate that a heat exchanger wash is required. Such conditions include increased boiler pressure, increased differentials across heat transfer surfaces, fall in the acceptable level of dry solids, increased press times, fall-off in press standards, and increase in odor from the plant. Recurrent problems have involved discharge valves, mono pumps, and farm flow units. The liquor treatment facilities at the plant consist of conventionally arranged biological filters. A spray deodorizer system around the plant's perimeter and a fiberglass lid and an ozonator for the thickening holding tank are used to control odor. (Snyder-FIRL)
W76-09708

INDUSTRIAL EXPERIENCE OF SEWAGE SLUDGE PROCESSING WITH ZIMPRO INSTALLATIONS IN THE NETHERLANDS,
Witteveen and Bos., Deventer (Netherlands).
E. L. C. Koster, J. H. J. M. van der Graff, and J. G. ten Wolde.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 429-445, 1976. 12 fig, 6 tab, 1 ref.

Descriptors: *Sewage treatment, *Sludge treatment, *Filtration, *Dewatering, Oxidation, Industrial wastes, Nitrogen, Biochemical oxygen demand, Europe, Waste water treatment.
Identifiers: *Zimmerman process, *Netherlands.

Industrial experience in processing fresh sewage sludge by the Zimmerman process has been obtained at installations at Apeldoorn and Breda in the Netherlands. The Zimmerman process's general characteristics--insensitivity to toxic components and changes in sludge composition, completely sterilizing fresh sludge by thermal oxidation without chemical conditioning, and excellent sludge dewatering properties--were important in the final choice of the processing system. The sludge at Apeldoorn has a large contribution from paper mills and 45% organic content. The sludge at Breda has a large contribution from the canned food industry and a 73% organic solids content. The systems for dewatering and discharging the filter cake differ; Apeldoorn uses a vacuum filter and a discharge system of conveyor belts and containers, and Breda uses filter presses, chain conveyors, and silos. The high organic solids content in Breda had an unfavorable effect on the thickening results. Due to rotting, buffering of fresh sludge in thickeners adversely affects the thickening results and must be kept to a minimum. Scaling in the heat exchangers may affect the energy balance, but the scaling can be removed by acid washes. The biochemical oxygen demand (BOD), chemical oxygen demand (COD), and Kjeldahl nitrogen at Breda increased after the Zimmerman process plant came into operation. The filter cake from Breda is suitable for use as a soil conditioner, but not a fertilizer, due to the lack of nitrogen. (Snyder-FIRL)
W76-09709

NEW YORK TAKES ANOTHER GIANT STEP,
Gannett, Fleming, Corddry and Carpenter, Inc., Harrisburg, Pa. Pollution Control Div.
H. B. Gerber, and G. G. Brinckerhoff.
Water and Wastes Engineering, Vol. 13, No. 3, p 24-26, 28, 48, March, 1976. 7 fig.

Descriptors: *Treatment facilities, *Sewage treatment, *Waste water treatment, *Aeration, Tanks, Equipment, Sludge treatment, Construction, New York.
Identifiers: *New York City Jamaica treatment plant.

Construction of an upgrading project at New York City's Jamaica Water Pollution Control Plant is nearing completion. The project includes a new sewage pumping station and screenings building; conversion of the primary settling tanks to remove both grit and sludge; converting the grit building to a grit and storage building; a new system to remove grease and scum; two new aeration blowers, and a new aeration system in the aeration tanks; conversion of the gas compressor building to an effluent pumping station; a new system to distribute waste sludge to the sludge thickening tanks; a new sludge thickening tank and extensive modification to two others; a new hypochlorite building; extensive modifications to the sludge digestion tank equipment and the gas collection and storage system; a sludge force main to another water pollution control plant; all new measuring and recording instruments; modifications to the plant drainage system; and major changes to the heating, ventilating, air conditioning, plumbing, and electrical systems. The existing sewage pumping station could not be demolished until the new one was ready to operate, so the new pumping station had to be built between the existing one and the main building, only 8 ft from the latter. (Snyder-FIRL)
W76-09710

THE DESERT WAR ON POLLUTION,
N. Gardner.
Water Services, Vol. 80, No. 960, p 87-88, February, 1976.

Descriptors: *Waste water treatment, *Recycling, *Water reuse, Water treatment, Sewage treatment, Waste disposal, Aeration, Asia, *Desalination.
Identifiers: *Middle East.

Rapid industrial and social development is taking place in Middle Eastern countries which had simple agricultural economies only 10 years ago. The greater prosperity and new industries have created a demand for better water treatment facilities. Desalination of water from desert bore-holes and sea water is often done in thermal type plants, due to the abundance of energy. Due to the scarcity of water, recycling of waste water is emphasized. Processes for recycling industrial waste water usually leave a concentrated waste, which will be disposed of at sea or on land following chemical and physical or thermal treatment. Aeration, which requires a minimum of maintenance, is frequently used for sewage. The deep shaft treatment process, in which effluent is circulated between two compartments in a shaft several hundred ft deep, has significant advantages for the Middle East. Attention is also being focused on the disposal of municipal solids. They can either be incinerated, with the ash used for landfill, or can be applied directly to land as compost. Due to the shortage of local water and sewage treatment consultants in the Middle East, there is competition between European, United States, and Japanese consultants. The Middle East has accounted for large increases in exports of British water treatment contracts. However, British export regulations sometimes make it impossible for British companies to bid competitively on the larger contracts. (Snyder-FIRL)
W76-09711

MICROBIAL ASPECTS OF CARBONISATION EFFLUENT TREATMENT,
University Coll., Cardiff (Wales). Dept. of Microbiology.
D. A. Stafford.
Effluent and Water Treatment Journal, Vol. 16, No. 3, p 136-137, 139, March, 1976. 20 ref.

Descriptors: *Waste water treatment, *Microorganisms, *Bacteria, *Activated sludge, Organic compounds, Industrial wastes, Oxidation, Pseudomonas, Carbon, Biodegradation.
Identifiers: *Carbonization effluents, Thiobacilli.

Microorganisms can readily utilize compounds from carbonization liquors as energy and carbon sources. Carbonization liquors also provide elemental sources for biosynthesis. Due to their biochemical potential, microorganisms are ideally suited for the chemical transformations necessary to mineralize the organic and inorganic compounds of carbonization liquors. The predominant bacteria in the activated sludge treatment of carbonization liquors include Pseudomonads and Thiobacilli; Pseudomonads are involved in the breakdown of organics, and reduced sulfur compounds are attacked mainly by Thiobacilli. The heterotrophic organisms obtaining carbon and energy from the aromatic and heterocyclic compounds of waste liquors are closely associated with those deriving energy from other processes. Some of the constituents in the effluents can affect the metabolism of some of these microorganisms. The products of reactions carried out by the microorganisms include substances necessary for their growth. Bacteria may act on some compounds preferentially; metabolic intermediates are often used preferentially to the original compounds. Adding certain organic compounds to the liquor feed increased the biochemical oxidation rate by as much as three times. The compounds also often improve effluent quality. Studies indicate that bacteria probably do not play a role in removing liquor components in waste-tip lagoon systems. (Snyder-FIRL)
W76-09712

OPERATION OF OZONE TREATMENT APPARATUS (OZONE SHORI SOCHI NO UNTEN),
For primary bibliographic entry see Field 5F.
W76-09713

OZONE PROVIDES ALTERNATIVE FOR SECONDARY EFFLUENT DISINFECTION PART 2,
Welsbach Ozone Systems Corp., Philadelphia, Pa.
C. Nebel, R. D. Gottschling, P. C. Unangst, H. J. O'Neill, and G. V. Zintel.
Water and Sewage Works, Vol. 123, No. 5, p 82-85, May, 1976. 8 fig, 3 tab, 41 ref.

Descriptors: *Sewage effluents, *Waste water treatment, *Disinfection, *Ozone, Phenols, Suspended solids, Chemical oxygen demand, Biochemical oxygen demand, Nitrogen, Color, Odor, Oxidation, *Sewage treatment.
Identifiers: *Secondary effluents.

As the second part of a continuing article, this paper describes new, economically feasible methods using ozone for the disinfection of secondary effluents. Contaminant removal may be achieved by a two-step process utilizing flotation. Suspended solids not captured by the plant secondary clarifier may be removed from the ozone contact chamber in this process. Additionally, ozone in small dosages removes substantial amounts of colored material. Reduction of COD in secondary effluent with ozone oxidation and physical removal by frothing was seen to vary, depending upon the initial COD level of the effluent. While refractory materials are biodegradable by ozonization, BOD values are mildly increased during ozonation of industrial municipal effluents. Studies on the oxidation of nitrogenous materials by ozone have been inconclusive, and ozonolysis cannot be considered a nitrification process. Phenol reduction has been demonstrated to take place rapidly at relatively low dosages of ozone. Additionally, pH is generally shifted following ozonation of secondary effluent. The formation of weak carboxylic acids from hydrocarbons tends to reduce pH, while C02 produced in the activated sludge process being removed by sweeping large volumes of air or oxygen through the ozone contact chamber tends to increase pH. (Kramer-FIRL)
W76-09715

HYDRODYNAMIC SEPARATION OF SOLIDS FROM SOLID-LIQUID MIXTURES,
Kentucky Water Resources Research Inst., Lexington.
H. J. Sterling, Jr., and D. J. Wood.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-254 490, $7.75 in paper copy, $2.25 in microfiche. Research Report No. 94, June 1976. 211 p, 28 fig, 40 tab, 58 ref. OWRT A-048-KY(1). 14-31-0001-4017, 14-31-0001-5017, 14-34-0001-6018.

Descriptors: Water treatment, *Separation techniques, Slurries, Suspensions, Sediment transport, *Waste water treatment, Mixing, Flow, *Turbulent flow, Settling basins, Pipes, *Pipe flow.
Identifiers: *Solids removal.

Several schemes for separating solid pollutants from water flowing in a closed conduit were examined. Separation based on the momentum differential between the solids and liquids and the centrifugal movement of a conveying liquid were both examined under turbulent flow conditions. The study indicated these processes to have limited applications, primarily due to the difficulties in withdrawing a significant fraction of separated flow and the deleterious effects of turbulent mixing. However, utilization of the differential momentum of solid particles and water when flowing laminarly through a pipe was found to be a a viable separation scheme. Significant experimental separations (greater than 50 percent for pulverized coal and fly ash) were achieved. The experimental situation was modeled theoretically using particles approaching a sink located in a uniform stream. The theory closely predicted observed results for low velocity flows, with increasing flow velocity being the most significant contribution to deviations between experimental results and theory. The ratio of separated flow to flow passing the outlet was also found to affect the separation, but to a lesser degree than flow velocity. An application using small separator pipes in conjunction with a tank was shown to have potential advantages over using a settling tank alone. (Huffsey-Kentucky)
W76-09716

NATIONAL SYMPOSIUM ON URBAN RAINFALL AND RUNOFF AND SEDIMENT CONTROL,
Kentucky Univ. Lexington, Coll. of Engineering.
For primary bibliographic entry see Field 4C.
W76-09729

AN APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Envirex Inc., Milwaukee, Wis. Environmental Sciences Div.
T. L. Meinholz, C. A. Hansen, and V. Novotny.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 109-113, October 1974. 9 fig, 1 ref. EPA 800744.

Descriptors: *Model studies, *Urban runoff, *Combined sewers, Mathematical models, Water quality, Discharge(Water), Sewers, Equipment, Cities, Storms, Storm runoff, Water pollution, Water pollution control, Runoff, Rainfall, Precipitation(Atmospheric), Urban drainage, *Wisconsin.
Identifiers: *Racine(Wis).

The Environmental Protection Agency Storm Water Management Model (SWMM) uses a high-speed digital computer to predict the quantity and quality of storm water runoff for a given rainfall event. This paper discusses the application of the SWMM to a combined sewer area of 832 acres which has its wet weather discharges treated by two satellite screening/dissolved air flotation units totalling 93 cfs in capacity. It was concluded that SWMM is an accurate tool for predicting the quantity and quality of urban runoff. Naturally, the results of the SWMM are only as accurate as the input data. (See also W76-09729) (Sims - ISWS)
W76-09738

IS THE SEPARATION OF SEWERS DESIRABLE,
Hydrotechnic Corp., New York.
R. Nebolsine, and G. L. Vercelli.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 115-123, October 1974. 4 fig, 4 tab, 18 ref.

Descriptors: *Combined sewers, *Separated sewers, Economics, *Urban runoff, Storm runoff, Sewage, Municipal wastes, Sewage treatment, Pollutants, Heavy metals, Water pollution, Sediments, Sewers, Costs, Cities, Population, Industries, Waste treatment, Storage, Storage requirements, Retention, Detention reservoirs, Ecology.

All but the more recently built cities were originally provided with combined sewer systems. The concept of having two separate sewer systems gained ground some 50 years ago. The basic rationale for such a belief was that the storm runoff consisted of clean water that could be innocuously discharged without any treatment into the nearest receiving water body. Whatever technical and economic justifications there may have been for such a rule, these have been weakened by recent developments. First, as urban growth has resulted in ever greater agglomerations of population and industry, and as street traffic has intensified, it has been found that the runoff from the streets contains many contaminants in concentrations com-

rable to those in sanitary sewage. This paper ntended when new sewerage facilities are being anned, one must carefully weigh the advantages d disadvantages, both in ecological and onomic terms, of the two alternates, either: (1) ilding more costly separate sewer systems with e result that eventually treatment will be quired not only of the dry weather flow, but entually also the stormwater flows; or (2) build- a combined system with the necessary flow de- ntion or equalizing facilities that will permit eating not only the sanitary but also most of the rst flush flows in one plant and cleaning up the ormwater overflows by an appropriate process d equipment in another plant or plants. (See also 76-09729) (Sims - ISWS)
76-09739

OMBINED SEWAGE OVERFLOWS - REQUENCY, ENVIRONMENTAL EFFECTS, ND A CORRECTIVE PROGRAM,
linton Bogert Associates, Fort Lee, N. J.
. L. Kaufman.
: National Symposium on Urban Rainfall and unoff and Sediment Control; Proceedings of mposium held July 29-31, 1974, Lexington, Kencky. Report UKY BU106, p 135-143, October 74. 8 fig, 7 tab.

escriptors: *Combined sewers, *Overflow, Water pollution, Water pollution control, ewers, Treatment facilities, Storm runoff, Urban unoff, Interceptor sewers, Detention reservoirs, torage, Runoff, Storms, Rainfall, Pollutants, ivers, Discharge(Water), Urban hydrology, Delaware River, *New Jersey.
dentifiers: *Trenton(NJ).

ounded in 1679, Trenton is one of the nation's olest cities. Like most old cities, Trenton is conronted with the problem of an inadequate sewer ystem. Chambersburg, a section of Trenton, comrises one-seventh of the city's land area, but its ombined sewer system serves about one-half of ie city's population and major industries. The emainder of the city is provided with a separate ewer system. The existing sewerage system was escribed. A proposed program for eliminating ollution from the city's sewage system included nlarging an interceptor and constructing a detenon basin to store all combined sewage for later eatment. Calculations showed that this proposed rogram would keep water quality within acceptale limits for all but the highest rainfalls. (See also 76-09729) (Sims - ISWS)
76-09741

INANCING POLLUTION ABATEMENT QUIPMENT FOR TEXTILES AND OTHER OUTH CAROLINA INDUSTRIES.
lemson Univ., S.C. Dept. of Economics.
or primary bibliographic entry see Field 5G.
76-09766

RESENTATION CONCERNING POLLUTION ONTROL FACILITIES REVENUE BONDS,
inkler, Gibbs, Simon and Guerard, Charleston, .C.
or primary bibliographic entry see Field 5G.
76-09767

OLE OF THE UNDERWRITER IN TAX EXMPT FINANCING FOR INDUSTRIAL EXPANION AND POLLUTION CONTROL,
nterstate Securities Corp., Charlotte, S.C.
or primary bibliographic entry see Field 5G.
76-09768

HE INDUSTRIAL REVENUE BOND FOR POLUTION CONTROL: ONE COMPANY'S PERPECTIVE,
a France Industries, S.C.
or primary bibliographic entry see Field 5G.
76-09769

FINANCING POLLUTION CONTROL PROJECTS IN SOUTH CAROLINA USING TAX-EXEMPT INDUSTRIAL REVENUE BONDS,
Spring Mills, Grace, S.C.
For primary bibliographic entry see Field 5G.
W76-09770

THE POLLUTION CONTROL BOND,
Clemson Univ., S. C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-09771

A GUIDE TO THE SELECTION OF COST-EFFECTIVE WASTEWATER TREATMENT SYSTEMS,
Bechtel, Inc., San Francisco, Calif. Environmental Water Projects Dept.
R. H. Van Note, P. V. Hebert, R. M. Patel, C. Chupek, and L. Feldman.
Technical Report EPA-430/9-75-002, July 1975. 223 p. 115 fig., 8 tab., 44 ref. 68-01-1276.

Descriptors: *Sewage treatment, *Treatment facilities, *Economic efficiency, Costs, *Analytical techniques, *Cost comparisons, *Waste water treatment, Sludge treatment, Capital costs, Operating costs, Maintenance costs, Estimating, Amortization, Equations, Sludge disposal.

An aid to the identification of most of the wastewater treatment process sequences (other than land treatment and pond systems) currently available to meet point source federal and state discharge standards is presented. In addition to identifying a wide range of treatment alternatives available, guidance is given in further screening of alternatives as to their cost-effective potential, defined as that which will minimize total resources costs to the nation over time to meet water quality standards. Resources costs include capital (construction and lands); operation, maintenance and replacements; and social and environmental costs. A sewage treatment system may provide for wastewater reuse when the sale or net value from such reuse will, at a minimum, offset any additional costs to the system. Detailed are unit treatment processes which are illustrated by flow sheets; methods of cost determinations, cost curves for unit processes, factors other than cost to be considered in selecting unit processes; and calculation of capital and O and M costs, and total costs. Combined unit processes are defined and diagrammed. Procedures are given for use of the diagrams and for comparing alternative systems costs, with examples of cost-effectiveness comparisons of complete treatment systems. Appendices describe the unit processes, give cost formulae, and analyze cost effective guidelines. (See W76-09773 and W76-09774) (Auen-Wisconsin).
W76-09772

WASTEWATER SLUDGE UTILIZATION AND DISPOSAL COSTS,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
T. G. Shea, and J. D. Stockton.
Technical Report EPA-430/9-75-015, September 1975. 16 p. 2 fig., 14 ref. EPA P5-01-205.

Descriptors: *Sewage treatment, *Sewage sludge, *Sludge disposal, *Cost comparisons, Amortization, Capital costs, Operating costs, Maintenance costs, Economic efficiency, Ultimate disposal, Transportation, Landfills, Estimating, *Waste water treatment.
Identifiers: Land spreading.

A series of cost relationships for five basic alternatives and two sub-alternatives of sludge disposal (the combination of sludge treatment processes and sludge transport and ultimate disposal methodologies) is presented with descriptions of the process and type of information used in creating these relationships. The variables considered are: sewage treatment plant flow rates varying from 1 to 1000 MGD; primary and secondary treatment; transport to ocean disposal by barging and land disposal by truck, rail, and pipeline; and land disposal by landfill and land spreading. Transport distances reflect those likely to be considered by Eastern Seaboard cities; barging transport costs apply to two situations--where all sludge can be loaded on a single barge loading station and where sludge is collected from a multiplity of loading stations. The material balances developed for the sludge 'flow' through the unit process trains in each alternative are based on 'tons of dry solids/day per MGD flow.' The assessment of the 288 sets of cost data develop a single-page graphical presentation allowing estimation, by alternative type of treatment, flow rate and type of distance of residuals transport, the capital costs, operating and maintenance costs, and total annual costs. The cost relationships are based on March 1975 dollars. (See also W76--09772) (Auen-Wisconsin).
W76-09773

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION,
Metcalf and Eddy, Inc., Palo Alto, Calif.
C. E. Pound, R. W. Crites, and D. A. Griffes.
Technical Report EPA-430/9-75-003, june 1975. 163 p. 41 fig., 15 tab., 61 ref., 4 append. 68-1-0966.

Descriptors: *Soil disposal fields, *Waste water treatment, *Cost comparisons, *Land use, *Estimated costs, *Economic efficiency, Water reuse, Capital costs, Operating costs, Maintanance costs, Amortization, Design, Benefits, Indirect benefits, Sewage treatment, Construction costs, Flow rates, Irrigation, Infiltration, Percolation, Overland flow, Application methods, Conveyance structures, Storage requirements, Distribution systems, Water rights.
Identifiers: *Land application.

Preliminary cost screening and detailed estimating methods for treatment alternatives involving land application of wastewater are presented. Estimates based on the preliminary data should generally be within 30% of actual costs; however, for conditions unfavorable to land application the variance could be more than 50%. Costs are divided into components, including total land area requirement, preapplication treatment, crop revenues, transmission methods, storage, application systems, and recovery of renovated water, with cost curves for each component relating to flow in mgd. The more detailed cost data enables the development of estimates for the most feasible treatment method, with cost curves for individual system components. These can easily be adjusted to reflect local and current conditions, and are expected to be accurate within 15% of actual costs. Alternative means of cost estimation are given for planting, cultivation, harvesting, yardwork, and relocation of residents. Also to be considered in cost effectiveness are revenue-producing benefits, such as sale of crops grown, sale of renovated water, sale of surplus effluent, land lease for irrigation and for recreation; and nonrevenue-producing benefits, such as social and environmental enhancement. The cost data base date is February 1973. (See also W76-09772) (Auen-Wisconsin).
W76-09774

DEVELOPMENT OF A DYNAMIC PROGRAMMING MODEL FOR THE REGIONALIZATION AND STAGING OF WASTEWATER TREATMENT PLANTS,
Utah State Univ., Logan.
S. L. Klemetson, and W. J. Grenney.
PRWA20-2, Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, Utah, June 1975. 124 p, 25 fig, 34 tab, 81 ref, 3 append.

Descriptors: *Waste water treatment, *Treatment facilities, *Dynamic programming, Optimization, Regional development, Costs, Decision making,

Water quality control, Feasibility, Economies of scale, Timing, Model studies, Equations, Systems analysis, *Utah.
Identifiers: *Cost minimization, Staging, Lower Jordan River region(Utah), Capacity expansion, Sensitivity analysis.

Many cities and industries are faced with the problem of planning wastewater treatment for a growing society. Several treatment plants might be phased out to provide for a much larger regional plant with improved economies of scale in both capital and operation and maintenance costs. This research presents some criteria and a method for evaluating the timing and capacity expansion decisions for wastewater treatment facilities. Presented is a dynamic programming, economic decision model to be used as a management and planning tool by regional and local planners for the sequential expansion, upgrading, and regionalization of wastewater treatment plants at a minimum total discounted future cost. Parameters include the projected populations, wastewater quality and quantity, treatment efficiency requirements, interest rates, inflation rates, construction costs, operation, maintenance, and replacement costs, economies of scale, excess capacity, and service life. An analysis of the wastewater treatment needs of the Lower Jordan River region of Salt Lake and Davis Counties in Utah has been made using the available data. These results are then subjected to a sensitivity analysis of the input parameters. (Bell-Cornell)
W76-09845

SEWAGE TREATMENT SYSTEM,
Koehler-Dayton, Inc., New Britain, Conn. (Assignee).
R. B. Davis, and A. H. Cornish.
U.S. Patent No. 3,922,976, 2 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 99, December 2, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Water pollution treatment, Water pollution control, Water quality control, Solid wastes, *Incineration Odor.
Identifiers: Combustion, Maceration.

The sewage treatment system delivers sewage in the form of a fluid containing macerated solids to an exhaust stack or other combustion chamber for combustive reduction. The sewage is delivered to the exhaust stack only when the gases in the exhaust stack exceed a predetermined temperature. The solid portion of the sewage must be macerated into very fine particles to assure that combustion of the delivered sewage will be complete so that no solid residue or viable organisms will be discharged from the exhaust stack. To assure that there will be no residue or odor emitted from the stack, the sewage is delivered to the stack only when the temperature within the exhaust stack at the point of admission of the sewage is at least a predetermined temperature such as 675 deg F. The success of the system depends in great measure on the ability to supply the sewage to the combustion zone only when the solid component of the sewage has been macerated into very fine particles. This objective is achieved in the invention with the utilization of a positive displacement pump which includes a macerator unit and whill will discharge the macerated sewage at a flow rate far in excess of the desired flow rate to the stack. (Sinha - OEIS)
W76-09854

WATER TREATMENT PROCESS AND APPARATUS,
Gealer (Saul), Los Angeles, Calif. (Assignee).
H. K. Harms.
U.S. Patent No. 3,933,606, 7 p, 4 fig, 4 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1337, January 20, 1976.

Descriptors: *Waste water treatment, *Patents, *Water purification, *Electrolysis, *Water pollution treatment, Water pollution control, Water quality control, Flocculation, Bacteria.
Identifiers: Cyanide.

Contaminated water containing any combination of organic and inorganic suspended solids of whatever particle size, dissolved metal salts and cyanide is fed to the water treatment apparatus. The contaminated water pretreated prior to introduction into the apparatus by adjusting its pH to a range of from about 8.0 to about 10.0 by addition of an aqueous acid or base such as HCl or NaOH, as required, and by screening out gross particulate matter. The contaminated water is then fed to the column where it flows through the perforations in the plates and is exposed to the pulsating electrical signal supplied to the plates. The application of the pulsating electrical signal to the plates as the contaminated water flows through the column causes metal salts to precipitate from the solution, bacteria to be killed, and cyanide to be destroyed, and initiates formation of micro floc. The floc is then removed by clarification and filtering apparatus to yield essentially pure water and a sludge which may be further treated to recover metals and other valuable by-products. (Sinha - OEIS)
W76-09855

METHOD OF BIOLOGICAL PURIFICATION OF INDUSTRIAL EFFLUENTS FROM CHROMATES AND BICHROMATES,
V. I. Romanenko, S. I. Kuznetsov, and V. N. Korenkov.
U.S. Patent No. 3,941,691, 3 p, 1 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 338, March 2, 1976.

Descriptors: *Patents, *Industrial wastes, Chemical wastes, Water purification, Domestic wastes, Water quality control, Water pollution control, *Water pollution treatment, Sewage treatment, *Biological treatment, Separation techniques, *Waste water treatment.
Identifiers: Chromates, Bichromates.

The industrial effluents to be treated which contain chromates and bichromates are delivered to an averaging reservoir where the content of chromium in the effluent is averaged, then the effluents are continuously fed to a sealed receiving vessel. The domestic sewage is first fed to a settler where large suspended matter settles to the bottom and the clarified sewage is continuously fed to the sealed receiving vessel. The amount of industrial effluents and domestic sewage entering the sealed receiving vessel is adjusted so as to have the amount of easily oxidized organic matter introduced with the domestic sewage at least 1.2 times higher than the amount of bound oxygen in the chromate or bichromate introduced together with the industrial effluents. The capacity of the sealed reservoir is calculated based on the time required for the chromate or bichromate to be biologically reduced. From the settler, the Bacterium dechromaticans Romanenko B-1167 is continuously fed into the sealed reservoir in amounts sufficient for the concentration of enriched culture to be maintained in the biological reducer to within 3 to 7 g per liter based on dry biomass matter. The mixture thus obtained of industrial effluents and domestic sewage together with the Bacterium dechromaticans Romanenko B-1167 culture is continuously stirred in the absence of air oxygen, then it is continuously fed to a settler tank where the Bacterium dechromaticans Romanenko B-1167 culture will settle, and the clear water free from chromates and bichromates is discharged. (Sinha-OEIS)
W76-09856

MEMBRANE SUPPORT-PLATES AND FLUID SEPARATING APPARATUS IN WHICH THEY ARE PRESENT,
Rhone-Poulenc, S.A., Paris (France). (Assignee).
B. Jamet, and J. Roget.
U.S. Patent No. 3,943,057, 5 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 944, No 2, p 832, March 9, 1976.

Descriptors: *Patents, *Separation techniques, *Membrane processes, *Water purification, *Permselective membranes, *Waste water treatment, Water pollution treatment, Water quality control, Water pollution control.
Identifiers: Membrane support.

A membrane support-plate for fluid separating apparatus is provided. The support-plate comprises a number of substantially flat elements superposed in face-to-face relation and joined to one another in a leakproof manner, each flat element being substantially symmetrical relative to a median plane passing through its thickness. The invention also provides fluid separating apparatus including two end plates and a pipeline for feeding fluid to one of the end plates and a pipeline for removing fluid from the other of the end plates and a stack of membrane support-plates each having a membrane on each face. The apparatuses are suitable for any operations of separating fluids by selective permeability, whether these fluids are in gaseous or liquid forms and whether or not they contain suspended particles. (Sinha-OEIS)
W76-09857

METHOD AND COMPOSITION FOR PREVENTING WATER CONTAMINATED WITH INDUSTRIAL WASTE FROM SEEPING THROUGH SOIL CONTAINING SAID WATER,
American Colloid Co., Skokie, Ill. (Assignee).
For primary bibliographic entry see Field 5G.
W76-09858

OPEN-LOOP WATER-WASHABLE INSPECTION PENETRANT PROCESS,
J. R. Alburger.
U.S. Patent No. 3,949,601, 6 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 613, April 13, 1976.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Water purification, *Separation techniques, *Water pollution treatment, Water quality control, Water pollution control, Water pollution sources, Industrial production.
Identifiers: *Water-washable penetrants.

Test parts which are being inspected for the presence of surface crack defects are dipped in the water-washable penetrant and are allowed to drain. They are then washed with water to remove surface penetrant, leaving entrapments of penetrant in any crack defects which may be present. As a result, wash water which is employed for either the water-washable penetrant process or the Post-Emulsifier process contains considerable contaminants of emulsified or dissolved penetrant, and such contaminants have become an increasingly objectionable source of pollution in sewage systems or water disposal systems. The principal object of the invention is to provide a water-washable inspection penetrant process in which the penetrant is recovered for reuse, and the wash water is maintained at a low level of contamination acceptable for discharge into water-disposal systems. Certain types of low-solubility water-washable inspection penetrants, and which contain no detergent, are adaptable to a mode of usage whereby used penetrant separates from the wash water and floats to the surface of the water where it can be collected and re-used. The relatively pure water is drawn from the bottom of the holding tank and is discharged into a water-disposal system. (Sinha-OEIS)
W76-09859

APPARATUS FOR PURIFICATION OF INDUSTRIAL WASTE WATER,
Elkem-Spigerverket A/S, Oslo (Norway). (Assignee).
K. W. Jahnsen.

.S. Patent No. 3,950,250, 3 p, 1 fig, 10 ref; Offi-ial Gazette of the United States Patent Office, ol 945, No 2, p 824, April 13, 1976.

escriptors: *Patents, *Industrial wastes, *Waste ater treatment, *Water purification, Water pollu-on treatment, Water pollution control, Water uality control, *Oxidation, Flocculation, Separa-on techniques, Hydrogen ion concentration.
lentifiers: Cyanides, Metal-working industrial lants.

he required amounts of sodium hypochlorite or aseous chlorine for oxidation of the cyanides ong with alkali for raising the pH to that level hich will give optimum reaction conditions are dded to the waste water in conventional amounts nd manner and then the water is conducted to a ombined prereaction and flocculation container which the mechanical flocculation and oxidation f cyanides takes place simultaneously. The pH of he waste water in the chamber for best results is sually in the range of 10 to 11. The prereaction nd flocculation container is provided with an nner and an outer compartment. The waste water fed into the inner compartment where it flows rough the compartment and into the outer com-artment where it flows countercurrently to the irection of flow in the first compartment. Con-entional agitation means are provided in the inner ompartment. The speed of agitation and retention me in the container as determined by rate of flow f the waste water are adjusted to obtain the op-mum reaction conditions for the oxidation or ecomposition of the cyanides and flocculation of uspended material. (Sinha - OEIS)
/76-09861

UPPORTED SEMI-PERMEABLE MEM-RANES,
Daicel Ltd., Osaka (Japan). (Assignee).
or primary bibliographic entry see Field 3A.
/76-09863

EMIPERMEABLE MEMBRANE AND ROCESS FOR THE PREPARATION HEREOF,
Daicel Ltd., Osaka (Japan). (Assignee).
or primary bibliographic entry see Field 3A.
/76-09864

PPARATUS AND METHOD FOR RECOVER-NG PURE WATER FROM NATURAL OURCES AND INDUSTRIAL POLLUTED VASTE SOURCES,
or primary bibliographic entry see Field 5G.
/76-09867

IETHOD AND APPARATUS FOR CONVERT-NG SALINE WATER TO FRESH WATER,
or primary bibliographic entry see Field 3A.
/76-09871

IETHOD AND APPARATUS FOR THE CON-ERSION OF AN AQUEOUS SCALE-FORMED IQUID,
or primary bibliographic entry see Field 3A.
/76-09872

IETHOD OF OPERATING A PURIFYING LANT AND TANK FOR PRACTICING SAID IETHOD,
lenzel and Co., Stuttgart (West Germany). Assignee).
. Porsch.
.S. Patent No. 3,951,758, 4 p, 2 fig, 7 ref; Official azette of the United States Patent Office, Vol 45, No 3, p 1333, April 20, 1976.

escriptors: *Patents, *Waste water treatment, Water purification, Water pollution control, Water pollution treatment, Water quality control, Sludge, Oxygenation, Ventilation, Air circulation, Application equipment.
Identifiers: Revolving tanks.

A method of operating a round reactivating tank for a purifying plant is described. The tank has a vertical axis and is adapted to receive a sludge-water mixture to be purified. The steps of the method are: revolving in the tank the sludge-water mixture to be purified; supplying the reactivating sludge flakes of the mixture in the tank with oxygen independently of revolving by introducing compressed air into the mixture along radial lines from adjacent the outer circumference inward toward the center; and increasing the volume of air outward from the center toward the circumference to force the mixture in the tank to carry out and maintain for a desired time a circular flow. The flow is substantially coaxial with the vertical axis and has a radially inward directed component adjacent the bottom of the tank and deflecting upward by a centrally positioned inclined surface. (Sinha-OEIS)
W76-09873

FURNACE FOR THERMAL TREATMENT OF LIQUID INDUSTRIAL WASTE WATERS CONTAINING TOXIC ORGANIC IMPURITIES (PECH' DLYA TERMICHESKOGO OBEZVREZHIVANIYA ZHIDKIKH PROMYSHLENNYKH STOKOV S TOKSICHESKIMI ORGANICHESKIMI PRIMESYAMI),
V. I. Brazhnikov, and P. A. Tikhanovskiy.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-783 850, $3.50 in paper copy, $2.25 in microfiche. Russian Patent No. 286983, 1971. 3 p, 4 fig. Translation prepared for Army Foreign Science and Technology Center, Charlottesville, Va.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, *Water pollution treatment, *Water pollution control, *Water quality control, Gases, Heat, Condensation.
Identifiers: Combustion, Furnaces, Atomizing.

A furnace is described for thermal treatments of industrial liquid waste with toxic organic impurities. It consists of a vertical shaft with channels for introducing fuel and air, units for heating and atomizing industrial wastes and for cooling and removal of gaseous combustion products. The effectiveness of the furnace is achieved by installing units for separate introduction of fuel into the shaft and combustion units and by using additional combustion chambers which form individual zones along the height of the furnace. Units for atomizing industrial waste waters, for example atomizers, are situated along the perimeter at different heights of the furnace shaft and the liquid being atomized is directed opposite to the gas stream at an angle to the vertical. The furnace consists of a vertical shaft with independent combustion chambers situated tangentially and furnished with short-flame burners. The industrial liquid waste heated to a temperature of 70-95 deg C is fed under pressure into the atomizing sprayers located in two decks along the furnace height. Air is introduced in the form of fine jets. The burning and removal of impurities by calcination of industrial waste liquids present in vapor form is accomplished. The products of combustion are removed from gas outlet and low-melting salts which precipitate during the treatment process are melted and periodically discharged. On cooling the gases leaving the furnace condenses and the moisture can be used again. (Sinha-OEIS)
W76-09875

PREPARATION OF REVERSE OSMOSIS MEMBRANES BY COMPLETE EVAPORATION OF THE SOLVENT SYSTEM,
Dept. of the Interior, Washington, D. C.
For primary bibliographic entry see Field 3A.
W76-09876

REVERSE OSMOSIS PROCESS USING CROSS-LINKED AROMATIC POLYAMIDE MEMBRANES,
Department of the Interior, Washington, D. C.
For primary bibliographic entry see Field 3A.
W76-09877

CALCULATION OF WATER TEMPERATURES IN CLEAR LAKE, IOWA,
Ichthyol. Assoc., Berwick, Pa. Icthyological Associates, Inc., Berwick, Pa.
For primary bibliographic entry see Field 5B.
W76-09879

THE COANDA EFFECT OIL/WATER SEPARATOR: A DEVELOPMENT STUDY,
Navy Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 5G.
W76-09890

PRELIMINARY DESIGN OF A COMPREHENSIVE WASTE OIL PROCESSING FACILITY,
Environmental Quality Systems, Inc., Rockville, Md.
G. D. Gumtz, and E. J. Martin.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 461, $6.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency Report No. EPA-670/2-75-056, May 1975. 133 p, 20 fig, 44 tab, 14 ref, append.

Descriptors: *Oil industry, *Waste water treatment, Facilities, *Pollutant identification, *Recycling, *Resources development, *Oil pollution, Pollutants, Maryland, Metals, Disposal, Sulfates, Halides, Quality control, *Treatment facilities.
Identifiers: *Waste oils, Oil recoveries.

A preliminary design was performed for a comprehensive waste oil recovery and disposal facility for the State of Maryland. The base for this design was an annual state-wide waste oil generation of 22,000,000 gallons which includes all known waste oil sources. With a 90% stream factor, feed to the plant is 66,000 gallons per day. The facility contains two major sections: (1) tank farm and (2) process plant. The tank farm is, in turn, composed of three major subsections: (1) receiving, (2) primary waste oil storage, and (3) product tankage. The comprehensive process plant has been designed to accept a wide range of waste oil types (crankcase, hydraulic, transformer, edible, etc.) and, potentially, provide multiple product oils (fuel, re-refined industrial, etc.). For this, it contains three major subsections: (1) adsorbent treatment, (2) solvent extraction, and (3) incineration. Basic processing will involve, in order, reagent addition and settling, flash distillation, adsorbent treatment followed by filtration, or sovent extraction followed by solvent recovery. Capital cost for this full-scale comprehensive facility is estimated at $5,700,000. Excluding collection, costs, overall system management, and major research and development, annual operating costs are estimated at about $2,331,000. Approximately 16,000,000 gallons of fuel oils and 500,000 gallons of lube oil base stock will be produced by this facility each year. Waste products generated include heavy metal particulates and calcium halides and sulfate. (Sinha-OEIS)
W76-09894

DEVELOPMENT OF A BATCHWISE IN-SITU REGENERATION TYPE SEPARATOR TO REMOVE OIL FROM OIL-WATER SUSPENSIONS,
Hydronautics, Inc., Laurel, Md.
For primary bibliographic entry see Field 5G.
W76-09895

INSECT GROWTH REGULATORS FOR THE CONTROL OF AQUATIC MIDGES,
California Univ., Riverside. Dept. of Entomology.
For primary bibliographic entry see Field 5G.
W76-09997

5E. Ultimate Disposal Of Wastes

MARINE SEWAGE DISPOSAL DEVICE,
For primary bibliographic entry see Field 5D.
W76-09418

SEPTIC TANK SYSTEM,
For primary bibliographic entry see Field 5D.
W76-09426

WASTE TREATMENT PLANTS,
Foster Wheeler John Brown Boilers Ltd., London (England). (Assignee).
R. J. Davies, and D. G. Blows.
United States Patent 3,954,605. Issued May 4, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 1, p 243, May, 1976. 1 fig.

Descriptors: *Patents, *Waste disposal, *Incineration, Domestic wastes, *Sewage treatment, Flocculation, *Waste water treatment.
Identifiers: *Shipboard wastes.

A method was patented for disposing of sewage wastes and domestic solid materials on a ship or in a remote land site using a fluidized bed incinerator. The solid material may be combustible, noncombustible, or a mixture. The sewage wastes first enter a reception zone. After collection in the reception zone, the wastes are passed to a macerator. Flocculation aids are introduced to the sewage wastes after maceration. The sewage wastes are passed to a zone for pressure aeration where air is dissolved into them under pressure. The sewage wastes are then passed to another zone and fine air bubbles are liberated, transporting solid particles which have flocculated to the zone's surface and separating the sewage into a clarified liquor and a pulp, which can be fed to the fluidized bed incinerator. The clarified liquor is disinfected and then reused on the ship or in the remote land site or passed to the incinerator. Part of the pulp is returned to the pressure aeration zone. The pulp not returned is passed to a feeding zone of the incinerator. The solid materials are passed to a pulverization zone and converted to incineratable form which can be fed to the incinerator's fluidized bed region. Combustion conditions are provided in the fluidized bed incinerator. The solid materials are passed to the feeding zone. The pulp and the solid materials are mixed in the feeding zone of the incinerator. This mixture is fed directly to the incinerator's fluidized bed region. Any oil waste from the remote land site or ship is introduced into the fluidized bed incinerator. (Snyder-FIRL)
W76-09427

PROCESS AND APPARATUS FOR THE INCINERATION OF AQUEOUS SEWAGE SLUDGE,
Myrens Verksted A/S, Oslo (Norway). (Assignee).
P. A. Loken.
United States Patent 3,954,069. Issued May 4, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 1, p 74-75, May, 1976. 1 fig.

Descriptors: *Patents, *Incineration, *Sludge treatment, Sewage treatment, Solids removal, Dewatering, Odors, *Waste water treatment.

A process and related equipment have been patented for incinerating aqueous sewage sludge, such as from community sewage treatment plants. The aqueous sewage sludge is mechanically dewatered to produce a wet sludge with high solids content. This wet sludge is indirectly heated and substantially dried in a heated drier, producing an exhaust gas containing water vapor and a dried sludge. The dried sludge is conducted to an incinerator for solid refuse. The exhaust gas is conducted through a condenser, condensing the water vapor and removing it, substantially drying the exhaust gas. This dry exhaust gas is conducted into the incinerator's combustion chamber. The exhaust gas is deodorized by heating with the aid of the hot combustion gases in the incinerator. (Snyder-FIRL)
W76-09428

SEWAGE SEPTIC SYSTEM FOR A PLURALITY OF DRAIN FIELDS,
Langley Hill Quarry, Woodside, Calif. (Assignee).
For primary bibliographic entry see Field 5D.
W76-09430

CARBON WASTEWATER TREATMENT PROCESS,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 5D.
W76-09441

A COMPARISON BETWEEN THE EFFICACY OF SUBMARINE OUTFALL DISPOSAL OF ADVANCED PRIMARY EFFLUENT AND CONVENTIONAL TREATMENT,
Trieste Univ. (Italy). Istituto di Idraulica e Costruzioni Idrauliche.
R. Olivotti.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 215-231, 1976. 2 tab, 55 ref.

Descriptors: *Waste water treatment, *Waste water disposal, *Pre-treatment(Water), *Outfall sewers, Nutrient removal, Viruses, Biochemical oxygen demand.
Identifiers: Marine outfalls.

The optimum choice of systems for treating and disposing of waste water in coastal areas depends on local circumstances. Types of systems frequently used include a long outfall preceded by pretreatment, a long outfall preceded by primary treatment, and biological treatment and chlorination followed by discharge near the coast. Advances which do not substantially change the problem's financial dimensions include the use of advanced primary treatment and following chlorination with dechlorination after biological treatment. Either of the latter two systems can usually meet a requirement that the 80th percentile be less than or equal to 100 fecal coliforms/100 cu cm. Viruses must also be considered as contaminats. Both of these systems can provide satisfactory protection against pollution by viruses, but outfalls must be longer than the current usual length. A long outfall preceded by advanced primary treatment is more effective against eutrophication. Both systems can result in satisfactory water quality near the outlet. Where the minimum prescribed treatment is not higher than advanced primary, either system may be used. The long outfall method, however, cannot be used where biochemical oxygen demand(BOD) standards are strict. Costs of the two systems are usually of the same order. Long outfalls preceded by advanced pretreatment are often preferable when concentrations of dissolved persistent toxicants meet specific standards and conventional 'full' treatment is not legally mandatory. (Snyder-FIRL)
W76-09448

RADIATION FOR A CLEAN ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5D.
W76-09512

TYPES AND TREATMENT OF SEWAGE SLUDGES PRACTICE IN THE FEDERAL REPUBLIC OF GERMANY,
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wassergute-wirtschaft.
For primary bibliographic entry see Field 5D.
W76-09513

METHODS FOR REDUCING THE INFECTION HAZARD OF WASTE-WATER SLUDGE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W76-09514

RECENT ADVANCES IN THE TREATMENT OF SOLID WASTES,
Technion-Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 5D.
W76-09553

NUMERICAL SIMULATION OF WASTE MOVEMENT IN STEADY GROUNDWATER FLOW SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W76-09564

EFFECTS OF DISCHARGE FROM A DREDGE SPOILS SITE ON CARROLL ISLAND, MARYLAND,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Lab.
For primary bibliographic entry see Field 5C.
W76-09647

DEWATERING OF SEWAGE SLUDGE VIEWED AS PART OF THE PURIFICATION PROCESS -- PLANNING CRITERIA (KLAERSCHLAMMENTWAESSERUNG ALS TEIL DER GESAMTEN KLAERAUFGABE BETRACHTET -- PLANUNGSKRITERIEN),
For primary bibliographic entry see Field 5D.
W76-09681

DEVELOPMENT OF EDINBURGH'S SEWAGE DISPOSAL SCHEME,
Lothian Regional Council (Scotland).
For primary bibliographic entry see Field 5D.
W76-09707

THE DESERT WAR ON POLLUTION,
For primary bibliographic entry see Field 5D.
W76-09711

A GUIDE TO THE SELECTION OF COST-EFFECTIVE WASTEWATER TREATMENT SYSTEMS,
Bechtel, Inc., San Francisco, Calif. Environmental Water Projects Dept.
For primary bibliographic entry see Field 5D.
W76-09772

WASTEWATER SLUDGE UTILIZATION AND DISPOSAL COSTS,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
For primary bibliographic entry see Field 5D.
W76-09773

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-09774

RGANIC SEDIMENT MODEL FOR WASTE-ATER OUTFALL,
tra Tech, Inc., Lafayette, Calif.
r primary bibliographic entry see Field 5B.
76-09951

RTICLE-LADEN JETS WITH APPLICATION O OCEAN DUMPING,
laware Univ., Newark. Dept. of Civil Engineer-g and Marine Studies.
r primary bibliographic entry see Field 5B.
76-09959

F. Water Treatment and Quality Alteration

N CLARIFIES SLUDGE OPTIONS,
ater and Wastes Engineering, Vol. 13, No. 4, p , April, 1976.

escriptors: *Water treatment, *Sludge treat-ent, Clays, *Polymers, Dewatering, Sludge sposal.
entifiers: *Alum, *Clay-polymer sludge.

clay-polymer clarification program developed Nalco Chemical Company as an alternative to m clarification was tested at two water treat-ent plants in Birmingham, Alabama. Sludge oduced from clay-polymer clarication is much wer in volume than the sludge produced from m clarification because no fluffy hydrated alu-num hydroxide is produced in the process. The y-polymer sludge dewaters easily by drainage d evaporation; no chemically bound water is rmed in the process. The city authorized Nalco use its water resources management van to con-ct evaluations of the clay-polymer program. The n contains a laboratory equipped with a Zeta eter, spectrophotometer pH instruments, tur-dimeter, and colorimetric instrumentation. The sults of the tests showed that the product water as of excellent quality, well within the city's ndards, and that the process produced a low lume of sludge with good handling and dewater-g properties. (Orr-FIRL)
76-09438

URRENT TECHNOLOGY AND ADVANCES IN RUE RE-USE OF EFFLUENTS,
tional Inst. for Water Research, Pretoria (South rica).
r primary bibliographic entry see Field 5D.
76-09515

UBLIC HEALTH ASPECTS OF WASTE-ATER TREATMENT,
yal Veterinary and Agricultural Coll., penhagen (Denmark). Dept. of Veterinary rology and Immunology.
r primary bibliographic entry see Field 5D.
76-09516

HE NEED FOR THE USE OF HIGH-LEVEL ADIATION IN WATER TREATMENT AND IN ASTE-WATER (SEWAGE) TREATMENT,
ueonics, Inc., Los Altos, Calif.
r primary bibliographic entry see Field 5D.
76-09518

ACTICAL APPLICATION OF THE GER-ICIDAL POWER OF ULTRAVIOLET IR-ADIATION TO DRINKING-WATER, (IN ENCH),
stitut Pasteur, Paris (France). Medical Virology b.
Maurin, L. P. Mazoit, A. Dodin, and G. callier.
ll W H O. 51(1), p 35-40, 1974.

Descriptors: Disinfection, *Ultraviolet radiation, Potable water, Public health, *Bacteria Enteric virus, Pesticides, Streptococcus, *Water treatment.
Identifiers: Colibacilli, Picornavirus, Poliovirus, *Vibrio-Cholerae.

The possibilities of using UV irradiation for disinfecting water, especially drinking-water are yet underestimated. Continuous and intermittent bacteriological trials on filtered and unfiltered river water showed that UV-rays are effective against colibacilli and fecal streptococci but less active against sulfite-reducing clostridia. Vibrio cholerae was completely inactivated by the procedure, and enteroviruses, such as poliovirus, were completely or almost completely inactivated.--Copyright 1975, Biological Abstracts, Inc.
W76-09646

REPORT TO THE CONGRESS BY THE NATIONAL COMMISSION ON WATER QUALITY,
National Commission on Water Quality, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-09663

MONITORING AND AUTOMATIC FILTER CONTROL OF THE DREIS-TIEFENBACK TREATMENT PLANT (BETRIEBSUEBERWACHUNG UND AUTOMATISCHE FILTERSTEUERUNG DER AUFBEREITUNGSANLAGE DREIS-TIEFENBACH),
H. Roesel, and H. Stein.
Wasser und Boden, Vol. 28, No. 4, p 76-79, 1976. 5 fig, 1 ref.

Descriptors: *Treatment facilities, *Water treatment, *Filtration, *Water works, *Control, Filters, Aeration, Chlorination, Oxygenation, *Monitoring, Automatic control.

The Dreis-Tiefenbach waterworks and its automatic filter control are described. Raw water obtained from a barrage and from groundwater is first aerated for oxygenation and for the partial removal of carbon dioxide. Suspended matter, iron, and manganese are removed in a first filter stage that uses such chemicals as aluminum sulfate, potassium permanganate, and aqueous lime. Quartz gravel is used for filtration. The water is treated with potassium permanganate, carbon dioxide and lime in a second filter stage composed of Jurassic chalk. In a final step, the water is chlorinated before distribution. (Takacs-FIRL)
W76-09679

THE CHEMISTRY OF OZONE IN THE TREATMENT OF WATER,
Hebrew Univ., Jerusalem (Israel). Graduate School of Applied Science and Technology.
M. Peleg.
Water Research, Vol. 10, No. 5, p 361-365, 1976. 1 tab, 50 ref.

Descriptors: *Ozone, *Water treatment, *Waste water treatment, *Organic compounds, *Kinetics, Analytical techniques, Phenols, Water chemistry, Reviews.
Identifiers: Hydroxyl radicals.

A review is presented of the chemistry of ozone in water and the potential disinfection efficiencies of ozone and its probable dissociation species in water. Ozone, an unstable gas that decomposes slowly in the gaseous phase to ordinary oxygen, will decompose at a greatly accelerated rate under thermal conditions. Knowledge of the mechanism and kinetics of the dissociation of ozone in water is uncertain. On the basis of several studies reviewed, the possible species to be found in aqueous ozone solution are 03, 0H, H02, 0-, 03-, and possibly the free oxygen atom if ozone decomposes before reacting with the water. Ozone has one of the highest oxidation potentials known, 2.07 V in acidic solutions and 1.24 V in basic solutions. Similar reactions of the hydroxyl radical and ozone have been noted. Both produce similar effects in the reduction of the organic carbon content of waste water effluents. Additionally, the ozonization of phenol in aqueous solution and the oxidation of phenol by OH both produce catechol and o-quinone as intermediate products. Investigations suggest that the dissociation products may be more powerful oxidation agents than ozone itself. Further experimental work is being performed in order to make more definitive statements about germicidal properties of ozone and its dissociation species in water. More work is needed on the effect of pH changes and increased catalytic decomposition of ozone on its disinfection ability. (Kramer-FIRL)
W76-09684

MODERN TECHNIQUES OF WASTE DETECTION,
East Worcestershire Waterworks Co., Bromsgrove (England).
R. H. Burch, and K. C. Marlow.
Water Services, Vol. 81, No. 960, p 179-182, March, 1976. 3 fig.

Descriptors: *Water treatment, *Distribution systems, Analytical techniques, Data collections, Sands, Flow rates, Pressure, Computers, Pollutant identification, Water supply, *Water conservation, *Waste identification.

The East Worcestershire Waterworks Company supplies water to a mixed rural and industrial community of about 300 sq mi. Until recently, sand from the wells from which most of this water is obtained entered the distribution system and eventually contributed to waste problems. Waste is defined as water supplied that cannot be accounted for in terms of legitimate domestic, metered, or bulk consumption. Waste dropped from 30% to 26% between 1963 and 1970, due to various water conservation measures. A new waste detection system was instituted in which a computer is used to compare flows at various points in the system. The system was divided into zones. Unusual demand in a zone is indicated by deviation of the solution of the zonal equation from known limits; sudden demands can be located within minutes. Every 24 hr, minimum night line figures are logged for all zones, to detect gradual waste increases. The equations consider losses or gains in reservoir levels in determining water consumption. Flow data is transmitted digitally, in units of 4546 liters for major source works and 455 liters for smaller flows. This system has reduced waste from 25% to 19% since 1971. The effect of pressure on waste level is also being studied. (Snyder-FIRL)
W76-09685

OPERATION OF OZONE TREATMENT APPARATUS (OZONE SHORI SOCHI NO UNTEN),
K. Takaya.
Suido Kyokai Zasshi (Journal of Japan Water Works Association), No. 497, p 38-49, February, 1976. 23 fig, 5 tab, 8 ref.

Descriptors: *Odor, *Ozone, *Water treatment, *Potable water, Rivers, Treatment facilities, Laboratory tests, Pilot plants, Costs, Waste water treatment.
Identifiers: *Japan, Deodorization.

The ozone treatment facility at the Kurashiki Water Works, Japan, for the deodorization of undesirable odors in the drinking water is described. The actual treatment facility was constructed after basic data collection at an experimental plant. The facility treated a maximum of 30,000 cu m/day river water which was first treated by a rapid filtration method, and entered into an ozone reaction bath. The residence time of water in the reaction bath was 3.3 minutes and a diffusion method for the ozone and water contact was employed. The

ozone absorption efficiency and the ozone level in the exhaust gas from the reaction bath agreed in both the experimental plant and the actual facility; ozonized air flow rate was 252 cu m/hr. With the ozone concentration in the flowing air at 1.5 ppm, ozone absorption efficiency by water was about 70% and ozone concentration in the exhaust gas was about 1.6 g/cu m air. Residual ozone from the reaction bath was treated with activated carbon. The dissolved ozone concentration in the water during winter treatment was almost twice that of summer treatment, due to water temperature. Treated water was stored in a pool before being sent into the water main and no residual ozone was found in the water of the water main. The deodorization effect achieved was a decrease in the threshold odor unit from 10 for the pre-treatment to 4 after the treatment. Operational costs of deodorization were 1 cent per cu m water. (Katayama-FIRL)
W76-09713

HYDRODYNAMIC SEPARATION OF SOLIDS FROM SOLID-LIQUID MIXTURES,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5D.
W76-09716

HYGIENIC ASSESSMENT OF CHANGES IN MINERAL WATER PROPERTIES DURING ITS TREATMENT FOR USE IN INTERNAL BALNEOTHERAPEUTIC PROCEDURES, (IN RUSSIAN),
Stavropol Territorial Medical Inst. (USSR).
For primary bibliographic entry see Field 5C.
W76-09795

DETERMINATION OF FLUORINE IN DRINKING WATER WITH A CERIUM(III)- OR LANTHANUM ALIZARIN COMPLEX, (IN RUSSIAN),
Research Inst. of Public Water Supply Water Purification, Moscow (USSR).
For primary bibliographic entry see Field 5A.
W76-09796

ON THE EXTERMINATION OF POLYCLADS: CALCIUM HYPOCHLORITE (CAOC12) TREATMENT IN THE PERIOD OF HIGH WATER TEMPERATURE, (IN KOREAN),
For primary bibliographic entry see Field 5C.
W76-09801

THE MERCURY CONTENT OF INDUSTRIAL FISH PRODUCTS: ITS RELATIVE VARIATION WITH THE TREATMENT (COOKING IN SALT WATER, PICKLING AND FISH PRODUCTION), (IN SPANISH),
Instituto Espanol de Oceanografie, Madrid (Spain).
For primary bibliographic entry see Field 5C.
W76-09802

DOMESTIC WATER FILTRATION APPARATUS,
Dynek Corp., Port Chester, N.Y. (Assignee).
E. Stern.
U.S. Patent No. 3,950,253, 5 p, 3 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 825, April 13, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Filtration, Domestic water, Potable water, Water quality, Odor, Demineralization, Application equipment, Bacteria.

The invention provides an improved water filtration apparatus which is sufficiently economical in cost and operation to be suitable for domestic use. It has greatly improved effectiveness, and will substantially reduce the bacterial count of drinking water. It also has active filter media which are effective in removing all of the different types of major water contaminants. The apparatus includes a container for treating water and has a reservoir for storing untreated water. A pump has an inlet connected to pump water from the bottom of the reservoir and an outlet connected within the container to the inlet of a filter device also located within the container. The filter device includes an integral outlet spout for discharging the filtered water over the upper edge of the container. (Sinha - OEIS)
W76-09862

EXPERIMENTAL EFFECT OF BORON ON ANTICARIOUS ACTION OF FLUORINE IN DRINKING WATER, (IN RUSSIAN),
Meditsinskii Institut, Kiev (USSR).
R. D. Gabovich, and G. A. Stepanenko.
Gig Sanit. 38(12), p 20-22, 1973.

Descriptors: *Boron, *Fluorine, Potable water, Trace elements, Public health, *Water treatment.
Identifiers: *Caries prevention, Dental health.

Addition of the trace element B to drinking water with low (0.1 mg/1) and optimal (1.5 mg/1) concentrations of F raised the incidence of tooth caries, increased the solubility of enamel in lactic acid solutions and diminished the assimilation of F by teeth and bones (rat).--Copyright 1975, Biological Abstracts, Inc.
W76-09885

5G. Water Quality Control

PHOSPHATE REMOVAL--TACKLING EUTROPHICATION FROM THE OTHER SIDE,
For primary bibliographic entry see Field 5D.
W76-09436

WORKING TOWARDS TOUGHER ODOUR CONTROL STANDARDS.
Process Engineering, p 95, February, 1976.

Descriptors: Odor, *Sewage treatment, *Waste water treatment, Municipal wastes, Food processing industry, Ozone, Oxygen, Standards.
Identifiers: Odor control, Odor control standards.

Due to anticipated stricter standards of control for odors from industrial and municipal sources, new technology is being considered in the United Kingdom. Available new equipment includes the high-efficiency KT fume scrubber from Plastic Constructions, a series of ozonators developed by Wallace and Tiernan, and Aeronca's closed-circuit drying system based on its Impinjet scrubber which could prove suitable for the control of escaping dust, vapor and odor. Detailed is the development of the Var 'wet' odor oxidation process using ozone. By scrubbing foul air with ozonated water, oxidation occurs and contact time is reduced to three seconds compared with 30 seconds for 'dry' ozonation. Ozone does not need to be applied in excess. The Var system is currently being installed at two sites near Edinburgh--the Seafield sewage treatment works and Leith Docks. It will be used to treat odors from sludge storage tanks at about 25,000 cu m/hr. The system is also suitable on an industrial scale for gases extracted from individual processes or as a high-volume polishing process on air extracted from an entire facility. A pilot scale test plant has been operating for over a year, treating the very difficult odor from a fish meal plant; performance has been reported to be very encouraging. (Kramer-FIRL)
W76-09446

MUNICIPAL WATERSHED MANAGEMENT: WHAT ARE THE OPPORTUNITIES,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 4D.
W76-09472

WATER UTILIZATION AND SOIL SALINITY: CONTROL IN ARID ZONE AGRICULTURE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3C.
W76-09482

COMBINED EFFECTS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES TO THE ENVIRONMENT,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-09490

COST EFFECTIVENESS OF RELEASE PREVENTION CONTROLS FOR TRITIUM AND KRYPTON-85,
International Atomic Energy Agency, Vienna (Austria).
J. J. Cohen.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/17. p 285-298, 6 fig, 2 tab, 18 ref.

Descriptors: *Environmental effects, *Costs, *Control, Radioactivity effects, *Tritium, Krypton, Nuclear reactors.
Identifiers: *Krypton-85.

The study evaluates and compares potential effects of environmental releases of tritium and krypton 85 with the objective of placing exposure risks in perspective so that costs for release prevention may be related to and made commensurate with the potential hazard and so that cost effectiveness for controls may be established on an objective basis. Based on predicted environmental levels for both nuclides, the dose rate for the year 2000 is predicted. Tritium dose effects will be almost entirely due to natural sources and the residual tritium from atmospheric explosive testing. Any effort to minimize tritium exposure would have to be aimed at reducing tritium effluent. Since environmental krypton 85 is entirely anthropic, proper control measures to minimize its release might produce substantially lower future population dose levels over the next several decades. (See also W76-09490) (Chilton-ORNL)
W76-09506

FIELD DRAINAGE WITH MANIFOLD WELL POINTS,
Agricultural Research Service, Weslaco, Tex.
R. J. Rektorik.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 81-84, January-February 1976. 2 fig, 4 tab, 6 ref.

Descriptors: *Drainage systems, *Drainage wells, *Rio Grande River, *Texas, Water quality control, Aquifers, Plastic pipes, Well screens, Water table, Dewatering, Drawdown, Drainage, On-site investigations, Leaching, Cost analysis, Depth, Transmissivity, Storage coefficient, Pumping, Electric power costs, Centrifugal pumps, Reclamation, Root zone, Hydraulic gradient, Cathodic protection, Corrosion, Electrolysis.
Identifiers: *PVC, *Manifold well point system.

A field study of a manifold well point system was conducted in a highwater table, shallow aquifer in the lower Rio Grande Valley of Texas. The objectives of the study were to determine how effectively well point drainage systems work, how long they would last, their design, and their installation and operational cost. PVC pipe was used for the wells and manifold piping, and plastic screens were used for the well points. These materials

offer much resistance to both corrosion and electrolytic problems and, as such, show promise for a long service life. The cost of well point systems at about $250/ha is materially lower than the $370-500/ha for pipe drain systems. The design of well point systems depends on variations in aquifer parameters. Straight line configurations are most economical to construct but do not produce the most uniform drawdown. Water removal of about 0.26 l/s/ha provides adequate control of the water table in the study area and permits leaching of salts by irrigation or rainfall. (Visocky-ISWS)
W76-09586

AN ECONOMIST'S VIEW OF THE OCEANS,
Yale Univ. New Haven, Conn.
For primary bibliographic entry see Field 6E.
W76-09617

THE DESIGN OF WATER QUALITY MANAGEMENT PROJECTS WITH INADEQUATE DATA,
Oklahoma Univ., Norman.
G. W. Reid.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS, Unesco - OMM - AISH, 1974, p 350-363. 3 fig, 2 tab, 7 ref.

Descriptors: *Water quality, *Management, Model studies, *Water pollution control, Projects, *Design, Equations, Decision making, Simulation, Equations, Systems analysis.
Identifiers: *Inadequate data, Submodels, Biodegradable model, Thermal model, Dispersed pollution model, Upstream use model, Streeter-Phelps equation.

One of the increasingly important elements in the design of water resource projects is the management of quality; an almost purely hydrological and hydraulic technology is being expanded to include the environmental and ecological impact areas and systems. Besides the interrelationships, flows and transports, the impacts on the living and nonliving water and peripherral environments need to be understood; ecological and water quality models must be developed. Unfortunately, there is rarely adequate data to properly describe these interrelationships. The methodology used for hydrological studies involving inadequate data such as the transfer of observed points to points of interest, short term intense studies, or use of simulation techniques, are being used in quality management modeling. In understanding data requirements using the system approach, the sequence of events are: (1) problem formulation; (2) symbolic modeling; (3) data collection; (4) analysis; and (5) design. Frequently, the order is changed. The complexities arise from an imperfect understanding of hydraulic, hydrological, chemical, biological, and ecological processes. Recognized is the superiority of an explicit quantifiable data and models over intuitive models and hunches. Suggested is a mental model, based on the mixture of incomplete information and intuition similar to most political decision making. A mathematical model deals with the same incomplete information available to an intuitive model, but through organization of information from many different sources into a closed loop. (Bell-Cornell)
W76-09623

EPA AND A STATE'S ROLE IN WATER RESOURCES MANAGEMENT,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 6E.
W76-09627

REPORT TO THE CONGRESS BY THE NATIONAL COMMISSION ON WATER QUALITY,
National Commission on Water Quality, Washington, D. C.
March 18, 1976. 90 p.

Descriptors: *Federal government, *Water quality act, *Water quality control, Standards, Wastes, Water treatment, Irrigation, *Water quality standards.
Identifiers: *Public Law 92-500, *Interim law modification.

Experience during the three and one half years since enactment of Public Law 92-500, and the Commission's studies and evaluations' indicate that the Law requires 'mid-course adjustments' to keep the nation on a realistic course toward the objective of restoring and maintaining the physical, chemical, and biological integrity of the nation's waters. Recommendations include: (1) Maintain the July 1, 1977 deadline for compliance with uniform treatment requirements by both industry and publicly owned treatment works but with some flexibility, (2a) Maintain 1983 water quality goal, while postponing the 1983 requirements for application of uniform technologies five to ten years, (2b) Postpone, for not more than 10 years, 1983 interim water quality goal, and seek general application of the 1977 requirements, (3) Decentralize regulatory and administrative functions of the national programs by selective certification of states, (4) Stabilize the Federal construction grants program by assuring 75 percent Federal financing for priority treatment needs at a fixed amount, (5) Redefine the goal of elimination of discharge of pollutants as one stressing conservation and reuse of resources, (6) Authorize flexibility in applying control or treatment measures to irrigated agriculture after an inventory of the problem, and (7) support salinity alleviation projects to reduce salt loads from sources other than man's activity. (Heiss-NWWA)
W76-09663

METHODOLOGIES FOR THE DETERMINATION OF STREAM RESOURCE FLOW REQUIREMENTS: AN ASSESSMENT,
Utah State Univ., Logan. Dept. of Wildlife Science.
For primary bibliographic entry see Field 6G.
W76-09666

EROSION CONTROL DURING PIPELINE CONSTRUCTION,
Yule, Jordan and Associates, Camp Hill, Pa.
L. R. Robinson, Jr.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 175-182, October 1974. 16 fig, 5 ref.

Descriptors: *Erosion control, *Pipelines, *Construction, *Pennsylvania, Sedimentation, Erosion, Regulation, Silts, Sediments, Filters, Channels, Spoil banks, Rainfall, Vegetation.
Identifiers: Straw filters, Stream crossings.

On September 21, 1973, the Pennsylvania Environmental Quality Board adopted an 'Implementation Plan and Regulations Dealing with Erosion and Sedimentation Control' which applies to all earthmoving activities in Pennsylvania. Federal and State criteria were used to develop an erosion and sedimentation control plan, as required by the new Pennsylvania regulations, to be used during pipeline construction during the 1973 construction season. Progress of construction and effectiveness of erosion control structures were monitored and pictorially recorded throughout the construction season. As evidenced by photographs and turbidity measurement, it was found that in most situations very little sediment left the site of pipeline construction. Straw bales placed across small streams and draws at critical road crossings and where bodies of water were to be protected, judicious use of pipe trenches and roadside ditches as sediment traps, utilization of the roughness and porosity of construction in the right of way as a runoff retardant, and vegetation alongside the right of way as a sediment filter provided satisfactory erosion control. (See also W76-09729) (Sims - ISWS)
W76-09743

WATERSHED MANAGEMENT AND SEDIMENT CONTROL IN MONTGOMERY COUNTY,
Environmental Protection Agency, Montgomery County, Md. Storm Water Management Section.
For primary bibliographic entry see Field 4D.
W76-09748

MUNICIPAL STORM WATER MANAGEMENT PROGRAMS,
Lindley and Sons, Inc., Hinsdale, Ill.
For primary bibliographic entry see Field 4A.
W76-09751

URBAN STORMWATER MANAGEMENT--PROBLEMS, SOLUTIONS AND IMPACT: A SUMMARY OF INTERVIEWS,
Poertner (Herbert G.), Bolingbrook, Ill.
For primary bibliographic entry see Field 4C.
W76-09752

THE CONTRIBUTION OF A WATER INFORMATION SYSTEM FOR ENVIRONMENTAL PLANNING IN MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Geography.
For primary bibliographic entry see Field 6G.
W76-09753

IMPROVING WATER QUALITY BY CONTROL OF ALGAE: CELLULAR AND EXTRACELLULAR BLUE-GREEN ALGAL POLYSACCHARIDES,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
R. B. Wildman, W. C. Wildman, G. E. Rottinghaus, and B. L. Benner.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 614, $6.00 in paper copy, $2.25 in microfiche. Completion Report, Iowa State Water Resources Research Institute Ames, Completion Report, No. ISWRRI-74, December 1975. 119 p, 32 fig., 15 tab., 160 ref. OWRT B-039-IA(2), B-043-IA(1), 14-31-0001-3888/4084.

Descriptors: *Cyanophyta, *Nuisance algae, Algae, Plankton, Aquatic microorganisms, Aquatic algae, Aeration, Water quality, *Eutrophication, Lakes, *Iowa, Water pollution effects, *Pollutant identification, Anabaena, Nostoc, Hydrolysis, Gas chromatography, *Algal control.
Identifiers: *Extracellular products, *Polysaccharides, Aphanizomenon flos-aquae, Anacystic nidulans.

Lakes in Iowa were surveyed for blue-green algal blooms each summer from 1972 through 1975. Physicochemical and biological parameters of four lakes were measured each year during and following blue-green algal blooms of a single dominant species or two co-dominants in one case. One lake was studied for six months during periods of aeration and non-aeration. The ultrastructure of the life cycle of Aphanizomenon flos-aquae was followed in nature and in culture. The influence of strains of Anabaena cylindrica, Anacystic nidulans, and Nostoc muscorum on the pH and buffer capacity of culture media was observed. During periods of dense algal blooms, lake water was collected and processed for isolation of water-soluble organic material which was found to be polysaccharide. The corresponding bloom algae were processed to yield whole cell, wall, intracellular, and sheath (in two cases) polysaccharide fractions. The chemical composition of polysaccharides from lake water and algal fractions was determined by hydrolysis and identifica-

tion of component monosaccharides, using paper, thin-layer, and gas-liquid chromatography. Molar ratios of the component monosaccharides were determined. Polysaccharides of blue-green algae grown in culture were analyzed in the same manner. Studies were initiated on the relationship between blue-green algal bloom species and aquatic bacteria associated with them, particularly concerning the role of algal polysaccharides.
W76-09760

FINANCING POLLUTION ABATEMENT EQUIPMENT FOR TEXTILES AND OTHER SOUTH CAROLINA INDUSTRIES.
Clemson Univ., S.C. Dept. of Economics.
March 26, 1974. 107 p.

Descriptors: *Pollution abatement, *Financing, *Industries, *Bond issues, *South Carolina, Interest rates, Cost repayment, Taxes, Marketing, Legal aspects, Federal government, State governments, Legislation, Methodology.

The contributions to this seminar discuss various aspects of financing industrial pollution abatement facilities, with emphasis on interest rates and costs of pollution control bonds and industrial revenue bonds. A comprehensive discussion of the PCB as a financing instrument, the restrictions imposed upon it both by the investment community and by the IRS, and the versatility of PCB financing is presented. Several alternative state legislative options to finance industrial pollution control, with emphasis on South Carolina, are also presented. Contributions cover the methodology of PCB financing, the role of the underwriter in tax exempt financing for industrial expansion and pollution control, one company's experience with a political subdivision in South Carolina; and the use of tax exempt industrial revenue bonds to finance pollution control projects. All combine to present a detailed picture of the most advantageous financing method for pollution control by industries and municipalities. (See W76-09767 thru W76-09771) (Auen-Wisconsin)
W76-09766

PRESENTATION CONCERNING POLLUTION CONTROL FACILITIES REVENUE BONDS,
Sinkler, Gibbs, Simon and Guerard, Charleston, S.C.
T. B. Guerard.
In: 'Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries, March 26, 1974, Shrine Hall, Office of Professional Development, Clemson Univ., South Carolina, 15 p.

Descriptors: *Pollution abatement, *Financing, *Industries, South Carolina, Equipment, Facilities, Bond issues, Interest rates, Legislation, Textiles, Cost repayment.
Identifiers: Tax exemption.

South Carolina's approach to financing industrial pollution abatement facilities is encompassed by the Industrial Revenue Bond Act passed in 1967 and by the Pollution Control Facilities Revenue Bond Act of 1971, since the former did not clearly provide for financing for only air or water pollution control facilities. While the 1967 Act can finance pollution abatement facilities as part of a manufacturing plant being financed by bonds, there is no clear authorization to finance pollution abatement facilities independent of financing of the plant. The 1971 Act provides that pollution control facilities may include those designed both for the elimination or abatement of pollution and may be constructed as part of, and may include facilities also designed for, the recovery of chemicals or to serve some other commercially beneficial purpose, but which also contribute to pollution abatement. The primary purpose of financing under both of these acts is to obtain tax-free treatment of interest, and, as a result, reduced interest cost to the industry. The applicability of the Internal Revenue Code to tax exemptions for this type of financing is discussed, particularly if recovery processes are introduced with pollution abatement facilities. (See also W76-09766) (Auen-Wisconsin)
W76-09767

ROLE OF THE UNDERWRITER IN TAX EXEMPT FINANCING FOR INDUSTRIAL EXPANSION AND POLLUTION CONTROL,
Interstate Securities Corp., Charlotte, S.C.
C. B. Watson.
In: 'Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries,' March 26, 1974, Shrine Hall, Office of Professional Development, Clemson Univ., South Carolina. 7 p.

Descriptors: *Pollution abatement, *Financing, *Industries, *Bond issues, South Carolina, Taxes, Interest rates, Marketing.
Identifiers: Tax exemption, Underwriters.

The chief function of the underwriter is that of designing the financial package so that it not only meets the specific needs of his client, the corporation, but that it is also a marketable security. Revenue bond purchasers are generally fire and casualty insurance companies, banking institutions, bond funds, and high tax bracket individuals. In 1973 South Carolina issued $43.6 million in pollution control bonds, with interest rates ranging from 5.318% to 6.386%. The factors affecting interest rates are the financial strength of the lessee; the marketability of the bonds; the rating applied to the bonds; the sizes of the issuing company and issue; the company's industry segment; current market conditions; and the underwriter's expertise of how and to whom to market the issue. The underwriter often suggests that the corporation obtain a credit rating on its industrial revenue or pollution control issue, as rated bonds can lead to lower interest rates and generally have greater marketability than non-rated bonds. The investment banker's job also includes the presentation of various alternatives to the corporate executive and advice in the decision making to provide the lowest available interest cost and simultaneously obtain optimum profitability. (See also W76-09766) (Auen-Wisconsin)
W76-09768

THE INDUSTRIAL REVENUE BOND FOR POLLUTION CONTROL: ONE COMPANY'S PERSPECTIVE,
La France Industries, S.C.
J. E. Haller.
In: 'Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries,' March 26, 1974, Shrine Hall, Office of Professional Development, Clemson Univ., South Carolina. 10 p.

Descriptors: *Pollution abatement, *Financing, *Bond issues, *Industries, Facilities, Textiles, South Carolina, Interest rates, Taxes, Local governments.
Identifiers: Industrial revenue bonds, Tax exemption.

The procedure involved in financing pollution abatement facilities by industrial revenue bonds at the Riegel Textile Corporation, operating in two counties of South Carolina, is described. The bonds are issued by the respective county and are secured by the facility acquired with the proceeds from the bonds. Interest on the bonds and redemption are dependent upon the revenue coming from the user of the facility. The federal and state codes provide that if all of the proceeds of the bond issue are used to provide water or air pollution control facilities, interest paid on the obligation are free of income taxes consequently reducing the interest rate on the bonds. The money is deposited in a construction fund account and is disbursed upon presentation of bills which Riegel certified were for the construction of the facilities. The county executes a Pollution Control Facilities Revenue Note which provides a repayment schedule and also provides that it is a limited obligation of the county and is payable solely out of monies derived by the county from Riegel and does not constitute a pecuniary liability of the county. (See also W76-09766) (Auen-Wisconsin)
W76-09769

FINANCING POLLUTION CONTROL PROJECTS IN SOUTH CAROLINA USING TAX-EXEMPT INDUSTRIAL REVENUE BONDS,
Spring Mills, Grace, S.C.
W. A. Moore.
In: 'Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries,' March 26, 1974, Shrine Hall, Office of Professional Development, Clemson Univ., South Carolina. 7 p.

Descriptors: *Pollution abatement, *Financing, *Industries, *Bond issues, Methodology, South Carolina, Taxes, Amortization, Interest rates, Costs.
Identifiers: Tax exemption.

The vehicle chosen by the Springs Mills, Inc., to finance the pollution abatement facilities at their Grace Finishing Plant in South Carolina was tax-exempt industrial revenue bonds issued by a political subdivision (Lancaster County) but unconditionally guaranteed by the firm. The agent was an investment banking firm who proposed a 20-year serial bond issue at an attractive interest rate. Involved in the process were the company whose credit secures the bonds; the county issuing the bonds; and independent bond counsel who verified the tax-exempt status of the bonds; and the underwriters who distribute them. An interim loan agreement was entered into with the county as this form of agreement allowed the firm to retain ownership of the facilities at all times. The State Board of Health and Environmental Control must also approve the project (after rating the bonds) because of the pollution control aspects; the approval is followed by a 20-day public notice. The trust indenture was finalized following approval of the prospectus. This indenture provides terms for disbursing and receiving funds involved in the issue. The bonds were then sold and the funds were turned over to the trustee for disbursement to the issuing authority who will receive repayments of principal and interest from the company. (See also W76-09766) (Auen-Wisconsin)
W76-09770

THE POLLUTION CONTROL BOND,
Clemson Univ., S. C. Dept. of Economics.
J. J. Glocker.
In: 'Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries,' March 26, 1974, Shrine Hall, Office of Professional Development, Clemson Univ., South Carolina. 59 p. 6 tab.

Descriptors: *Pollution abatement, *Bond issues, *Financing, Industries, Legal aspects, Marketing, Taxes, Interest rates.
Identifiers: *Pollution control bonds, Tax exemption.

The comparatively recent entrance of the pollution control bond (PCB) as an industrial debt instrument to finance pollution abatement facilities, its history, its flexibility, the discord it has caused in the investment community, its marketing problems, and the IRS restrictions on its tax exempt status, are discussed. For the larger company, with established credit rating and a massive cleanup job, the PCB is the cheapest money around. The widely offered incentives of state property exemptions can also generate substantial savings. The advantages of a regional treatment facility, as exemplified by the Gulf Coast Waste Disposal Authority, servicing 140 plants on the Houston Ship Channel, are that they can shift poi-

ıtion control responsibility to a public agency esulting in immunity from prosecution; compaies can also enjoy a 10 to 25% cost saving accrug from economies of scale as well as tax exempt nancing and exclusion from property taxes on ıe facility. The Ohio Water Development uthority is cited as an example of comprehensive nd well designed legislation to provide help to oth industrial and local governmental agency prorams. Among other aspects of PCB financing iscussed, is the dichotomy between the IRS point f view of the PCB tax status regarding recycling r reclaiming byproducts and EPA's conservation bjective. (See also W76-09766) (Auen-Wisconn).
/76-09771

CONOMIC ANALYSIS OF EFFLUENT UIDELINES: GRAIN PROCESSING SEGMENT F THE GRAIN MILLS INDUSTRY,
evelopment Planning and Research Associates, ıc., Manhattan, Kans.
. G. Unger, and M. W. Wjolverton.
vailable from the National Technical Informaon Service as PB-240 196, $7.50 in paper copy, 2.25 in microfiche. Report EPA-230/2-74-014, ebruary 1975. 186 p. 6 fig., 63 tab., 27 ref. 68-01-533.

escriptors: *Economic impact, *Water pollution ontrol, *Food processing industry, Corn(Field), ice, Wheat, Prices, Costs, Employment, Waste ater treatment, Standards, Effluents, Industrial roduction, Employment, Regional economics, inancing.
lentifiers: *Grain milling industry, Flour milling, ice milling, Corn milling.

he structures of the corn wet milling, corn dry illing, bulgar processing, and parboiled rice illing segments of the grain milling industry are nalyzed with respect to the impact of the 'best racticable technology,' 'best available technolo-y' and 'new source performance standards' of ollution abatement on financing, production, emloyment, community impact, and foreign trade. ince most of the plants discharge into municipal ystems whose treatment processes are adequate control pollution, these segments of the indus-y are not likely to experience severe economic npacts through imposition of treatment stanards; many effects would be minimal and would e important only on an individual plant basis. ery few corn wet milling plants discharge rectly to surface water. Individual plant waste chnology is such that no plant need close ecause of pollution controls. The only difficulty at pollution control will impose on these industry gments may be one affecting growth as mucipal treatment systems may prove inadequate to ceive large quantitative increases in wastewater. orn dry milling plants will also be only marginally fected by pollution control costs. Their present ofitability, financial conditions, and production chnologies are sufficient to absorb those costs hich cannot be passed through to purchasers. All isting bulgur and parboiled rice plants discharge to municipal systems. (Auen-Wisconsin)
76-09775

ATER USE POLICIES AND POWER PLANT CONOMICS,
ouston Univ., Tex.
. Inoue, E. J. Henley, G. H. Otto, and R. G. ıompson.
vailable from the National Technical Informaon Service, Springfield, VA 22161, as PB-239 2, $5.50 in paper copy, $2.25 in microfiche. Reort No. NSF-RA-B-74-014, June 1974. 122 p. 39 ., 5 tab., 32 ref., 7 append. NSF (RANN) 34459.

escriptors: *Water policy, *Electric power costs, Cooling towers, *Water utilization, Cooling ater, Electric power production, Optimization, axes, Operating costs, Water treatment.

How a water withdrawal tax of from 0 to 2 cents/1000 gal; a heat discharge tax of from 0 to 20 cents/10 million BTU; a temperature differential constraint between cooling water discharge temperature and reservoir temperatures of 5 to 20 deg F; and various heat discharge constraints relate to water use and water quality and to the cost of generating electric power and the demand for cooling water, are compared. The effects of these policies and/or combinations (totaling six) on the price of power are computed for a 500,000 KW prototype plant operating at 2000 boiler pressure and 1050 deg F on a once-through cooling system, a closed cycle wet tower cooling system, an open cycle wet tower cooling, and a dry cooling tower system. Each policy variable was changed and the power cycles and cooling systems were reoptimized to find the cooling system and operating conditions which produce the lowest cost power. The stack gas scrubber and the water treatment plant are not explicitly included in the cost and operation equations developed. The computations were based on a parametric search of 19-key designs. (Auen-Wisconsin).
W76-09776

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: FERTILIZER INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
M. L. David, J. M. Malk, and C. C. Jones.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-241 315, $7.75 in paper copy, $2.25 in microfiche. Report No. EPA-230/2-74-010, January 1974. 221 p. 9 fig., 74 tab., 2 append. 68-01-1533

Descriptors: *Water pollution control, *Economic impact, *Industries, *Fertilizers, Effluents, Standards, Pricing, Employment, Regional economics, Industrial production, Financing, Return(Monetary), Costs, Foreign trade, Analysis.
Identifiers: Nitrogenous fertilizers, Phosphate fertilizers, Financial analysis.

Based on 1972 conditions and model plant data, the effects of 'best practicable technology' (BPT), 'best available technology' (BAT), and 'new source performance standards' (NSPS) of pollution control are evaluated. It is concluded that the larger companies of the nitrogenous and phosphatic fertilizer segments of the industry will be able to finance new investment in pollution control facilities; smaller companies may find new investment difficult or impossible. Small ammonium nitrate plants may be impacted severely, with over half of the plants and about one-third of capacity possibly shut down. Small diammonium phosphate (DAP) plants may also suffer severly, with just over one-quarter of the capacity affected. Other segments of the fertilizer industry are expected to be impacted much less severely. NSPS may cause some delay in the construction of medium-sized DAP and triple superphosphate plants, but expected higher prices would probably make such plants profitable. NSPS will probably not be a deterrent in the other segments. Total estimated employment losses due to pollution control range from 490 to 1620 jobs with payrolls of $5.9 to $19.4 million, but closures are not expected to impact any one area of the country. Price increases due to pollution abatement would be relatively small in relation to normal swings in export prices with negligible effect on the balance of payments. (Auen-Wisconsin).
W76-09777

SECONDARY EFFECTS OF PUBLIC INVESTMENTS IN HIGHWAYS AND SEWERS.
Environmental Impact Center, Inc., Newton, Mass.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-240 332, $6.00 in paper copy, $2.25 in microfiche. Report EOC 3172deffl, February 1975. 148 p. 18 fig., 26 tab., 19 ref. EQC 317

Descriptors: *Government finance, *Highway effects, *Sewerage, *Land use, Urbanization, Econometrics, Model studies, Regional economics, Zoning, Regression analysis, Regional development, Third party effects, Computer programs.
Identifiers: Case studies, Washington(DC), Boston(Mass), Denver(Colo), Minneapolis-ST. Paul(Minn).

Econometric techniques for forecasting secondary effects of highway and sewer construction on land use patterns of metropolitan regions are described. Data were collected on the amount and location of single and multi-family unit construction, together with commercial and industrial land development at Washington, D.C., Boston, Denver, and Minneapolis-St. Paul and related by regression analysis to sewer service availability, proximity to major highways, amount of vacant land, residential vacancy rate, and land market conditions. The statistical analysis was tested by a dynamic model applied to Washington, D.C. The relative importance of each factor varied substantially between regions. Although several types of development were affected, the greatest influence of sewer investment appeared to be on the single-family housing construction in all areas studied. A greater influence of sewers is anticipated with stricter water pollution control. The effect of new highways on various types of development was marginally dependent on preexisting highways. The study shows that quantitative techniques can be developed for specific regions, which would allow project planners to estimate the magnitude and type of likely secondary effects associated with proposed infrastructure investments. The suggested approach is to develop a set of equations reflecting the particular conditions and circumstances applicable to the specific region. (Auen-Wisconsin).
W76-09778

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: APPLE, CITRUS AND POTATO PROCESSING SEGMENTS OF THE CANNED AND PRESERVED FRUITS AND VEGETABLE INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
D. J. Wissman, D. L. Jordening, and S. G. Unger.
Available from the National Technical Information Service, as PB-240 195, $8.00 in paper copy, $2.25 in microfiche. Report EPA-230/2-74-012, February 1975. 224 p. 93 tab. EPA 65-01-1533.

Descriptors: *Economic impact, *Food processing industry, *Water pollution control, *Pollution abatement, Apples, Citrus fruits, Potatoes, Effluents, Standards, Capital costs, Waste water treatment, Operating costs, Employment, Financing, Pricing, Return(Monetary), Regional economics, Asparagus, Foreign trade.
Identifiers: Fruit processing, Vegetable processing.

The canning and freezing segments of the industry consist of 36% small, 29% large, and 10% very large firms, with the large, multiproduct plants increasing their percentage of production. In general, industry concentration--when measured by value of shipments--is greater for the canned and dehydration segments than for the frozen fruit and vegetable segments; between 1963-1970 the larger frozen food firms have increased their share of output. Overall employment is trending downward in the canning segment but almost doubling in the freezing segment. Smaller and some of the medium-size plants may not be able to survive the added costs of pollution abatement. A synthesized analysis of cost and return data projects economic data for a 20-year period, showing estimated pollution abatement costs, with and without internal waste treatment. There is apparently available capital to finance pollution control for large and medium-sized canners, and especially freezers. However, individual plants and

local considerations may have unique overriding conditions that prelude financing. If the industry successfully passes pollution abatement costs to consumers, the price increases would have little impact on consumption patterns. The impact of the imposition of effluent standards on the citrus and apple segments are detailed under price, financial, production, employment, community, and other effects. (Auen-Wisconsin).
W76-09779

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: INSULATION FIBERGLASS INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-240 649, $4.50 in paper copy, $2.25 in microfiche. Report EPA-230/2-74-011, January 1975. 49 p. 5 fig., 8 tab.

Descriptors: *Water pollution control, *Economic impact, *Thermal insulation, *Industries, Effluents, Standards, Waste water treatment, Costs, Prices, Employment, Foreign trade, Regional economics , Financing, Return(Monetary), Industrial production.
Identifiers: *Wool fiberglass industry.

The cost of water pollution control (zero discharge-water recycle) in wool fiber glass plants varies from 0.18 to 1.15 cents/lb of glass wool produced and is sensitive to plant capacity. The incremental capital investment cost is 1.3 to 3.8% of current plant investment and any increase due to pollution abatement will be modest and not likely to increase prices. However, if operating costs increase concurrently, the cumulative total might become significant. With no price increases, those plants with current return on investment of 10-15% or greater will continue to enjoy good returns. Investment cost for water pollution control-recycle is 1.25 - 3.75% of current plant investment which will be expended over three years. The annual expenditures for water treatment and recycle are modest and will not have any significant impact on normal capital expenditures of major companies. The supply/demand projections indicate that pollution abatement expenditures will not affect production. No plant shutdown is likely to occur; rather one major producer plans to increase capacities in spite of additional abatement cost. Glass wool exports represent about 2% of production and pollution abatement costs will not influence import/export markets. No effects on unemployment in the industry or secondary effects on communities are anticipated. (Auen-Wisconsin).
W76-09780

METAGAME THEORY AND ITS APPLICATIONS TO WATER RESOURCES,
Waterloo University (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W76-09847

METHOD AND COMPOSITION FOR PREVENTING WATER CONTAMINATED WITH INDUSTRIAL WASTE FROM SEEPING THROUGH SOIL CONTAINING SAID WATER,
American Colloid Co., Skokie, Ill. (Assignee).
A. G. Clem.
U.S. Patent No. 3,949,560, 4 p, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 599, April 13, 1976.

Descriptors: *Patents, *Industrial wastes, *Seepage control, *Settling basins, *Confined water, *Water pollution treatment, *Water quality control, *Water pollution control, Bentonite, Impervious soils, Chlorides, Sulfides, Sulfates, Polymers, Soil dispersants.

A method is provided for forming lagoons and other water-holding areas which will not allow seepage of water containing inorganic water-soluble industrial waste compounds. A mixture of soil and a soil sealant composition composed of bentonite, a water-soluble dispersing agent, and a water-soluble polymer are used to form a water containing enclosure. The bentonite is prevented from disintegrating when contacted with water containing water-soluble industrial waste compounds such as inorganic water-soluble chloride salts, sulfate salts and sulfite salts by the use of the water-soluble dispersent and a water-soluble polymer. The water-soluble dispersent can be a water-soluble salt of phosphoric acid such as hypophosphate, orthophosphate, metaphosphate, and pyrophosphate. The preferred water-soluble polymer is polyacrylic acid. (Sinha-OEIS)
W76-09858

COMBINATION PROVIDING SAFETY BERTHING, UNLOADING OF OIL, AND CONDUIT CARRIAGE TO REFINERIES ON LAND, OF LARGE DEEP-SEA-REQUIRING TANKERS,
Parson, Brinkerhoff, Quade and Douglas, Inc., New York. (Assignee).
C. J. Murphy.
U.S. Patent No. 3,950,805, 4 p, 19 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1024, April 20, 1976.

Descriptors: *Patents, Engineering structures, *Environmental effects, *Water pollution control, *Oil industry, Abatement, Pollution abatement, Water quality control, Conduits, Pontoons, Continental shelf.
Identifiers: *Outer Continental shelf, Tankers, Oil tankers, Mooring, Offshore technology.

A subaqueous conduit extends from a mainland terminal and leads to the base of a tubular mooring stanchion which extends above the sea surface. The base of the stanchion is located at a depth of up to 100 fathoms adapting the stanchion for the mooring of very large oil tankers. Secured to the stanchion is a double floating pontoon structure to which tankers can berth. The tankers are moored alongside the pontoon structure and discharge their oil through swivel-jointed tubes at the upper portion of the stanchion which permit relative motion of the tanker caused by sea conditions. The pontoon structure can be ballasted to submerge to a predetermined depth during adverse weather conditions. The stanchion may receive oil from two tankers simultaneously and is adapted for connection to a plurality of submarine conduits by which oil from the stanchion may be received at a number of land-based reception points. (Sinha - OEIS)
W76-09865

APPARATUS AND METHOD FOR RECOVERING PURE WATER FROM NATURAL SOURCES AND INDUSTRIAL POLLUTED WASTE SOURCES,
S. L. Ross, and O. Shuffman.
U.S. Patent No. 3,951,198, 5 p, 5 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1153, April 20, 1976.

Descriptors: *Patents, *Industrial wastes, *Gases, *Air pollution, *Reclaimed water, Water sources, *Condensation, Generators, Potable water, Condensers.
Identifiers: Thermal energy generators.

A method and apparatus is described for purifying industrial waste gases in order to avoid polluting the atmosphere and to produce comparatively pure water. The waste gases are first cooled and then passed to a waste gas purifier unit from which the waste gases are circulated between the outer wall of the waste gas purifier and a surrounding insulated duct prior to exhausting to the atmosphere, with the liquid waste from the waste gas purifier being conducted to a liquid collection means and then to a thermal energy generator for the produ tion of super-heated steam that is subsequentl condensed to produce comparatively pure wate The apparatus includes an in-line condenser f reducing the temperature of the industrial was gases prior to being conducted to the waste gas p rifier. The solid particulate matter of the industri waste gases are collected in suitable disposal co tainers. (Sinha - OEIS)
W76-09867

RESULTS OF HYGIENIC AND TOXICOLOG CAL STUDIES OF PESTICIDES IN COUNTRI OF THE COUNCIL OF MUTUAL ECONOMI ASSISTANCE IN 1962-1972, (IN RUSSIAN),
Ustav Hygieny, Bratislava (Czechoslovakia).
L. Rosival, A. Sokolai, and V. Batora.
Gig Sanit. 5, p 73-76, 1974.

Descriptors: Pesticides, *Pesticide residues, To icity, Europe, *Water quality standards, Air poll tion, Soils, Public health, Environment.
Identifiers: Bulgaria, Czechoslovakia, East Ge many, Hungary, Poland, USSR.

Data are presented on the coordination of i vestigations of member countries of the Council Mutual Economic Assistance (Czechoslovaki East Germany, Poland, Hungary, USSR, Bu garia) on the topic 'Hygienic and toxicologic study of pesticide residues in the environment The general tasks of investigations on this top are formulated: to reduce the danger of pesticid residues in the external environment (foo products, forage, water, soil, air) for the health the population; to set rates for pesticides in the e vironment based on a study of their toxicologic properties, dynamics of residues, etc.; to establis allowances and develop and standardize analytic methods of determining pesticides in man's e vironment.--Copyright 1975, Biological Abstract Inc.
W76-09884

HYGIENIC STANDARDIZATION OF FLOT TION REAGENT BB-2 AND ITS COMPONENT AS INDUSTRIAL CONTAMINANTS OF WATE BODIES, (IN RUSSIAN),
Kazanskii Gosudarstvennyi Meditsinskii Instit (USSR).
For primary bibliographic entry see Field 5B.
W76-09886

ASSESSING POTENTIAL OCEAN POLLU TANTS,
National Academy of Sciences, Washington, D.
A Report of the Study Panel on Assessing Pote tial Ocean Pollutants to the Ocean Affairs Boa Commission on Natural Resources, Nation Research Council, 1975. 438 p, numerous tab a ref.

Descriptors: *Water pollution, Resourc development, Pollutant identificatio *Environmental effects, *Waste disposa *Nuclear wastes, Continental Shelf, Toxicity, I dustrial wastes, Iron, Copper, Metals, Organ compounds.
Identifiers: *Outer Continental Shelf, *Ocea dumping, Medical wastes, Environmental impac Tetracyclines, Technetium, Chlorinated hydroca bons, Aromatic hydrocarbons, Metallic wastes.

The purpose of this study was to develop and te a method for reviewing technologies with a pote tial impact on marine systems, and to determi whether they clearly pose a potential hazar whether they are clearly unimportant, or wheth they fall into an intermediate category and ne further study. Six groups of materials we selected for study: transuranic elements; synthe organic chemicals; ocean discharges; metal wastes; medicinal wastes; and marine litter. T study proved successful and some definite concl sions resulted. Two of the materials studied

ransuranic elements and hexachlorobenzene--
ere identified as clear potential problems, at least
hen the present limited production is projected
nto the future. Others; low molecular weight
hlorinated hydrocarbons (LMCH's),
crylonitrile, iron and copper wastes, open ocean
tter, tetracycline, and technetium; present no
emonstrable hazard to open ocean ecosystems at
resent or foreseeable levels of release. In the
emaining cases (aromatic hydrocarbons, certain
umped chemicals, and inshore litter) it was
nought that some local adverse effects were
ossible, but the area of uncertainty could be nar-
owed and the information required to determine
ffects was specified. A general conclusion of this
tudy is that many potential ocean pollution
roblems can be assessed by a detailed review fol-
owed by a limited number of well-planned mea-
urements. (Sinha-OEIS)
/76-09889

**HE COANDA EFFECT OIL/WATER SEPARA-
OR: A DEVELOPMENT STUDY,**
lavy Civil Engineering Lab., Port Hueneme,
alif.
. Pal.
vailable from the National Technical Informa-
on Service, Springfield, Va., 22161, as AD-A011
06, $4.00 in paper copy,$2.25 in microfice.
echnical Note N-1389, May 1975. 38 p, 20 fig, 10
ab, 4 ref, append.

escriptors: *Separation techniques, *Oily water,
Oil pollution, Waste water treatment,
Methodology, Equipment, Technology, Water
esources, Resources development.
dentifiers: *Oil-water separators, Wall at-
achment, 'Coanda effect', Oil recovery, Fluid
ynamics.

new method of separating free oil from oil/water
ixtures is under development at the Civil En-
ineering Laboratory. This technique utilizes the
uid-dynamic phenomenon, called the 'wall at-
achment, or Coanda effect'. Such a separator
ould be considerably smaller than the conven-
onal gross separators of the laminar flow types.
ased upon the results of the feasibility study, a
etailed investigation was carried out to determine
ie design parameters of a practical separator
uitable for gross separation. The report describes
detail the entire development program of the
eparator. (Sinha-OEIS)
/76-09890

**EVELOPMENT OF A BATCHWISE IN-SITU
EGENERATION TYPE SEPARATOR TO
EMOVE OIL FROM OIL-WATER SUSPEN-
IONS,**
ydronautics, Inc., Laurel, Md.
. H. Fruman.
vailable from the National Technical Informa-
on Service, Springfield, Va., 22161, as COM75-
0608, $4.50 in paper copy, $2.25 in microfiche.
aritime Administration Final Report No. MA-
D-930-75060, December 1974. 49 p, 23 fig, 7 tab,
ref, append.

escriptors: *Waste water treatment, *Oily water,
ater resources, *Recycling, *Water quality con-
ol, *Separation techniques, Dispersion, Suspen-
ons, Methodology, Reclaimed water, Environ-
ental effects, Water pollution effects.
entifiers: *Outer Continental Shelf, *Ballast
ater, Bilge water, Oil-water suspension.

esign test and evaluation of a 600 gpm oil-water
parator for ballast water treatment is docu-
ented. The basis of the particular separation con-
pt resides in the use of a very thick, open reticu-
ted, oleophilic foam which is capable of separat-
g the dispersed oil phase from the aqueous con-
uous phase independently of the oil density and
hich is amenable to regeneration by simple ex-
ession. Separation of the oil phase in the oleo-
ilic foam body occurs as a result of filtration, re-
tention and coalescence processes that are discussed in detail. Extensive scavenging and regeneration laboratory tests demonstrated the technical feasibility of a unit in which both processes, separation and regeneration, were performed on a batch basis. During the second phase the conceptual design of a Batchwise In-Situ Regenerated Separator (BIRS) cell and the construction of a 40 gpm bench scale unit for laboratory testing with simulated ballast water was undertaken. Excellent oil separation results were obtained with this unit under a wide variety of operating conditions and contaminant characteristics. The operation manual is incorporated as an appendix.
W76-09895

ENGINEERING AND ECOLOGICAL EVALUATION OF ARTIFICIAL-ISLAND DESIGN, RINCON ISLAND, PUNTA GORDA, CALIFORNIA,
Blume (John A.) and Associates Research Div., San Francisco, Calif.
For primary bibliographic entry see Field 2L.
W76-09903

RECOMMENDED PROCEDURE FOR DEVELOPING DEEPWATER PORTS DESIGN CRITERIA,
Coast Guard, Washington, D.C. Office of Marine Environment and Systems.
Department of Transportation, Office of Marine Environment and Systems, Deepwater Ports Project, Report, Recommended Procedure for Developing Deepwater Ports Design Criteria, 1975. 11 p.

Descriptors: *Design criteria, *Environmental effects, Resources development, Water resources, *Water pollution sources, *Water quality control, Continental shelf, *Ports, Winds, Waves(Water), Currents(Water), Seiches, Tides, Visibility, Temperature, Ice, Protection.
Identifiers: *Deepwater ports, *Superports, Environmental protection, Environmental impact.

The provisions of these procedures are intended to establish methods for defining the environmental conditions which will affect operations at the site and which must be considered in establishing design criteria for all fixed marine and floating components (except hoses) of a deepwater port. Included also is a list of applicable laws concerning protection of the environment. The design criteria treated in this paper are concerned with waves, wind, currents, seiche, tides, visibility, temperature, and ice. In dealing with design loads attention is given to operating mooring loads, operating hawser loads, operating anchor loads, and storm loads. (Sinha - OEIS)
W76-09907

ENVIRONMENTAL IMPACT STUDY OF OFFSHORE SAND AND GRAVEL MINING,
National Oceanic and Atmospheric Administration, Tiburon, Calif. Marine Minerals Technology Center.
For primary bibliographic entry see Field 6G.
W76-09910

AN ENVIRONMENTAL RESEARCH PROGRAM FOR DRILLING IN THE CANADIAN BEAUFORT SEA,
Gulf Oil Canada Ltd., Calgary (Alberta).
J. Hnatiuk.
Journal of Canadian Petroleum Technology, Vol 15, No 1, p 29-36, January-March, 1976. 5 fig, 2 tab, 4 ref.

Descriptors: Oil industry, Resources development, Water resources, *Environmental effects, *Offshore platforms, *Canada, Wildlife, *Oil spills, Water quality control, Continental Shelf, Exploration, Floating, Drilling, Ice cover, Animal populations, Logistics, Research and development, Baseline studies.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, *Artificial islands, Environmental impact, Mackenzie Delta, Prediction, Scouring.

A multi-million-dollar environmental research program consisting of 33 wildlife, biological, oceanographic, meteorological, sea ice and oil clean-up studies related to the southern Beaufort Sea is described. The studies are designed to provide ecological baselines, a better understanding of the physical environment, knowledge related to the consequences of a possible oil spill and means of oil clean-up in ice-infested waters. Seasonal offshore drilling in the Canadian Beaufort Sea from a floating vessel has been approved in principle and is scheduled to be undertaken during the open-water period of 1976. The results of the studies discussed will be used to set operating constraints to safeguard the environment and minimize any adverse impact. The hostile environment is briefly described and problems arising during one of the worst ice seasons on record are discussed. The scope of the studies, research methods and progress to date in individual studies are outlined and, where possible, results are provided. An important phase of the program is public interface to inform northern natives, government, those with environmental concerns and others about the program and the study results. (Sinha-OEIS)
W76-09912

ACADEMIC DATA-NEEDS FOR ENVIRONMENTAL ASSESSMENTS OF OFFSHORE TECHNOLOGICAL OPERATIONS,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 6G.
W76-09914

COAST GUARD'S RESPONSE TO SPILLED OIL,
Coast Guard Reserve, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-09915

BIOLOGICAL PRODUCTION PROCESSES IN THE URAL RIVER, (IN RUSSIAN),
Gosudarstvennyi Meditsinskii Institut, Orenburg (USSR).
For primary bibliographic entry see Field 5C.
W76-09919

POSSIBILITIES AND LIMITATIONS IN BIOLOGICAL CONTROL OF WEEDS,
Staatliches Museum fuer Naturkunde, Ludwigsburg (West Germany).
For primary bibliographic entry see Field 4A.
W76-09920

RECENT TRENDS IN WEED CONTROL IN FRESHWATER,
Agricultural Research Council, Kidlington (England). Weed Research Organization.
For primary bibliographic entry see Field 4A.
W76-09921

THE ERADICATION OF THE SEAWEED SARGASSUM MUTICUM FROM BRITAIN,
Portsmouth Polytechnic (England). Dept of Biological Sciences.
W. F. Jones, and E. B. Gareth.
Biol Conserv. 6(1), p 57-58, 1974.

Descriptors: *Aquatic weed control, Ecosystems, Intertidal areas, Shallow water, Europe, Floating plants.
Identifiers: Britain, Japan, *Sargassum-Muticum, *Seaweed eradication.

Studies indicated that S. muticum, accidentally introduced from Japan to the intertidal lagoons of

the Isle of Wight and Portsmouth Harbor, can drastically change the ecosystem of shallow coastal waters by reducing species diversity. Free-floating masses of detached Sargassum annoy fishermen, boaters and swimmers. Volunteers were sought to pick the plants by hand at regular intervals until all larvae, sporelings and adult plants are eliminated from the area.--Copyright 1974, Biological Abstracts, Inc.
W76-09989

INSECT GROWTH REGULATORS FOR THE CONTROL OF AQUATIC MIDGES,
California Univ., Riverside. Dept. of Entomology.
M. S. Mulla, R. L. Norland, T. Ikeshoji, and W. L. Kramer.
J Econ Entomol. 67(2), p 165-170, 1974.

Descriptors: *Insect control, *Growth rates, Insect resistance, *Diptera, Regulation, Oxidation lagoons, Inhibition, *Midges, Sewage, Insecticides.
Identifiers: Chironomus-Stigmaterus, Procladius-Sp, Tanypus-Grodhausi, Tanytarsus-Sp.

In laboratory, Altosid (isopropyl 11-methoxy-3,7,11-trimethyldodeca-2,4-dienoate) was the most effective compound tested against OP(organophosphate)-resistant and susceptible Chironomus species. This material also was effective against larvae of C. stigmaterus Say and Tanypus grodhausi (Sublette) taken from sewage oxidation ponds and treated in the laboratory. Two slow-release encapsulated flowable formulations of Altosid at 0.2 and 0.1 ppm concentration showed excellent activity against midges of the genera Chironomus, Procladius, and Tanytarsus in small box plots and in field breeding ponds. Both proved superior to the emulsifiable formulations in terms of initial suppression and residual activity. The 2 slow-release and EC (emulsifiable concentrate) formulations were studied in a warm-water lake (5-6 ft deep) where 4-8 acre portions were treated. Slow-release formulations produced good to excellent inhibition of emergence of adults for a period of 1-2 wk. The 10% slow-release greater initial and short-term inhibition of emergence at 0.25 lb/acre AI(active ingredient) than 0.1 lb/acre. EC-formulation yielded lower initial and short-term inhibition of emergence than the 10% slow-release forulation.--Copyright 1974, Biological Abstracts, Inc.
W76-09997

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ENERGY MODELING AND FORECASTING.
California Univ., Berkeley. Lawrence Berkeley Lab.
Proceedings of the Conference on Energy Modeling and Forecasting, June 28, 29, 1974, Lawrence Berkeley Laboratory, University of California, Berkeley, California. 170 p, 20 fig, 28 tab, 160 ref, 2 append. Benenson, P., Ruderman, H., Merrill, D., and Sathaye, J. (Eds.).

Descriptors: *Energy, *Forecasting, *Methodology, *Model studies, Demand, *Economics, Oil, Environment, Fuels, Supply, Systems analysis, Technology, Simulation analysis, Decision making, Optimization, Water resources, Reservoirs.
Identifiers: Econometrics.

Presented are the proceedings of a conference on methodology in energy modeling and forecasting. The objectives of the conference, held at the Lawrence Berkeley Laboratory, were to evaluate the suitability of present modeling techniques for responding to energy policy questions and to explore approaches for improving each method. Each of the participants in the small but diverse group presented a paper and then a discussion followed, focusing on the strengths and weaknesses of alternative methodologies. The participants were also asked to criticize their methods in terms of the assumptions of the model, the applicability of the model to today's conditions, the policy questions that can most easily be addressed, the time horizon of the model, the treatment of uncertainty, and the phenomena that can be most and least readily described. The first paper deals with the relationship of methods to policy questions. Most of the remaining papers deal with particular methods, including probability theory, network analysis, linear programming, regression analysis, input-output, process analysis, systems dynamics, interactive game theory, and computer simulation techniques. The final presentations, which focus on energy models from a user's point of view, were made by representatives from an oil company and from a public utilities company. (See W76-09603 thru W76-09613) (Bell-Cornell)
W76-09602

ENERGY PROJECTIONS--RELATIONSHIP TO POLICY ISSUES,
Brookhaven National Lab. Upton, N.Y. Energy Systems Analysis Group.
K. C. Hoffman.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 1-11. 3 ref, 2 fig, 1 tab.

Descriptors: *Energy, *Forecasting, *Projections, Demand, Research and development, Planning, Regulation, Rates, Environment, Standards, Risks.
Identifiers: *Policy issues, Capital investment, Oil allocation.

Accuracy is not the only criterion for evaluating an energy projection. Other attributes of specific forecasts, such as scope, level of aggregation and time horizon should also be considered in light of the policy issue to be addressed. Even a rough approximation of the relative changes attributable to alternative policy actions may be more important than the accurate determination of the demand level. It is not inconsistent for the same groups to use low or high forecasts, depending upon the policy questions they are trying to answer. Because energy policy questions are related to social, economic, political and environmental issues, energy models must be embedded in an overall framework or model that encompasses these issues. One must understand if these differences reflect different economic and social assumptions, different judgements of the influence of the same assumptions, or different degrees of conservatism imposed by the policy issues addressed. This article distinguishes the factors influencing projections in the near, intermediate, and long-term. Four general policy questions have been examined to indicate which attributes are most important. The four policy questions are: research and development planning, capital investment, near-term allocation of oil, and the regulation of rates and environmental standards. A discussion following the article contains such issues as the possibility of combining economic and technical analyses, the level of detail with which one ought to be modeling, and the problem of the self-fullfilling forecast. (See also W76-09602) (Bell-Cornell)
W76-09603

A PROBABILISTIC MODEL OF THE OIL AND GAS DISCOVERY PROCESS,
Alfred P. Sloan School of Management, Cambridge, Cambridge Mass.
G. M. Kaufman, Y. Balcer, and D. Kruyt.
In Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 13-26. 7 fig.

Descriptors: *Oil, *Probability, *Model studies, *Reservoirs, *Size, Statistical methods, Sampling, Simulation analysis, Monte Carlo methods, Distribution, Rivers, Computers, Graphical methods, Drilling, Economics.
Identifiers: Petroleum gas, Probabilistic models.

Presented is a probabilistic model for the discovery of petroleum deposits. Two assumptions are made regarding the distribution of reservoir sizes and its relationship to the discovery process for reservoirs within a region of uniform geological characteristics, called a 'play': (1) the size distribution within a subpopulation is log-normal; and (2) the probability of discovering a reservoir is proportional to its size. Presented is a statistical analysis of data from plays in Alberta, Canada to support the assumption that the underlying distribution is log-normal. Estimated is the expected sampling distribution of reservoir size in chronological order of discovery. Since the largest reservoirs are most likely to be discovered first the sampling distribution deviates from a log-normal distribution, which leads to an overestimate of the amount of petroleum remaining in place. A Monte-Carlo computer simulation of the discovery process is described. Results show the effect of sample size on the shape of the distribution. Further refinement of the model will be made, and further work will be done to incorporate this physical model into an economic model to investigate the optimum investment strategy for the development of a play over time. Subjects in the discussion following the article include: four methods for estimating the total number of reservoirs in a play; application of the model for predicting cumulative discoveries over time; and a method to incorporate model results into an econometric model for estimating a production function for oil or gas. (See also W76-09602) (Bell-Cornell)
W76-09604

COUPLED ENERGY SYSTEM-ECONOMIC MODELS,
Brookhaven National Lab., Upton, N.Y. Energy Systems Analysis Group.
K. C. Hoffman, P. F. Palmedo, W. Marcuse, and M. D. Goldberg.
In: Proceedings of the conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 27-40. 3 fig, 3 tab, 6 ref.

Descriptors: *Energy, *Economics, *Model studies, Systems analysis, Technology, Demand, Supply, Assessment, Fuels, Optimization, Linear programming, Input-output analysis, Environment, Costs, Economic efficiency.
Identifiers: Economic models.

A coupled energy system/economic model is being developed for energy policy analysis and technology assessment. The model emphasizes technological detail of both supply and utilizing devices employed in the energy system, in terms of conversion efficiency, cost, and emissions to the environment. The model consists of the Reference Energy System format and the Brookhaven Energy System Optimization Model. Special features of the model that are important for projecting energy supply and demand are the scope of the model in allowing for interfuel substitution, the incorporation of a load-duration curve for the electrical sector, and the inclusion of the utilizing device as an important element in interfuel substitution. The presentation has dealt in detail with the method for developing the requisite inputs mentioned above, and for operating the model. The model yields the optimal energy flows within the energy demand and resource-supply constraints that are applied for a particular analysis. Also determined is the total annual cost of service and an inventory of emissions to the environment associated with a given energy flow solution. Finally, a study is provided of the range of cost and efficiency ove

ich given technologies are competitive. A
ıpling of the optimization overcomes some of
difficulties in the conventional input-output
roach by providing for technological change
interfuel substitution in the energy sector. A
cussion following this article considers adapting
model to permit the input-output coefficients
change when prices change. (See also W76-
02) (Bell-Cornell)
6-09605

ERGY POLICY AND ECONOMIC GROWTH,
ta Resources, Inc., Cambridge, Mass.
A. Hudson, and D. W. Jorgenson.
Proceedings of the Conference on Energy
deling and Forecasting, Peter Benenson, et al.
s.), Lawrence Berkeley Laboratory, Universi-
f California, June 1974, p 41-76. 19 tab, 41 ref.

scriptors: *Energy, *Economics, *Model stu-
s, Industries, Input-output analysis, Prices, De-
nd, Estimating, Fuels, Methodology, Evalua-
ı, Taxes, Effects, Equations, Systems analysis,
estment.
ntifiers: Producer behavior, Energy projec-
ıs, Energy policy, Interindustry model, Interin-
try transactions.

dson's approach to analyzing energy develop-
nts and energy-nonenergy economic relation-
ps involves: (1) an interindustry model of U.S.
nomy, incorporating nine intermediate sectors,
h emphasis on the energy-producing sectors;
econometric models of producer behavior for
h of the domestic producing sectors; (3) a
croeconomic growth model; and (4) sub-models
personal consumption expenditures and of in-
tment, government and export components of
l demand. Prices of domestic availability of
put and the input-output coefficients in the
duction of this output are endogenous func-
ıs, simultaneously determined within the
ducer behavior models. Output prices and
duction structure reflect producer adjustment
he prevailing set of prices of the products of all
tors and of capital, labor, and competing im-
ts. The macro-econometric growth model con-
s of endogenous production and household sec-
s and exogenous foreign and government sec-
s. The model integrates demand and supply
ditions or consumption, investment, capital
labor. Dynamic aspects of capital accumula-
ı and consumer behavior are incorporated.
del applications reported include a set of pro-
tions of energy use and its composition, an
lysis of structural changes resulting from an
rgy use tax, and an estimate of the effects of an
rgy tax policy designed to promote energy in-
endence. (See also W76-09602) (Bell-Cornell)
6-09606

THDOLOGICAL ISSUES IN THE ONOMETRIC ESTIMATION OF ENERGY MAND ELASTICITIES,
arton School of Finance and Commerce,
ladelphia, Pa. Dept. of Economics.
I. Griffin.
Proceedings of the Conference on Energy
deling and Forecasting, Peter Benenson, et al.
s.), Lawrence Berkeley Laboratory, Universi-
f California, June 1974, p 77-89. 23 ref.

scriptors: *Energy, *Demand, *Estimating,
odel studies, *Economics, *Methodology,
ces, Income, Fuels, Economics, Least squares
thod, Equations, Time series analysis, Systems
lysis.
ntifiers: Policy analysis, Fuel shares, Translog
roach, Price elasticities.

s paper describes preliminary work on a model
stimate the long-run price, cross-price, and in-
ne elasticities of energy sources using
nometric analysis on pooled international data.
recognizing the derived demand nature for
de oil and the numerous possibilities for long-run interfuel substitution, Griffin proposes determining the aggregate final demand for energy in each of eight fuel-using sectors. In a second step, the shares of the respective fuels would be determined. The sample consists of observations for 20 OECD countries drawn at 5 year intervals from 1955-70, giving 80 observations. Discussed are two alternative procedures for estimations of fuel shares. The first is use of ordinary least squares. An alternative approach popularized by Christenson, Jorgenson and Lau is the Translog cost function approach. The advantages and drawbacks of each are discussed. The basic issues are whether the restrictive theoretical conditions of the Translog approach are met statistically and how large the loss in goodness-of-fit will be with the Translog model. Model applications are envisioned to be for long-run forecasting and policy analysis. (See also W76-09602) (Bell-Cornell)
W76-09607

ENERGY SYSTEMS: MODELING AND POLICY PLANNING,
Massachusetts Inst. of Tech. Cambridge. Energy Lab.
M. L. Baughman, and E. Hnyilicza.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 91-100. 1 tab, 19 ref.

Descriptors: *Energy, *Systems analysis, *Planning, *Model studies, Economics, Methodology, Simulation analysis, Optimization, Fuels, Estimating, Supply, Demand.
Identifiers: *National energy policy, Multidisciplinary, Cost minimization.

This presentation is drawn from two papers. The first is an overview of the major issues pertinent to the formulation of national energy policy, including such issues as the nonrenewability of fossil fuels, imports, national security, and balance of payments. The modeling task and steps are (1) development of conceptual models, (2) identification of data needs, (3) estimation of parameters, (4) assessment of model validity, and (5) testing, prediction, and policy analysis. Alternative ways in which models can be used for policy planning through simulation and optimization techniques are presented. The second paper contains the theoretical framework and results of a descriptive model of energy supply and demand. Demand is broken down into residential, commercial, industrial and transportation sectors. The model is used to establish the consistency of estimates and projections and to maintain a system of accounting. Baughman has used his interfuel substitution study as an example of the model building process described in his modeling and policy planning paper. He gives two examples of how the choice of model depends upon the particular characteristics of a sector and the data availability. The first example is the residential-commercial sector, where fuel choice is a two-step process. The second example is the model for electricity supply, for which he uses engineering estimates. Baughman suggests: (1) linking macro mode models that account for political intervention with micro models that describe fuel supply and demand; and (2) coupling optimization techniques with descriptive models such as the one he has described. (See also W76-09602) (Bell-Cornell)
W76-09608

ENERGY CONSUMPTION AND FUEL CHOICE BY RESIDENTIAL AND COMMERCIAL CONSUMERS IN THE UNITED STATES,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
M. L. Baughman, and P. L. Joskow.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 101-119. 4 tab, 3 fig, 15 ref, 2 append.

Descriptors: *Energy, *Model studies, *Simulation analysis, *Decision making, *Fuels, United States, Estimating, Prices, Economics, Electricity, Natural gas, Oil, Equations, Temperature, Systems analysis.
Identifiers: *Energy consumption, Commercial, Residential.

This paper reports the conceptual design and estimation results of models for total demand and aggregate fuel choice decisions in the residential and commercial sector. Fuel utilization decisions can be separated into a two-level decision process. First, the consumer decides on the level of energy using services he desires to meet his functional needs, then he seeks to find the combination of fuels that will provide these services most cheaply. This dichotomy forms the basis for the models adopted. The model used to explain total demand for energy in the residential and commercial sector is a simple flow adjustment model. The long run price and income elasticities of demand in this sector are estimated to be about -0.50 and 1.0 respectively. The short run elasticities were about 16% of these values. Finally, a set of simulations to 1980 are performed using some hypothesized price scenarios. Results show that much conservation can be expected to take place in the residential and commercial sector as a result of price increases and that the geographic shifts in consumption are highly dependent on both the particular fuel in use and the cost of competing fuels in the region. Both these effects should have important significance for policy decisions in the energy area. The paper concludes with a discussion of the modeling and of the potential role of behavioral sciences in the quantitative analysis of supply and demand. (See also W76-09602) (Bell-Cornell)
W76-09609

JOINT USA/JAPAN PROJECT ON GLOBAL SYSTEMS ANALYSIS AND SIMULATION (GLOSAS) OF ENERGY, RESOURCES, AND ENVIRONMENTAL (ERE) SYSTEMS,
Japan GLOSAS Project Committee, Tokyo.
T. Utsumi, and E. A. Eschbach.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 121-144. 4 fig, 36 ref.

Descriptors: *United States, *Projects, *Simulation analysis, *Energy, *Systems analysis, Effects, Resources, Environment, Computers, Methodology, Networks, Decision making, Research, Design, Supply, Demand, Fuels, Technology, Planning.
Identifiers: *Japan.

Described is a joint United States-Japanese project currently under development for Global Systems Analysis and Simulation (GLOSAS) with special emphasis on the problems of energy, resources and environmental systems. The GLOSAS project is intended to provide decision makers in the participating countries with comprehensive solutions within an international framework. Impacts on domestic economies, international trade and the international monetary system are included. When completed, the project will employ an international computer conferencing network via satellite telecommunications for worldwide interactive simulation modeling. Global simulation would be carried out by running submodels of socio-economic systems on computers throughout the world linked by the communications system. Typical submodels would be for crude petroleum production, world petroleum trade, and domestic economic and energy models. Such diverse modeling techniques as systems dynamics, input/output, linear programming and econometrics would be employed where appropriate. The models will permit input of policy makers' decisions via interactive terminals. Thus an interactive gaming situation for alternative scenarios will exist whereby the results of policy decisions or strategies formulated in different

countries could be exhibited. An objective of the project is to improve cooperation for setting worldwide energy policy. (See also W76-09602) (Bell-Cornell)
W76-09610

THE USE OF ECONOMETRICS TO PROJECT ENERGY DEMANDS,
Data Resources, Inc., Lexington, Mass.
P. K. Verleger, Jr.
In: Proceedings of the Conference on Energy Modeling and Forecasting Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 145-157. 17 ref.

Descriptors: *Energy, *Demand, *Mathematical models, Prices, Forecasting, Economics, Fuels, Transportation, Industries, Equations, Systems analysis, *Projections.
Identifiers: *Econometrics, Disaggregation.

Presented is a critique of econometric techniques for projecting energy demands, and the usefulness of these techniques for analyzing policy is discussed. The pairing of modeling techniques with specific problems is necessary if projections made by econometric techniques are to be accurate. During the last five years most of the econometric projections have been at a very aggregated level and price impacts have been systematically excluded. A subset of these studies is mentioned having the following characteristics: (1) a specific sector and fuel is examined; (2) the model is regionally disaggregated; (3) price is included as an explanatory variable; and (4) attention is paid to the theoretical structure of demand. A model with these characteristics may, given proper projections of exogenous data, function as a good forecasting tool. An important difference between the two model types is that the disaggregated model attempts to distinguish between the energy usage pattern and the capital stock of energy-using devices. The stock-flow separation is discussed in detail and a model is sketched that incorporates this distinction. This model allows for extramarket constraints on the choice of fuel, such as the unavailability of fuel in a particular region. Such a model can be used under the situations prevailing today. Price effects and regulatory constraints can be included. Several drawbacks of this model are also discussed. The problem of data disaggregation by fuel, industry, and region is explored. Following the paper is a discussion, including applications of econometric models. (See also W76-09602) (Bell-Cornell)
W76-09611

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Exxon Corp., New York. Corporate Planning Dept.
P. P. McCall.
In: Proceedings of the conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 159-165. 1 fig.

Descriptors: *Energy, *Demand, *Forecasting, *Mathematical models, Linear programming, Oil, Industries, Supply, Technology, Fuels, Economics, Systems analysis.
Identifiers: Disaggregation, Fuel substitution, Functional demand.

During the past twenty years, Exxon has employed the forecasting methods of judgment and trend extrapolation. Energy demand forecasts for the individual units of the company were accurate, but forecasts for the total industry were low. Exxon's projections of the world energy supply indicated a flattening out of world oil production in the late 1980's or early 1990's, alerting them to the energy crisis. Currently Exxon uses a linear program for the world oil industry. It is highly disaggregated by geographical region, refining technology, transportation technology, and type of oil. It is used to forecast future oil prices and to provide a framework for facilities planning. The important components of an ideal energy model were outlined. Functional demand should be considered first in an energy model. Price, alternative supply technologies, fuel substitution, and the natural resource base also should be considered. Further, here is a need for disaggregation to incorporate these considerations and to monitor changes in trends. No all-purpose model is expected. The Brookhaven model is useful because it deals with functional demand, alternative supply technologies, and interfuel substitution. Its hierarchical structure renders it useful to policy makers. Following the paper is a discussion of the Exxon linear programming model. (See also W76-09602) (Bell-Cornell)
W76-09612

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Pacific Gas and Electric Co., San Francisco, Calif.
R. L. Breen.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 167-170.

Descriptors: *Energy, *Forecasting, *Demand, *Mathematical models, Economics, Decision making, Costs, Systems analysis.
Identifiers: *Econometrics, Disaggregation, Credibility.

Econometrics can be used to complement modeling techniques such as input-output and process analysis to model the total energy system. Once this has been accomplished, high priority should then be attached to sectoral and regional disaggregation. This step is needed because policy decisions impact differently on different industries and geographical regions. A user's evaluation of a model takes into account (1) the policy question to be answered, (2) the level at which the decision will be made, and (3) the cost of the model. Concerning the first point, the policy issues must be clearly stated before the usefulness of a model can be determined. For example, a utility which must consider the issues of rate structure design, facilities planning, siting, and environmental impacts needs a regional model. Such models should be linked with more comprehensive national models, but the methods for doing this are not well developed. A particular problem is whether price determination takes place in the regional or the national model. Furthermore, once it is determined, by what method can it be incorporated in the model to which it is linked. A user of models also takes into account that decisions are made at several very dissimilar levels (national, regional and corporate); no single model can answer questions at all these levels. Finally, the model builder must be able to justify the costs of the model to the potential user. Models should be applied only to the uses for which they were intended. Discussed is the linkage problem. (See also W76-09602) (Bell-Cornell)
W76-09613

THE COST ASSIGNMENT OF THE COOPERATIVE WATER RESOURCE DEVELOPMENT: A GAME THEORETICAL APPROACH,
Tokyo Inst. of Tech. (Japan).
M. Suzuki, and M. Nakayama.
Management Science, Vol. 22, No. 10, p 1081-1086, June 1976. 4 tab, 7 ref.

Descriptors: *Water resources development, *Cost allocation, Linear programming, Rivers, Water supply, Agriculture, Optimization, Mathematical models, Systems analysis.
Identifiers: Cooperation, Game-theoretic approach, Japan.

As the demand for natural resources intensifies, the costs of further exploitation of these resources become enormous. These costs, in turn, require the development of a given resource to be a cooperative venture among several participants, each of whom must be assured that the costs and benefits of the venture will be 'fairly' distributed among them. It is at this point that the theory of cooperative games may offer guidelines as to what is fair or not fair to each participant or player in a given cost allocation. To illustrate an application of cooperative game theory in assigning 'fair' costs and benefits to the participants in a cooperative venture, an example problem in water resources is considered. A mathematical model of water resource development is applied to the case of Kanagawa prefecture in Japan, for which it is assumed that a dam will be constructed on the River Sakawa and that the diversion of water from agricultural use to city service is done in the basins of the Rivers Sakawa and Sagami. (Bell-Cornell)
W76-09619

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 4A.
W76-09622

THE DESIGN OF WATER QUALITY MANAGEMENT PROJECTS WITH INADEQUATE DATA,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W76-09623

IMPROVED TECHNIQUES FOR WATER RESOURCE SYSTEMS DESIGN,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 4A.
W76-09624

MAXIMUM INFORMATION OBTAINABLE FROM INADEQUATE DESIGN DATA: FROM MULTIVARIATE TO BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Management.
For primary bibliographic entry see Field 4A.
W76-09625

THE COST-EFFECTIVENESS OF WATER RESOURCES SYSTEMS CONSIDERING INADEQUATE HYDROLOGICAL DATA,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
N. Buras.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS - Unesco - OMM - AISH, 1974, p 649-659. 2 fig, tab, 9 ref.

Descriptors: *Water resources, *Hydrologic data, Projects, Design, Costs, Effects, Planning, Reservoirs, Water demand, Groundwater development, Probability, Equations, Decision making, Management, Mathematical models, Systems analysis.
Identifiers: *Cost effectiveness, *Inadequate data, Reservoir capacity.

How much hydrological information is necessary for the design of water-sources systems is not yet satisfactorily known. In general, the cost of a project decreases with the amount of available hydrological data. However, additional hydrological data involve increased cost, interms of more gauging stations and more costs incurred to society by delaying the design for data collection and processing. These two cost functions can be shown as two curves intersecting in the data-cost space; the parabola is the sum of the two functions. Adequate hydrological data is defined as the amount of information corresponding to the minimum ordinate of the total cost curve. Information in excess of this amount is as inadequate as not enough data, and may increase the project

t. Insufficient data is used for information less
n adequate, and redundant data for information
xcess. Considered are the consequences of in-
quate hydrological data on the cost and effec-
eness of water resources structures and pro-
ts. Discussed is cost-effectiveness, flexibility in
nning, reversible vs. irreversible decisions. For
nning and design with inadequate data, two ex-
ple problems are considered: (1) determining
capacity of a surface reservoirto satisfy a
en demand; and (2) evolving a planning and
nagement model of a groundwater development
ject. (Bell-Cornell)
6-09626

TIMAL ACTIVATED SLUDGE DESIGN
DER UNCERTAINTY,
burn Univ., Alabama. Dept. of Chemical En-
eering.
r primary bibliographic entry see Field 5D.
6-09628

TIMAL OPERATION OF THE PUMPING
ATIONS IN THE KINNERETH-ESHKOL
CTION OF THE NATIONAL WATER CARRI-
,
koroth Water Co. Ltd., (Israel). Research and
salting Div.; and Technion - Israel Inst. of
ch., Haifa.
r primary bibliographic entry see Field 4A.
6-09629

VESTIGATIONS INTO THE YIELD OF AN
ISTING SURFACE RESERVOIR AND
QUIFER SYSTEM,
ncashire River Authority (England).
r primary bibliographic entry see Field 3B.
6-09631

COMBINED MODEL FOR OPERATING IR-
GATED AGRICULTURAL SYSTEMS UNDER
ICERTAINTIES,
chnion - Israel Inst. of Tech., Haifa. Low-
rmilk Faculty of Agricultural Engineering.
r primary bibliographic entry see Field 3F.
6-09634

QUEDUCT OPTIMIZATION WITH INTER-
EDIATE STORAGE,
lifornia Univ., Berkeley. Lawrence Berkeley
b.; and California Energy and Environment
v.
r primary bibliographic entry see Field 4A.
6-09636

EAST COST DESIGN OF ACTIVATED
UDGE SYSTEMS,
rnell Univ., Ithaca, N. Y. Dept. of Environmen-
Engineering.
r primary bibliographic entry see Field 5D.
6-09638

WATER-LAND USE MANAGEMENT MODEL
OR THE SEVIER RIVER BASIN PHASES I
ND II,
ah State Univ., Logan.
r primary bibliographic entry see Field 4A.
6-09844

EVELOPMENT OF A DYNAMIC PRO-
RAMMING MODEL FOR THE RE-
ONALIZATION AND STAGING OF WASTE-
ATER TREATMENT PLANTS,
ah State Univ., Logan.
r primary bibliographic entry see Field 5D.
6-09845

VESTMENT SEQUENCING, ALLOCATION,
ND LEARNING IN THE DESIGN OF WATER
RESOURCES SYSTEMS: AN EMPIRICAL AP-
PLICATION,
Harvard Univ., Boston, Mass. Graduate School of Business Administration.
G. C. Rausser, and C. E. Willis.
Water Resources Research, Vol. 12, No. 3, p 317-330, June 1976. 2 fig, 5 tab, 35 ref.

Descriptors: Water resources, *Design, *Investment, *Water allocation(Policy), Technology, Desalination, Costs, Decision making, Constraints, *California, Computers, Water supply, Water demand, Regional analysis, Estimation, Optimization, Equations, Mathematical models, Systems analysis, Water quality, *Cost allocation.
Identifiers: Quadratic programming, Integer programming, Sequencing, Cost minimization.

Four of the more important unresolved problems in the design of water resources systems involve a determination of methods to deal with technological progress (e.g., new desalting processes), availability of water from more than a single supply source, the rate of investment in the capital complex employed to exploit the resource along with the allocation of water once the capital complex is in place, and price sensitive demands for water. The importance of these issues is demonstrated, and a decision framework is advanced which formally incorporates each along with a new technique for solving large-scale investment-sequencing and water allocation problems. The allocation process is formulated as a quadratic programming problem, and the investment-sequencing process is specified as an integer programming problem. Four theorems are advanced which outline the consistency and convergence properties of this iterative approach. The framework is applied to an empirical situation in California with encouraging results. (Bell-Cornell)
W76-09846

METAGAME THEORY AND ITS APPLICATIONS TO WATER RESOURCES,
Waterloo University (Ontario). Dept. of Civil Engineering.
K. W. Hipel, R. K. Ragade, and T. E. Unny.
Water Resources Research, Vol. 12, No. 3, p 331-339, June 1976. 14 fig, 4 ref.

Descriptors: *Water resources, *Operations research, *Political aspects, Water pollution control, Management, Behavior, Equations, Feasibility, Decision making, Systems analysis.
Identifiers: *Metagame theory.

Metagame theory is a new scientific method that reconstructs classical game theory on a nonquantitative basis in order to analyze political conflicts. It is a positive descriptive approach that can be used for the political resolution of water resource conflicts. Quantitative methods of operations research may be integrated with the political analysis so as to arrive at solutions to water resource problems that are politically feasible as well as economically and technically feasible. Herein, various resource problems are formulated, and it is shown by two examples that classical game theory, which is based on the theory of rationality, does not work. The concepts of metagame theory are surveyed within a nonquantitative set theoretic framework. The conflicts examined illustrate the potential of metagame theory for analyzing water resource management problems. (Bell-Cornell)
W76-09847

A LINEAR PROGRAMMING MODEL FOR USE IN GUIDING URBAN FLOODPLAIN MANAGEMENT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W76-09849

A PROPOSED ALGORITHM FOR THE SOLUTION OF THE LARGE-SCALE INVERSE PROBLEM IN GROUNDWATER,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 2F.
W76-09850

EFFECT OF SEQUENCE LENGTH N ON THE CHOICE OF ASSUMED DISTRIBUTION OF FLOODS,
IBM Thomas J Watson Research Center, Yorktown Heights, N. Y.
For primary bibliographic entry see Field 4A.
W76-09851

ESTIMATING SELECTED PARAMETERS FOR THE KENTUCKY WATERSHED MODEL FROM WATERSHED CHARACTERISTICS,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 2A.
W76-09852

PARAMETER OPTIMIZATION FOR WATERSHED MODELS,
New South Wales Univ., Kensington, Australia. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-09853

SPECIFICATIONS FOR CONTAINER FACILITIES BY SIMULATION,
O. Beeman, and G. Vallicelli.
In: Symposium On Modeling Techniques, Volume I: 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 23-42, 1975.

Descriptors: *Model studies, *Harbors, *Facilities, *Docks, Ships, Mathematical models, Simulation analysis, Operation and maintenance, Equipment, *Oregon.
Identifiers: *Container facilities, Shipping, Port facilities, Portland(Ore).

The cost of container facilities is now approaching $15,000,000 per berth. Concurrently, standby costs of a modern container vessel can exceed $20,000 per day. The high costs and high risks involved demand that rule of thumb planning be replaced by modern planning techniques, including simulation of the system to optimize its design and to assure that it is brought on-line at a proper time. The techniques described were originally devised to set performance specifications for a new container facility at the Port of Portland, Oregon. These techniques were used to analyze the following criteria and parameters: (1) required berth length, (2) queuing and servicing times per vessel, (3) berth utilization, (4) crane utilization, (5) yard equipment utilization, (6) type of equipment, (7) number of cranes and other container handling equipment, (8) general yard layout, (9) design of entry gate, and (10) number of shifts worked per day. In each case, the simulation was used to test the impact of changing berth scheduling, ship size, load per vessel, berth length, crane productivity, etc. Rather than using a single simulation for all problems, emphasis was placed on having the appropriate simulation for each given problem, and to tackle the problems at the lowest possible level. A large scale microsimulation was used in order to check the effect of all decisions on the entire system. (See also W76-09941) (Sims - ISWS)
W76-09943

6B. Evaluation Process

ENERGY POLICY AND ECONOMIC GROWTH,
Data Resources, Inc., Cambridge, Mass.

For primary bibliographic entry see Field 6A.
W76-09606

AN ECONOMIST'S VIEW OF THE OCEANS,
Yale Univ. New Haven, Conn.
For primary bibliographic entry see Field 6E.
W76-09617

METHODOLOGIES FOR THE DETERMINATION OF STREAM RESOURCE FLOW REQUIREMENTS: AN ASSESSMENT,
Utah State Univ., Logan. Dept. of Wildlife Science.
For primary bibliographic entry see Field 6G.
W76-09666

WATER AUTHORITY RATE MAKING,
Pennsylvania State Univ., University Park. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W76-09717

URBAN STORMWATER MANAGEMENT--PROBLEMS, SOLUTIONS AND IMPACT: A SUMMARY OF INTERVIEWS,
Poertner (Herbert G.), Bolingbrook, Ill.
For primary bibliographic entry see Field 4C.
W76-09752

A FLOODPLAIN MANAGEMENT FRAMEWORK WITH STRUCTURAL AND NON-STRUCTURAL MEASURES,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6F.
W76-09754

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS. RECOMMENDATIONS AND EXECUTIVE SUMMARY,
Institute for Water Resources (Army), Fort Belvoir, Va.
R. L. Trisko.
IWR Research Report 75-R2, May 1975. 42 p.

Descriptors: *Energy, *Electric power production, *Hydroelectric plants, *Feasibility studies, Project feasibility, Pumped storage, Competing uses, Peaking capacity, Water resources, Limiting factors, Water supply, Fossil fuels, Environmental effects, Electric power rates, Electric power costs, Evaluation, Interest rates, Discount rates, Projections, Cost-benefit ratio, Federal project policy.
Identifiers: *Corps of Engineers projects, *Hydro/energy potential.

This summarization of the comprehensive report of the same title is prefaced by recommendations for the Corps of Engineers to study new projects previously considered unfeasible, of power potential at existing projects without power, and additions to existing projects with power. The Corps should re-examine operating rules at reservoirs with power installations in view of increased power values relative to other benefits, and the possibilities of enhancing or increasing power generation and capacity. The federal role in the development of pumped storage should be defined so that the economic, social, and environmental problems associated with the need for additional peaking power can be thoroughly analyzed and federal hydropower development and operation should emphasize increased sources of peaking power. The federal policy relating to the marketing of its hydropower should reflect present economic development, energy supplies, and costs and should permit market prices based on revised rate structures consistent with value. A single benefit-cost ratio should be deemphasized and project planning should stress maximum displacement of scarce fuels. Water resource development should be based on comprehensive assessments of long range water needs on regional and national bases, including requirements of thermal energy production and processing industries, as well as hydropower generation. (See also W76-09765) (Auen-Wisconsin)
W76-09764

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS,
Institute for Water Resources (Army), Fort Belvoir, Va.
R. L. Trisko, A. Gilead, G. P. Johnson, and B. Sasaki.
IWR Research Report 75-R1, July 1975. 343 p. 26 fig., 63 tab., 111 ref.

Descriptors: *Energy, *Electric power production, *Hydroelectric plants, *Feasibility studies, Projections, Project feasibility, Reservoir operation, Federal project policy, Pumped storage, Peaking capacity, Pricing, Power marketing, Water resources, Project planning, Efficiencies, Economic feasibility, Evaluation, Model studies, Fuels, Electric power industry, Electric power costs.
Identifiers: *Corps of Engineers projects, *Hydro/energy potential.

An overview of hydropower potential in the context of energy and water resources and demands, energy economics, and federal policy, organization, and practices pertaining to hydropower development and marketing presents a framework within which the Corps of Engineers might conduct studies at existing projects and on streams susceptible of development by the Corps. The discussion focuses on energy resources, consumption, regional hydropower distribution, load curve, economic, and environmental perspectives; and potential displacement of fossil fuels through increased hydropower development is related to the selection of thermal alternatives, environmental and balance of payment implications, and pumped storage. The economics of hydroelectric power are evaluated as they relate to its complexities, standards based on interest rates, determination of power values, use of levelized costs, cost allocation, and electrical cost characteristics and trends. Appendices contain samples of hydropower values assigned by Federal Power Commission regional offices, long run fossil fuel thermal power generating real costs and economics. A computerized cost model for evaluating capacity is supplemented by examples of calculation results. The survey of federal hydropower marketing and rate making practices includes various rate schedules and a financial data summary. Federal power marketing practices detail overall power marketing and by agency. (See also W76-09764) (Auen-Wisconsin)
W76-09765

SECONDARY EFFECTS OF PUBLIC INVESTMENTS IN HIGHWAYS AND SEWERS.
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5G.
W76-09778

LANDSLIDE HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst., of Behavioral Science.
For primary bibliographic entry see Field 6F.
W76-09781

NATIONAL CONFERENCE OF DISTRICT CHIEFS, ALBUQUERQUE, NEW MEXICO, SEPTEMBER 28-OCTOBER 3, 1975--PROCEEDINGS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W76-09838

A WATER-LAND USE MANAGEMENT MODEL FOR THE SEVIER RIVER BASIN PHASES I AND II,
Utah State Univ., Logan.
For primary bibliographic entry see Field 4A.
W76-09844

METAGAME THEORY AND ITS APPLICATIONS TO WATER RESOURCES,
Waterloo University (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W76-09847

OFFSHORE PETROLEUM AND NEW ENGLAND - A STUDY OF THE REGIONAL ECONOMIC CONSEQUENCES OF POTENTIAL OFFSHORE OIL AND GAS DEVELOPMENT,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
T. A. Grigalunas.
Available from the National Technical Information Service, Springfield, Va., 22161, as COM-75-10717, $5.50 in paper copy, $2.25 in microfiche. University of Rhode Island Marine Technical Report No. 39, 1975. (Also Sea Grant). 114 p, 5 fig, 35 tab, 56 ref. SG 04-3-158-3.

Descriptors: *Oil industry, *Fossil fuels, *Resources development, *Economic impact, *Economic justification, Continental Shelf, New England, Massachusetts, Oil fields, Coasts, Models, Regional economics, Industries.
Identifiers: *Outer Continental Shelf, *Refineries, North Atlantic Ocean, Georges Bank.

Georges Bank, an historically prolific fishing ground off the coast of New England, is one of three areas along the Atlantic OCS of particular interest in terms of potential oil and gas reserves and production. A representation of the hypothetical development of individual Georges Bank oil and gas fields was constructed. Its results were used to make judgments about some of the implications of a buildup of a potential Georges Bank petroleum basin, i.e., a number of fields. A multi-industry multiregional economic model was adapted to provide insights into the kinds of direct and indirect effects alternative offshore oil and gas and petroleum refinery developments could have on the region. Hypothetical production from a Georges Bank petroleum province is projected for consideration. The potential offshore petroleum and refinery investment is seen in two parts: direct investment demands associated with potential offshore petroleum development and potential refinery activity within New England. The regional economic consequences of the developments are projected and tabulated. The impacts on a coastal area, Bristol County, Massachusetts are used to illustrate the projections for a particular geographic unit. (Sinha-OEIS)
W76-09893

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COST OF PRODUCING CROPS IN THE IRRIGATED SOUTHWEST, PART II: NEW MEXICO,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-09475

COST EFFECTIVENESS OF RELEASE PREVENTION CONTROLS FOR TRITIUM AND KRYPTON-85,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5G.
W76-09506

OSTS AND HYGIENIC NECESSITY OF EWAGE SLUDGE PASTEURIZATION IN WITZERLAND,
dgenoessische Technische Hochschule, Zurich witzerland). Inst. for Aquatic Sciences and ater Pollution Control.
or primary bibliographic entry see Field 5D.
76-09542

N THE CAPACITY-EXPANSION OF ESALINATION PLANTS AND STORAGE ANKS,
alifornia Univ., Davis. Dept. of Water Science d Engineering.
or primary bibliographic entry see Field 3A.
76-09618

HE COST ASSIGNMENT OF THE COOPERA-IVE WATER RESOURCE DEVELOPMENT: A AME THEORETICAL APPROACH,
okyo Inst. of Tech. (Japan).
or primary bibliographic entry see Field 6A.
76-09619

HE COST-EFFECTIVENESS OF WATER ESOURCES SYSTEMS CONSIDERING IN-DEQUATE HYDROLOGICAL DATA,
echnion - Israel Inst. of Tech., Haifa. Low-rmilk Faculty of Agricultural Engineering.
or primary bibliographic entry see Field 6A.
76-09626

PROCEDURE FOR ESTIMATING OFF-SITE EDIMENT DAMAGE COSTS AND AN EMPIRI-AL TEST,
inois State Water Survey, Urbana.
or primary bibliographic entry see Field 4A.
76-09632

EAST COST DESIGN OF ACTIVATED LUDGE SYSTEMS,
ornell Univ., Ithaca, N. Y. Dept. of Environmen-l Engineering.
or primary bibliographic entry see Field 5D.
76-09638

UBSTITUTE CHEMICAL PROGRAM - INI-IAL SCIENTIFIC AND MINIECONOMIC EVIEW OF CAPTAN.
idwest Research Inst. Kansas City, Mo.
or primary bibliographic entry see Field 5C.
76-09651

ATER AUTHORITY RATE MAKING,
ennsylvania State Univ., University Park. Dept. Economics.
G. Halteman, and O. H. Sauerlender.
vailable from the National Technical Informa-on Service, Springfield, Va. 22161, as PB-254 91, $5.50 in paper copy, $2.25 in microfiche. esearch Publication 91, Institute for Research on and and Water Resources, University Park, ecember 1975, 103 p, 9 tab, 21 fig, 59 ref, 4 ap-end. OWRT B-052-PA(1), 14-31-0001-3930.

escriptors: *Municipal water, Surface waters, roundwater, *Cost comparisons, Tax rates, In-rest rates, Water costs, *Rates, Performance, Water utilization, Water wells, Regulation.
dentifiers: *Water authority, Rate making, Private water firms, Water consumer, Level of ilization, Customer mix, Technological costs.

he performance of unregulated municipal water uthorities and regulated private water firms is ompared. Four study groups were selected. uthorities and private firms using 80 percent of pply from surface water formed groups one and vo. The same type firms using 80 percent ground-ater composed groups three and four. Cost com-risons between groups one and two showed that technological costs are lower for private firms than for municipal authorities, but that when the institutional differences of tax and interest are taken into account, private firms' costs are higher than those of the municipal authority. Factors consistently influencing cost significantly are customer mix, level of utilization, and output. Between 35 and 50 percent of variation in cost was explained by these variables. The analysis of well water firms -- both private and municipal authority -- was much less conclusive. Private firms have higher cost levels than municipal authorities over much of the relevant range of output. When the revenue and cost functions of the firms studied were examined it was concluded that rate of return regulation of municipal authorities would not be beneficial to the consumer. (Sink - Penn State)
W76-09717

IS THE SEPARATION OF SEWERS DESIRABLE,
Hydrotechnic Corp., New York.
For primary bibliographic entry see Field 5D.
W76-09739

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS. RECOMMENDATIONS AND EXECUTIVE SUMMARY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09764

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09765

FINANCING POLLUTION ABATEMENT EQUIPMENT FOR TEXTILES AND OTHER SOUTH CAROLINA INDUSTRIES.
Clemson Univ., S.C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-09766

PRESENTATION CONCERNING POLLUTION CONTROL FACILITIES REVENUE BONDS,
Sinkler, Gibbs, Simon and Guerard, Charleston, S.C.
For primary bibliographic entry see Field 5G.
W76-09767

ROLE OF THE UNDERWRITER IN TAX EXEMPT FINANCING FOR INDUSTRIAL EXPANSION AND POLLUTION CONTROL,
Interstate Securities Corp., Charlotte, S.C.
For primary bibliographic entry see Field 5G.
W76-09768

THE INDUSTRIAL REVENUE BOND FOR POLLUTION CONTROL: ONE COMPANY'S PERSPECTIVE,
La France Industries, S.C.
For primary bibliographic entry see Field 5G.
W76-09769

FINANCING POLLUTION CONTROL PROJECTS IN SOUTH CAROLINA USING TAX-EXEMPT INDUSTRIAL REVENUE BONDS,
Spring Mills, Grace, S.C.
For primary bibliographic entry see Field 5G.
W76-09770

THE POLLUTION CONTROL BOND,
Clemson Univ., S. C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-09771

A GUIDE TO THE SELECTION OF COST-EFFECTIVE WASTEWATER TREATMENT SYSTEMS,
Bechtel, Inc., San Francisco, Calif. Environmental Water Projects Dept.
For primary bibliographic entry see Field 5D.
W76-09772

WASTEWATER SLUDGE UTILIZATION AND DISPOSAL COSTS,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
For primary bibliographic entry see Field 5D.
W76-09773

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-09774

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: GRAIN PROCESSING SEGMENT OF THE GRAIN MILLS INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09775

WATER USE POLICIES AND POWER PLANT ECONOMICS,
Houston Univ., Tex.
For primary bibliographic entry see Field 5G.
W76-09776

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: FERTILIZER INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09777

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: APPLE, CITRUS AND POTATO PROCESSING SEGMENTS OF THE CANNED AND PRESERVED FRUITS AND VEGETABLE INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09779

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: INSULATION FIBERGLASS INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5G.
W76-09780

DEVELOPMENT OF A DYNAMIC PROGRAMMING MODEL FOR THE REGIONALIZATION AND STAGING OF WASTEWATER TREATMENT PLANTS,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5D.
W76-09845

6D. Water Demand

SUMMARY OF MUNICIPAL WATERSHED MANAGEMENT SURVEYS IN EASTERN UNITED STATES,
Southeastern Area State and Private Forestry, Atlanta, Ga.
For primary bibliographic entry see Field 4D.
W76-09466

ARIZONA ENERGY: A FRAMEWORK FOR DECISION.
Arizona Univ., Tucson.
Arizona Academy, Phoenix, 28th Arizona Town Hall Research Report, April, 1976. 154 p, 34 tab, 24 fig, 69 ref. $5.00.

Descriptors: *Electric power production, *Arizona, *Energy conversion, *Water management(Applied), *Water utilization, *Water allocation(Policy), Energy, Hydroelectric power, Tidal energy, Thermodynamics, Planning, Thermal pollution, Air pollution, Water quality standards, Nuclear powerplants, Water cooling, Fossil fuels, Coals, Conservation, Geothermal studies, Water reuse, Waste water disposal, Colorado River.
Identifiers: *Biological energy sources, *Solar energy.

Technical and planning-related information on Arizona's energy needs and resources are presented, with some specific attention to the potentials of hydropower and to water use for extraction and conversion of energy minerals and for cooling in thermal power generation. Material is presented on the state's energy economy including discussion of supply sources and consumption patterns, technical explanations of energy conversion and use, potential energy sources and their availability, and decision-making issues and prospects. Although coal is abundant, large quantities of water are needed to process it, as well as for gasification. Hydropower cannot compete in output with the coal-fired Navajo Generating Station at Page, Arizona, because of a lack of enough suitably placed river water. Pumped storage for secondary hydroelectric generation is an economical way of providing required peaking power. Water needs for processing and cooling are outlined; the Navajo station, for instance, uses 13.5 acre-feet of water per year for each megawatt produced. Sources include surface, ground and waste water; groundwater is most versatile and abundant, but overdraft is becoming widespread and supplies are limited. Waste water discharge and reuse potentials are also described. Legal questions concerning Colorado River water use and thermal pollution problems are discussed. (Jahns-Arizona)
W76-09484

POWER GENERATION IN ARIZONA AND ITS ENVIRONMENTAL IMPLICATIONS,
Arizona Univ., Tucson. College of Engineering, Engineering Experiment Station.
S. E. Smith.
EES Series (1976) Report No. 47. 215 p, 46 fig, 41 tab, 101 ref, 4 append.

Descriptors: *Electric power production, *Hydroelectric plants, *Nuclear powerplants, *Arizona, *Thermal powerplants, *Water demand, Industrial water, Powerplants, Electric power costs, Colorado River, Coals, Turbines, Environmental effects, Economic efficiency, Water consumption(Except consumptive use), Fuels, Electric power, Effluents, Radioactive waste, Water pollution.
Identifiers: Gas turbines.

Information is presented on hydroelectric, coal-fired, gas turbine and nuclear power generation with analyses of their respective natural resource demands and impacts in Arizona. Comparisons are made between different types of power plants as to the amount of land and water needed to sustain that generation process. Most power plants require substantial amounts of water to cool condensers; tables are provided showing the water use pattern of different plant designs and input-use balance data for the state. The percentage contribution of hydropower to Western electrical needs has decreased steadily since 1950; as the number of conventional thermal power plants has increased, hydroelectric power has assumed less of a base load and more of a peak load service role. Coal is most abundant, but its extraction causes more serious ecological damage. The advantages and disadvantages of these power generation systems are described with respect to economic and environmental impacts, including water use and pollution. (Jahns-Arizona)
W76-09485

ENERGY MODELING AND FORECASTING.
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 6A.
W76-09602

ENERGY PROJECTIONS--RELATIONSHIP TO POLICY ISSUES,
Brookhaven National Lab. Upton, N.Y. Energy Systems Analysis Group.
For primary bibliographic entry see Field 6A.
W76-09603

COUPLED ENERGY SYSTEM-ECONOMIC MODELS,
Brookhaven National Lab., Upton, N.Y. Energy Systems Analysis Group.
For primary bibliographic entry see Field 6A.
W76-09605

METHDOLOGICAL ISSUES IN THE ECONOMETRIC ESTIMATION OF ENERGY DEMAND ELASTICITIES,
Wharton School of Finance and Commerce, Philadelphia, Pa. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W76-09607

ENERGY SYSTEMS: MODELING AND POLICY PLANNING,
Massachusetts Inst. of Tech. Cambridge. Energy Lab.
For primary bibliographic entry see Field 6A.
W76-09608

THE USE OF ECONOMETRICS TO PROJECT ENERGY DEMANDS,
Data Resources, Inc., Lexington, Mass.
For primary bibliographic entry see Field 6A.
W76-09611

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Exxon Corp., New York. Corporate Planning Dept.
For primary bibliographic entry see Field 6A.
W76-09612

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Pacific Gas and Electric Co., San Francisco, Calif.
For primary bibliographic entry see Field 6A.
W76-09613

PROBLEMS AND SOLUTIONS IN ESTIMATING THE DEMAND FOR AND VALUE OF RURAL OUTDOOR RECREATION,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
R. L. Gum, and W. E. Martin.
American Journal of Agricultural Economics, Vol. 57, No. 6, p 558-566, November 1975. 4 tab, 13 ref.

Descriptors: *Recreation demand, *Estimating, *Rural areas, *Regional analysis, Mathematical models, Resource allocation, Value, Methodology, Evaluating, Arizona, Fishing, Hunting, Costs, Regression analysis, Equations, Systems analysis.

An improved methodology for estimating demand functions for outdoor recreation and evaluating the outdoor recreation resource by use classification is presented. The illustrative framework is a large-scale empirical study of all outdoor recreation activities in all areas of Arizona. The first step of the analysis is to estimate statistical demand relationships for the recreation experience as a whole. Demand relationships were derived for: (a) deer hunting; (b) other big game hunting; (c) small game hunting; (d) waterfowl hunting; (e) predator hunting; (f) cold water fishing; (g) warm water fishing; and (h) general rural outdoor recreation for each of the seven Arizona Department of Fish and Game regions in the state where more than twenty-five area-activity observations were obtained. The use of the improved procedures produces estimates of resource values which are much larger than in most previous studies and which are about the size of estimates of gross variable expenditures. It is argued that the time has come to relax the search for improved estimating methodology and concentrate on interpretation of the estimates in studies of resource allocations. (Bell-Cornell)
W76-09633

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 6G.
W76-09665

INVESTMENT SEQUENCING, ALLOCATION, AND LEARNING IN THE DESIGN OF WATER RESOURCES SYSTEMS: AN EMPIRICAL APPLICATION,
Harvard Univ., Boston, Mass. Graduate School of Business Administration.
For primary bibliographic entry see Field 6A.
W76-09846

6E. Water Law and Institutions

JOINT USA/JAPAN PROJECT ON GLOBAL SYSTEMS ANALYSIS AND SIMULATION (GLOSAS) OF ENERGY, RESOURCES, AND ENVIRONMENTAL (ERE) SYSTEMS,
Japan GLOSAS Project Committee, Tokyo.
For primary bibliographic entry see Field 6A.
W76-09610

AN ECONOMIST'S VIEW OF THE OCEANS,
Yale Univ. New Haven, Conn.
R. N. Cooper.
In: Perspectives on Ocean Policy, Conference on Conflict and Order in Ocean Relations, October 21-24, 1974, Airlie, Virginia, p 143-165. 3 fig, 8 ref, append. (Prepared for NSF by Johns Hopkins University, Washington, D. C.)

Descriptors: *Oceans, *Management, *Economic efficiency, *Fisheries, Benefits, Optimization, Water pollution, Mathematical models, Equations, Systems analysis.
Identifiers: Scarcity rent, Maximum sustainable yield, Shipping, Seabed minerals, National security.

Taken is a global perspective in analyzing how better ocean management can maximize benefits to the world at large. The oceans are no longer a free common resource, but have taken on economic value commanding scarcity rent. Efficient use of the oceans requires limiting access to those willing to pay this rent; suggested are principles for collecting the rent. Ocean fisheries are analyzed in detail. It is found necessary that the rent be prevented from influencing entry and investment in the industry; a charge could be levied on all those engaged in the fishing industry. Such an arrangement would increase efficiency and would generate substantial revenues that could be used for developmental purposes and other interests of the international community. For optimal management of fisheries along these lines,

hstocks need be generally kept larger than is ggested by the principle of maximum sustaina- yield. While methods of maximizing the gains m ocean's resources need not be a source of nflict, the distribution of the gains is a potential urce of disagreement, and they should be used inly to serve global objectives, such as nomic growth of developing countries. velopment of accurate scientific and economic ormation is imperative for an efficient manage- nt system. Appended to this article is a simple thematical model of a fishery and a guide to op- um management. (Bell-Cornell)
76-09617

PA AND A STATE'S ROLE IN WATER SOURCES MANAGEMENT,
w York State Dept. of Environmental Conser- tion, Albany.
P. Curran, and T. W. King, Jr.
ter Resources Bulletin, Vol. 10, No. 1, p 127- 5, February 1974.

scriptors: *Water resources, *Management, nvironment, New York, Legislation, Projects, deral government, Decision making.
ntifiers: *Environmental impact, *National En- onmental Policy Act.

e National Environmental Policy Act of 1969 s been called a revolutionary piece of legisla- n. It has changed, and is still changing, the tradi- nal ways of governmental decision-making. EPA has strongly influenced the field of water sources management. An environmental state- nt can now be seen not as a document to sup- rt or justify a plan, but an objective assessment what environmental costs and benefits are in- lved. New York State has seized upon NEPA as important feature of its environmental quality nagement programs and has used the opportu- y to comment upon draft environmental state- nts under NEPA to increase its influences upon deral decision making. The Department of En- onmental Conservation coordinates and nthesizes all comments and provides one unified ate response on a statement. At the State level, cking a comprehensive 'little NEPA,' an exten- e environmental analysis program has been ilt by utilizing a wide spectrum of Federal and ate Laws and administrative regulations. (Bell- rnell)
76-09627

EPORT TO THE CONGRESS BY THE NA- ONAL COMMISSION ON WATER QUALITY,
ational Commission on Water Quality, Washing- n, D. C.
r primary bibliographic entry see Field 5G.
76-09663

EGAL APPROACHES TO CONTROL RUNOFF ND SEDIMENTATION: A CASE STUDY OF EORGIA,
e Research Group, Inc., Atlanta, Ga.
r primary bibliographic entry see Field 4D.
76-09747

UNICIPAL STORM WATER MANAGEMENT ROGRAMS,
ndley and Sons, Inc., Hinsdale, Ill.
r primary bibliographic entry see Field 4A.
76-09751

F. Nonstructural Alternatives

FLOODPLAIN MANAGEMENT RAMEWORK WITH STRUCTURAL AND ON-STRUCTURAL MEASURES,
assachusetts Univ., Amherst. Water Resources search Center.
L. Kaul, C. E. Willis, and J. H. Foster.
Available from the National Technical Information Service, Springfield Va., 22161, as PB-254 544, $5.50 in paper copy, $2.25 in microfiche. Publication No. 61, Completion Report FY-76-8, October 1975. 114 p, 3 fig, 27 tab, 209 ref, 5 append. OWRT B-043-MASS(5) 14-31-0001-5081.

Descriptors: Management, *Connecticut, *Nonstructural alternatives, Cost analysis, Cos-benefit analysis, Warning systems, *Flood protection, Flood plain insurance, Decision making, *Flood plain zoning.
Identifiers: Farmington(Conn).

A decision framework is developed which describes the results of an investigation of the economic potential of structural as well as nonstructural measures for a floodplain in Farmington, Connecticut. The analysis demonstrates the potential usefulness of operations research methods to flood zone decision makers. A review of the literature is included. Components of the decision framework are developed, regional application is attempted, the distributional equity impacts of the alternative measures are discussed. It is clearly feasible to develop an operations research framework, featuring the floodplain management alternatives considered here, which: treats rent or land values as a function of level of development; is capable of considering interrelationships among uses; is capable of formally reflecting planners' aversion to uncertainty; and which provides for early period decisions which are conditional upon forecast later period situations.
W76-09754

LANDSLIDE HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst., of Behavioral Science.
J. H. Sorensen, N. J. Ericksen, and D. S. Mileti.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 979, $5.00 in paper copy, $2.25 in microfiche. Report No. NSF-RA-E-016, June 1975. 90 p. 9 fig., 11 tab., 48 ref. NSF GI 32942.

Descriptors: *Landslides, *Research priorities, *Hazards, *Costs, Land use, Damages, Social impact, Protection, Warning systems, Land management, Rehabilitation, United States, California, Colorado, Forecasting, Insurance, Probability, Regulation.
Identifiers: Research needs, Case studies, San Jose(Calif), San Francisco(Calif), Los Angeles(Calif).

Research requirements for landslide hazards are proposed relating to both the reciprocal actions to landslides by protection, prediction, land use management, disaster preparedness, relied and rehabilitation, and insurance (by increasing the limits of coverage for the National Flood Insurance Program) together with constraints mitigating against the effectiveness of the reciprocal actions. A description of each research need is presented, then a framework for examining those proposals is suggested. Levels of expenditures believed to be required for the successful outcome of the research are provided. The needs for research are substantiated by discussions of the nature of landslides and their regional distribution. Human adjustment to landslides is defined by classifying adjustments, the nature, responsibility, effectiveness, and cost of such actions and constraints on their adoption, adjustment trends, and interaction and combination of adjustments. The national cost of landslides is defined, citing two case studies in California, and the catastrophe potential, and cost distribution. Exogenous forces affecting landslides are cited as population growth, environmental concerns, and the public energy policy with its impact on landslide potential. (Auen-Wisconsin)
W76-09781

A LINEAR PROGRAMMING MODEL FOR USE IN GUIDING URBAN FLOODPLAIN MANAGEMENT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
J. C. Day, and R. N. Weisz.
Water Resources Research, Vol. 12, No. 3, p 349-359, June 1976. 1 fig, 6 tab, 42 ref, 2 append.

Descriptors: *Flood plains, *Management, *Linear programming, *Flood control, Optimization, Engineering, Economic efficiency, Land use, Constraints, Alternative planning, Operations research, Mathematical models, Equations.
Identifiers: *Urban planning, Land use allocation, Site elevation, Time variables, Maximization model, Regression equations.

Modern planning seeks better solutions to urban flood problems through floodplain management practices involving coordinated land use and engineering approaches. Land use control can be integrated with dams, levees, channel works, etc., but the physical and economic interrelationships must be taken into account. Trade-offs require quantification of the economic impacts of dissimilar alternatives. Herein, a linear programming land use assignment model is combined with discrete sets of public land acquisition and engineering works. Solution of the management system yields an economically desirable mix of measures which can be constrained by noneconomic conditions. Empirical testing of the approach and sensitivity analysis verify that useful planning guidelines for large and small urban areas alike can be produced. The computational technique presented herein is applied to the Tucson situation to determine the optimum combination of flood control works and land development policies; information helpful for floodplain management is yielded. (Bell-Cornell)
W76-09849

6G. Ecologic Impact Of Water Development

POWER GENERATION IN ARIZONA AND ITS ENVIRONMENTAL IMPLICATIONS,
Arizona Univ., Tucson. College of Engineering, Engineering Experiment Station.
For primary bibliographic entry see Field 6D.
W76-09485

THE SAHELIAN DROUGHT AND ITS DEMOGRAPHIC IMPLICATIONS,
Australian National University, Canberra, Department of Demography.
J. C. Caldwell.
American Council on Education, Overseas Liason Committee, Paper No. 8, December, 1975. 88 p, 4 tab, 1 fig, 103 ref.

Descriptors: *Droughts, *Human population, *Africa, *Arid lands, *Environmental effects, Grasslands, Mortality, Crop production, Land use, Livestock, Weather patterns, Weather data, Water resources development, Planning, Migration.
Identifiers: *Sahel, Nomads.

The Sahelian drought region and its demography are analyzed with specific attention to fertility control, effects on population and mortality rates, savannah imbalance, nomadic-sedentary relationships and general reactions of the population to the drought condition. Sahelian population will increase by about 17 million in the next 25 years. Growth rates among nomads could force sedentarization of considerable numbers of these people. Possible weather changes and past trends are described, along with the effect on herds, crop production and pasturage. Large-scale irrigation appears limited in usefulness and too costly. The region had received two seasons of satisfactory rainfall by the end of 1975, and emergency relief

had mostly been replaced by 'medium-term development' and 'long-term assistance' programs aimed at increasing food production and improving the savannah's position as a provider of livestock meat for coastal countries. (Jahns-Arizona)
W76-09486

COMBINED EFFECTS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES TO THE ENVIRONMENT,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-09490

NEPA AND A STATE'S ROLE IN WATER RESOURCES MANAGEMENT,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 6E.
W76-09627

ENVIRONMENTAL QUALITY RESEARCH, FIRST ANNUAL REPORT,
California Univ., Irvine.
For primary bibliographic entry see Field 5C.
W76-09654

PHYSIOLOGIC RESPONSES TO WATER IMMERSION IN MAN: A COMPENDIUM OF RESEARCH,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 10C.
W76-09655

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
Report No. FWS/OBS-76/05, March 1976. 132 p, 3 fig, 34 tab, 209 ref. Editors: Lynch, M. P., Laird, B. L., Theberge, N. B., and Jones, J. C.

Descriptors: *Estuarine environment, *Water demand, *Estuarine fisheries, Recreation demand, Water management(Applied), Commercial fishing, Marine animals, Income analysis, Evaluation, Environmental effects, Regional analysis, Wildlife management.
Identifiers: National Water Resources Assessment.

The impacts of water uses and projected water demands upon the estuarine and nearshore marine environments of the United States have been evaluated as part of the 1975 National Water Resources Assessment. The evaluation included a regional review of major estuarine nearshore marine habitats, major problems impacting water and water resources, the management approach of the states, and Federal management initiatives, particularly Federal-State interactions. Geological history, tidal amplitude, weather, currents, latitude, and estuarine environments are described for each region. Estuarine resource harvest and projections are given for commercial fisheries, sport fishing, waterfowl, other wildlife harvest, bird watching, and recreational boating. Conflict areas include domestic versus foreign fleets, commercial versus sport fishing, subsistence versus commercial harvest activities. Future harvest and recreational projections include demand/supply of fisheries products, and recreation and hunting demands. Impacts of predicted water resource utilization include demand/supply, patterns of water use, seasonal and annual freshwater outflows, and effects of increased comsumptive use. Appendixes include a partial list of estuarine dependent and nearshore marine species, a list of species under each waterfowl harvest category, projected changes in population for water resource regions, projected per capita income for water resource regions, and present status of selected species of interest to U. S. fishermen. (Fish and Wildlife Service)
W76-09665

METHODOLOGIES FOR THE DETERMINATION OF STREAM RESOURCE FLOW REQUIREMENTS: AN ASSESSMENT,
Utah State Univ., Logan. Dept. of Wildlife Science.
C. B. Stalnaker, and J. L. Arnette.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 152, $7.75 in paper copy, $2.25 in microfiche. U.S. Fish and Wildlife Service, Office of Biological Services, Report No. FWS/OBS-76/03, 1976, 199p.

Descriptors: Water quality, Measurement, Environmental effects, Water resources, Flow, Flow control, Flow measurement, Wildlife, Aquatic biology, Fish, Mathematical models, Recreation facilities, Aesthetics, Reviews, Research priorities, Methodology, Model studies, Evaluation.

Techniques for establishing instream flow requirements and assessing the effects of changing stream flows, are summarized and evaluated. The state-of-the-art summation is intended to provide a basis for further work in developing methodologies and defining research needs. Standard nomenclature is presented. Basic stream flow measurements and relationships are described and methodologies for evaluating water quality in streams and estuaries in relation to flow changes are examined. Methods for assessing instream flow needs for fish, other aquatic life, and terrestrial wildlife are discussed. Problems of determining the impact of stream flow changes on recreational activities and aesthetic values are considered. (Fish and Wildlife Service)
W76-09666

THE CONTRIBUTION OF A WATER INFORMATION SYSTEM FOR ENVIRONMENTAL PLANNING IN MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Geography.
B. R. Higgins.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-254 626, $5.00 in paper copy, $2.25 in microfiche. Water Resources Research Center Bulletin 86, University of Minnesota. March 1976. 70 p, 19 fig, 3 tab. OWRT A-031-MINN(2).

Descriptors: *Minnesota, *Planning, *Environment, *Attitudes, Data collections, Information exchange, Social values, Social change, Watershed management, Land use, Water quality, Lakes, Fish.
Identifiers: *Information systems, *Environmental planning, Information dissemination, Housing, *Swan River Watershed(Minn).

A conceptual design of a computerized statewide water information system is devised in order to use existing land and water data together for environmental planning decisions. In order to specifically demonstrate the potential of such a system, a case study area was chosen, the Swan River Watershed in southeastern Itasca County, and the rudiments of a water information system were constructed. Research being conducted by the Center for Urban and Regional Affairs of the University of Minnesota and the State Planning Agency has produced a computerized land management data base for the Arrowhead planning region which includes Itasca County, Minnesota. In this system there are already some variables which are considered water information variables. These include: flood potential for urban residential land use; drainage class of soil landscape unit; wetness problem for urban residential construction; septic tank limitations for urban residential construction; groundwater contamination potential for urban residential construction; land use; and water orientation. By including other water variables which were available, a more complete environmental planning methodology may be constructed and environmental policy modified. The following water variables were computer coded for each forty acre parcel in the Swan River Watershed: watershed boundaries; Minnesota Pollution Control Agency water quality classification; Minnesota Department of Natural Resources; water appropriation permits; Minnesota Pollution Control Agency point source discharge; Lakeshore Study lakeshore physical combinations; lake fish type; lake crowding potential; and lake relative water crowding. To demonstrate, clarify, and elaborate a possible planning approach, the topic of housing was discussed in terms of water and environmental planning.
W76-09753

ASSESSING POTENTIAL OCEAN POLLUTANTS,
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-09889

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1975,
Southern California Coastal Water Research Project, El Segundo, Calif.
For primary bibliographic entry see Field 5B.
W76-09899

LAND USE CHANGES AND RESERVOIR DEVELOPMENT: AN APPLICATION OF LAND USE INFORMATION SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-09905

ENVIRONMENTAL IMPACT STUDY OF OFFSHORE SAND AND GRAVEL MINING,
National Oceanic and Atmospheric Administration, Tiburon, Calif. Marine Minerals Technology Center.
H. D. Hess.
Marine Technology Society Journal, Vol 7, No 1, p 49-52, January-February 1973. 5 fig.

Descriptors: *Mining, *Dredging, *Environmental effects, Model studies, Continental Shelf, New England, Sands, Gravels, Monitoring, Massachusetts, Planning.
Identifiers: *Outer Continental Shelf, *Environmental impact, *Offshore technology, United Kingdom, Massachusetts Bay, New England Offshore Mining Environmental Study(NOMES).

The New England Offshore Mining Environmental Study (NOMES) is a four-year, NOAA-sponsored, cooperative federal/state experiment designed to assess the environmental impact of offshore sand and gravel mining. The project will include monitoring a short duration dredging operation in Massachusetts Bay and determining by field tests and laboratory studies the nature, magnitude, and impact of resultant environmental disturbances. Prediction techniques, developed through complementary laboratory testing and modeling, will enable planners and decision-makers to estimate the general nature of the environmental impact. Through the data generated and environmental guidelines developed, Project NOMES will provide a scientific basis for establishing realistic environmental safeguards over any future offshore mining operations of this type. The experiment obviously will not provide immediate answers to all of the questions concerning the effects of marine sand and gravel mining on the environment in all potentially promising offshore areas. However, it will provide the beginnings of an understanding of the broad cause-

and-effect relationships involved and assist decision making through sounder judgments based on predictive models. (Sinha - OEIS)
W76-09910

ACADEMIC DATA-NEEDS FOR ENVIRONMENTAL ASSESSMENTS OF OFFSHORE TECHNOLOGICAL OPERATIONS,
New York Ocean Science Lab., Montauk.
R. Nuzzi.
Marine Technology Society Journal, Vol 9, No 5, p 25-28, July 1975. 7 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water quality control, Ecosystems, Monitoring, Continental Shelf.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact.

Questions currently being asked cannot be answered concerning environmental impact because technology, as generally thought of in the phrase 'offshore technology,' is years ahead of science. While we have the technical ability to build bridges, or offshore power stations, or drill for oil in 300 feet of water, we do not yet have the ability to predict the consequences of these activities in ecological terms. We must face up to the realization that the conclusions of most environmental impact statements as they are performed today, are based on relatively easily obtainable information, but certainly not on all the information that is required to answer some very pertinent questions. Baseline studies and monitoring of chemical, physical and biological properties should be initiated immediately in areas that are expected to be impacted by offshore technological operations, however, one year baseline studies are not considered adequate for proper characterization of an area. Instruments and techniques need to be developed for more meaningful baseline and monitoring studies. No parameter can be disregarded simply because instrumentation and/or economical techniques for its study are currently unavailable. Laboratory studies investigating the function and interactions of species, populations and communities within the ecosystem must be initiated. (Sinha-OEIS)
W76-09914

USE OF THE PRINCIPLES AND METHODS OF RADIO-ECOLOGY IN SOLVING SOME URGENT PROBLEMS OF MAN'S EFFECT ON THE ENVIRONMENT, (IN RUSSIAN),
R. M. Aleksakhin.
Ekologiya. 4(4), p 51-56, 1973.

Descriptors: *Radioecology, Methodology, Environmental effects, Elements(Chemical), Model studies, Path of pollutants, Ecological distribution.
Identifiers: *Biogeocoenoses.

Principles, methods and achievements of radioecology in the study of man's effect on the environment and the migration of chemical elements in biogeocoenoses are discussed. The increase in the number of atomic power plants and the possibility of release of radioactive substances into the environment are evaluated. Dynamic models for studying the cycle of radionuclides in biogeocoenoses are described.--Copyright 1975, Biological Abstracts, Inc.
W76-09936

7. RESOURCES DATA

7A. Network Design

IMPROVED TECHNIQUES FOR WATER RESOURCE SYSTEMS DESIGN,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 4A.
W76-09624

MAXIMUM INFORMATION OBTAINABLE FROM INADEQUATE DESIGN DATA: FROM MULTIVARIATE TO BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Management.
For primary bibliographic entry see Field 4A.
W76-09625

REGRESSION ANALYSIS AND PARAMETER IDENTIFICATION,
Geological Survey, Reston, Va.
N. C. Matalas.
In: Hydrological Network Design and Information Transfer; Proceedings of international seminar, held at Newcastle upon Tyne, U K, August 19-23, 1974: World Meteorological Organization Operational Hydrology Report No 8 (WMO No 433), p 47-50, 1976. 6 ref.

Descriptors: *Streamflow, *Model studies, *Network design, *Regression analysis, Statistical method, Analytical techniques, Evaluation.

A procedure of streamflow network design is outlined using regression relations and assuming levels of acceptable errors in estimating the values of statistical parameters. Problems arise in the implementation of the procedure. One of these problems relates to the compounding of model and time errors. The term model error refers to the classical standard error of regression, whereas, the term time error refers to the error introduced by regressing estimates of the values of statistical parameters rather than the true values themselves on the values of the physiographical and meteorological variables. Another problem pertains to the relationship between the values of the statistical parameters needed to meet the condition of homoscedasticity in the regression relation. (Woodard-USGS)
W76-09824

SAMPLING NETWORK DESIGN FOR DISPERSION VERIFICATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09961

7B. Data Acquisition

ISLAND BARRIER EFFECTS ON SEA STATE AS REVEALED BY A NUMERICAL WAVE MODEL AND DMSP SATELLITE DATA,
Environmental Prediction Research Facility, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-09559

RESEARCH AND INVESTIGATION OF GEOLOGY, MINERAL, AND WATER RESOURCES OF MARYLAND.
Geological Survey, Baltimore. Maryland
For primary bibliographic entry see Field 4A.
W76-09565

DIFFERENTIATION OF SERPENTINITIC FROM NON-SERPENTINITIC ULTRAMAFIC ROCKS IN ERTS-1 MSS IMAGERY,
Geological Survey, Baltimore, Maryland.
For primary bibliographic entry see Field 4A.
W76-09566

OBSERVATION OF LINEAR FEATURES IN THE MARYLAND PIEDMONT AS SHOWN ON ERTS-1 MSS IMAGERY AND AIRCRAFT SUPPORT PHOTOGRAPHY,
Geological Survey, Baltimore, Maryland.
For primary bibliographic entry see Field 4A.
W76-09567

MARYLAND CHESAPEAKE BAY BEACHES - GENERAL DISTRIBUTION AND CLASSIFICATION,
Geological Survey, Baltimore, Maryland.
For primary bibliographic entry see Field 2L.
W76-09568

THE RELATIONSHIP OF THE NEARSHORE LONGSHORE BAR AND SAND WAVES AT OCEAN CITY, MARYLAND,
Geological Survey Baltimore, Maryland.
For primary bibliographic entry see Field 2L.
W76-09569

LINEAR DISTRIBUTION OF THE HIGH MARSH VEGETATION COMMUNITIES OF THE LOWER EASTERN SHORE AND ITS GEOLOGICAL SIGNIFICANCE,
Geological Survey, Baltimore, Maryland.
For primary bibliographic entry see Field 2L.
W76-09570

VISUAL OBSERVATION OF THE SUSPENDED SEDIMENTS AND NEARSHORE ICE SIGNATURES IN CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W76-09571

ACCURACY OF RESERVOIR INFLOW FORECASTS BASED ON RADAR RAINFALL MEASUREMENTS,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 2B.
W76-09574

METHODS FOR MEASUREMENT OF BIODEGRADABILITY OF CHEMICAL COMPOUNDS,
Akzo Research Lab., Arnhem (Netherlands).
For primary bibliographic entry see Field 5C.
W76-09599

DISSOLVED OXYGEN ANALYZER T-01 ANALYZER. A SIMPLE APPARATUS FOR ELECTROCHEMICAL DETERMINATION OF DISSOLVED OXYGEN IN WATER (TLENOMIERZ T-01 UPROSZCZONY PRZYRZAD ELEKTROCHEMICZNEGO OZNACZANIA TLEUNU ROXPUSZCZOMEGO W ROZTWORACH WODNYCH),
For primary bibliographic entry see Field 5A.
W76-09688

AN UNDERWATER TEMPERATURE-DEPTH DATA COLLECTION DEVICE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W76-09727

PLANKTON ANALYSIS TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 5C.
W76-09782

DETERMINATION, STORAGE, AND PRESERVATION OF LOW MOLECULAR WEIGHT HYDROCARBON GASES IN AQUEOUS SOLUTION,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 2K.
W76-09834

OPERATION AND MAINTENANCE OF A DEEP-WELL WATER-LEVEL MEASUREMENT DEVICE, 'THE IRON HORSE',
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-09835

PROPOSED REVISION TO THE MODIFIED EINSTEIN METHOD OF COMPUTING TOTAL SEDIMENT DISCHARGE,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-09842

TEN YEARS OF EXPERIENCE WITH AUTOMATIC PUMPING-SEDIMENT SAMPLERS,
Geological Survey, Parkville, Md.
T. H. Yorke.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 100/3GI (Proceedings). Printed copy $23.75, Microfiche $15.00. Reprint from Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 7-54 - 7-64, 1975. 11 p, 5 fig, 1 tab, 2 ref.

Descriptors: *Sediment transport, *Sampling, *Methodology, Research and development, Equipment, Pumps, Data collections, Sediment yield, Storm runoff.
Identifiers: *Sediment sampler.

The U.S. Geological Survey has used pumping-sediment samplers to study the sediment transport characteristics of small streams in Maryland for the last 10 years. Four different samplers developed by the Federal Inter-Agency Sedimentation Project were used to sample suspended sediment on five streams with drainage areas ranging from 1.2 to 54.6 square kilometres (0.47 to 21.1 square miles). A PS-62 sampler has been in continuous operation since its installation in 1966. The sampler provided satisfactory coverage for 139 of 220 storms between 1966 and 1975. Installation of a streamlined intake structure, commercial electrical power, and in-line battery chargers increased the reliability of the sampler from 32 percent in 1969 to 84 percent in 1973. It is estimated that the latest version of pumping samplers, the PS-69, would provide reliable service during 90 percent of the storms if the installation were properly designed and maintained. (Woodard-USGS)
W76-09843

THE MODIFIED FERNOW FROST GAGE,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
B. O. Wilen, and W. P. Mac Connell.
Soil Sci. 115(4), p 326-328, 1973.

Descriptors: *Gages, *Frost, *Instrumentation, Measurement, *Soil measurements, Depth.
Identifiers: *Fernow frost gage.

The Fernow Gage developed by Patric and Fridley was reported to give accurate measurements of soil frost penetration, except during periods of fast freezing and thawing when the tops of the gages were exposed to the weather and when soil frost penetration was shallow. These problems were caused by the heat conducted by the copper well-casing used to hold the gage. A modification solved the problem of the heat conduction by the well-casing by breaking the copper well-casing into short segments. The problem of the gage's inability to measure subsurface frost when the surface soil was unfrozen was also solved by inserting beads into the gage. The beads divided the gage into short compartments to prevent the whole column of ice from thawing when the surface soil thawed while the subsoil remained frozen.--Copyright 1974, Biological Abstract, Inc.
W76-09880

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS,
Canada Centre for Remote Sensing, Ottawa (Canada), Data Acquisition Div.
For primary bibliographic entry see Field 5A.
W76-09891

DEVELOPMENT OF A BOAT AND HELICOPTER DEPLOYABLE OIL SLICK SAMPLER,
Marconsult, Inc., Santa Monica, Calif.
For primary bibliographic entry see Field 5A.
W76-09892

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM, FINAL REPORT,
Aerojet Electrosystems Co., Azusa, Calif.
For primary bibliographic entry see Field 5A.
W76-09898

COAST GUARD'S RESPONSE TO SPILLED OIL,
Coast Guard Reserve, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-09915

COMPARATIVE STUDY IN MEASURING FLUID SURFACE TENSION AND FLUID CONTENT WITH THE AID OF ELECTRICAL RESISTANCE ELEMENTS 'IN SITU' AND IN THE LABORATORY, (IN FLEMISH),
For primary bibliographic entry see Field 2G.
W76-09923

STEADY-STATE METHOD OF MEASURING UNSATURATED HYDRAULIC CONDUCTIVITY,
Battelle Pacific Northwest Labs., Richland, Wash.
Water and Land Resource Dept.
For primary bibliographic entry see Field 2G.
W76-09924

7C. Evaluation, Processing and Publication

HYDROLOGIC SYSTEMS ANALYSIS MODEL FOR GENERATING RUNOFF TIME SERIES (HIDROLOGIAI) RENDSZERVIZSGALATI MODELL VIZHOZAMIDOSER ELOALLITASARA (II. RESZ),
BME Institute for Water Resources and Hydraulics, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W76-09557

MONITORING WELLS,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 4B.
W76-09558

A THREE-DIMENSIONAL GALERKIN FINITE ELEMENT SOLUTION OF FLOW THROUGH MULTIAQUIFERS IN SUTTER BASIN, CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2F.
W76-09562

RESEARCH AND INVESTIGATION OF GEOLOGY, MINERAL, AND WATER RESOURCES OF MARYLAND.
Geological Survey, Baltimore. Maryland
For primary bibliographic entry see Field 4A.
W76-09565

EVALUATION OF MEAN SQUARE ERROR INVOLVED IN APPROXIMATING THE AREAL AVERAGE OF A RAINFALL EVENT BY A DISCRETE SUMMATION,
Puerto Rico Univ., Mayaquez. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W76-09572

SENSITIVITY OF LINEAR AND NONLINEAR SURFACE RUNOFF MODELS TO INPUT ERRORS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W76-09578

ON LONG-TERM STABILITY OF ZOOPLANKTON COMPOSITION,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 5C.
W76-09600

ON THE CAPACITY-EXPANSION OF DESALINATION PLANTS AND STORAGE TANKS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 3A.
W76-09618

DESIGN OF WATER RESOURCES PROJECT WITH INADEQUATE DATA IN INDIA - GENERAL AND PARTICULAR CASE STUDIES,
International Hydrological Decade, New Delhi (India). Indian National Committee.
For primary bibliographic entry see Field 4A.
W76-09621

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 4A.
W76-09622

THE DESIGN OF WATER QUALITY MANAGEMENT PROJECTS WITH INADEQUATE DATA,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W76-09623

OPTIMAL ACTIVATED SLUDGE DESIGN UNDER UNCERTAINTY,
Auburn Univ., Alabama. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W76-09628

A COMBINED MODEL FOR OPERATING IRRIGATED AGRICULTURAL SYSTEMS UNDER UNCERTAINTIES,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-09634

HYDROLOGY FOR ENGINEERS, SECOND EDITION,
Stanford Univ., Calif.
For primary bibliographic entry see Field 8B.
W76-09661

USE OF THE COMPUTER PROGRAM 'STORM' FOR ANALYSIS OF THE QUANTITY AND QUALITY OF URBAN STORM WATER RUNOFF,
Hydrologic Engineering Center. Davis, Calif.
For primary bibliographic entry see Field 5B.

/76-09740

HE CONTRIBUTION OF A WATER INFOR-ATION SYSTEM FOR ENVIRONMENTAL LANNING IN MINNESOTA,
innesota Univ., Minneapolis. Dept. of Geogphy.
or primary bibliographic entry see Field 6G.
/76-09753

RAVITY GEOPHYSICS FOR GROUND-VATER EXPLORATION IN GLACIATED REAS,
ichigan State University, East Lansing. Dept. of eology.
or primary bibliographic entry see Field 4B.
/76-09758

OMPUTER ESTIMATES OF NATURAL ECHARGE FROM SOIL MOISTURE DATA - IGH PLAINS OF COLORADO,
olorado State Univ., Fort Collins. Dept. of Civil ngineering.
or primary bibliographic entry see Field 2F.
/76-09761

ECONNAISSANCE MAP SHOWING RELA-IVE AMOUNTS OF SOIL AND BEDROCK IN HE MOUNTAINOUS PART OF THE MOR-ISON-EVERGREEN QUADRANGLES AND DJOINING AREAS TO THE WEST IN JEF-ERSON COUNTY, COLORADO,
eological Survey, Reston, Va.
. W. Schmidt.
Miscellaneous Field Studies Map MF-740, 1976. 1 heet, 5 ref.

Descriptors: *Maps, *Soil structure, *Bedrock, eptic tanks, *Water pollution sources, Soil ag-regates, Soil compaction, Soil density, Mapping, erial photography, Geological surveys.
dentifiers: Morrison-Evergreen quadran-les(Colo).

his map shows the relative amounts of soil and ard bedrock within the upper 6 feet (1.8 m) of the and surface. It provides information useful for road-scale land-use decisions. The map is based n reconnaissance field studies and aerial-photo-raph interpretation. Although the unconsolidated naterials in this area are easily excavated for sep-ic systems with leach fields, the seasonal rise of he water table and local inundation of the surface nake this area one of high potential constraint. Only after careful site evaluation, especially dur-ng infiltration of the spring snowmelt, can this rea be considered safe for septic systems with each fields. Along major valleys, septic systems vith leach fields may drain through highly permea-le alluvial gravels and contaminate nearby treams. Septic systems with leach fields should e restricted to those few areas where acceptable mounts of unconsolidated material can be located n suitable slopes or where pervious fill can be dded. (Woodard-USGS)
W76-09825

HYDROLOGIC UNIT MAP--1974, STATE OF ALASKA,
Geological Survey, Reston, Va.
Hydrologic Unit Map, 1976. 1 sheet.

Descriptors: *Maps, Hydrology, *Alaska, *Water resources, Data collections, Planning, *Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Alaska), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Alaska that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-09826

HYDROLOGIC UNIT MAP--1974, STATE OF OREGON,
Geological Survey, Reston, Va.
Hydrologic Unit Map, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Oregon, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Oreg), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Oregon that are basically hydrographic in nature. The Cataloging Unit shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-09827

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
H. D. Buckner.
Open-file report, May 1976. 13 p, 1 fig.

Descriptors: *Hydrologic data, Surface waters, *Streamflow, *Reservoirs, *River basins, *Texas, Rainfall, Runoff, Water yield, Water storage, Lakes.
Identifiers: *Mountain Creek(Tex), Trinity River basin(Tex).

Surface-water runoff and storage data collected during the 1974 water year in the Mountain Creek basin, Texas, are presented. Basin outflow for the water year was 80,480 acre-ft which is 7,310 acre-ft above the 14-year (1960-74) average of 73,170 acre-ft. Storage in Mountain Creek Lake showed a net loss of 1,030 acre-ft during the water year. Rainfall over the area was about 35 inches, which is about 1 inch above the long-term mean (1960-74). (Woodard-USGS)
W76-09829

REPORT OF WATER LEVELS IN SELECTED OBSERVATION WELLS IN UTAH--APRIL 1976,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-09832

PROPOSED REVISION TO THE MODIFIED EINSTEIN METHOD OF COMPUTING TOTAL SEDIMENT DISCHARGE,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-09842

EFFECT OF SEQUENCE LENGTH N ON THE CHOICE OF ASSUMED DISTRIBUTION OF FLOODS,
IBM Thomas J Watson Research Center, Yorktown Heights, N. Y.
For primary bibliographic entry see Field 4A.
W76-09851

LAND USE CHANGES AND RESERVOIR DEVELOPMENT: AN APPLICATION OF LAND USE INFORMATION SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-09905

OPERATIONAL MODEL FOR PREDICTING THE MOVEMENT OF OIL IN CANADIAN NAVIGABLE WATERS,
Canada Centre for inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-09908

RIVER DELTA COMPUTER SIMULATION MODEL (SIMUDELT),
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-09954

8. ENGINEERING WORKS

8A. Structures

SIOUX FALLS RESTORES FOUR WELLS WITH COLLECTOR PIPE,
Sioux Falls Water Dept. S. Dak.
For primary bibliographic entry see Field 3B.
W76-09510

RELATIONSHIP OF RATIONAL AND UNIT GRAPH METHODS IN RETENTION BASIN DESIGN,
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4C.
W76-09732

CONCEPT ANALYSIS: OFFSHORE BREAK-WATER-OIL STORAGE SYSTEM,
Raymond Technical Facilities Inc., New York.
J. Peraino, and T. Plodowski.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A010 348, $4.50 in paper copy, $2.25 in microfiche. Department of the Army Coastal Engineering Research Center Miscellaneous Paper No. 4-75, April 1975. 66 p, 23 fig, 4 tab, 7 ref, append. DACW72-73-C-005.

Descriptors: *Offshore platforms, *Breakwaters, *Oil industry, *Resources development, Continental Shelf, Environmental effects, Water resources, Storage, Deepwater, Harbors, Construction, Design.
Identifiers: *Deepwater ports, *Superports, *Petroleum, *Ports, U. S. East Coast, Breakwater-storage.

A satisfactory method of providing a prompt and efficient answer to the fast-growing need for deep-draft berthing facilities along the U. S. east coast is studied. The general concept of large hollow precast floating units towed to the site, and sunk into position lends itself particularly to using the hollow interiors as storage space for liquid bulk cargo in large quantities. Since the trend for more economical transportation of petroleum products is by use of large deep-draft carriers, the combination breakwater-oil storage system is a possible

solution. Assumptions were made as to probable site conditions, i.e., water depths, sea conditions, bottom conditions, and a preliminary design developed for the units. Various construction procedures were studied and compared from both technical and construction cost aspects. Once all technical advantages and disadvantages had been considered, the most suitable design was completed, a construction procedure laid out, and a basic budget estimate prepared. With this basic estimate, it was possible, with a series of factors, to adjust this basic cost to other water depths and other locations. Design principles, construction procedures and cost estimates are detailed in the report, including basic assumptions, sample design calculations, and estimate breakdown. (Sinha - OEIS)
W76-09904

8B. Hydraulics

SIOUX FALLS RESTORES FOUR WELLS WITH COLLECTOR PIPE,
Sioux Falls Water Dept. S. Dak.
For primary bibliographic entry see Field 3B.
W76-09510

ENERGY DISSIPATION ON A ROUGH SLOPE,
Massachusetts Inst. of Tech., Cambridge Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
O. S. Madsen, and S. M. White.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW1, Proceedings Paper 11904, p 31-48, February 1976. 7 fig, 2 tab, 9 ref, 2 append.

Descriptors: *Coastal engineering, *Coastal structures, *Ocean waves, Unsteady flow, Energy dissipation, Slopes, Mathematical studies, Breakwaters, Waves(Water), Reflectance.
Identifiers: *Energy dissipators, Wave dispersion, Wave runup.

Assuming long normally incident waves, described by linear theory, the energy dissipation on a rough slope was accounted for by introducing a term expressing the bottom shear stress. The theoretical development leads to a determination of the reflection coefficient as a function of the horizontal extent of the slope relative to the wave length in front of the slope and an equivalent slope friction factor. A method for the accurate determination of the reflection coefficient from experimental data was developed and used to establish an empirical relationship for the frictional characteristics of a rough slope. The resulting semi-empirical procedure for estimating the reflection coefficient of rough slopes was shown to yield fairly accurate results. The results showed that bottom friction may account for the dissipation of 80% of the incident wave energy on a slope as large as 1:3 where the incident waves show no sign of breaking. (Morris - ISWS)
W76-09582

TRANSVERSE FORCES ON VERTICAL CYLINDERS IN WAVES,
Cambridge Univ. (England). Dept. of Engineering.
M. de St. Q. Isaacson, and D. J. Maull.
Journal of the Waterways, Harbors, and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW1, Proceedings Paper 11934, p 49-60, February 1976. 10 fig, 18 ref, 2 append.

Descriptors: *Coastal engineering, *Coastal structures, *Underwater, *Piles(Foundations), *Ocean waves, Hydraulic models, *Waves(Water), Model studies, Laboratory tests, Vortices.
Identifiers: Lift, Pile structures, Transverse waves.

The results of a laboratory investigation into the development of forces on a vertical circular cylinder in regular waves were presented. The force transverse to the direction of waves propagation was examined in detail and its relation to the shedding of vortices was considered. It found that the Keulegan-Carpenter number is important in determining whether lift forces will be developed and at what frequency compared with the wave frequency. The unsteady pressure distribution round the cylinder at various depths has been measured and the sectional forces derived from these distributions. The flow in waves has been compared with that round a circular cylinder oscillating in still water. (Morris - ISWS)
W76-09583

LONGITUDINAL DISPERSION COEFFICIENTS FOR STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-09589

INFLUENCE OF HYDRAULIC TROUGH AND LATERAL JOINTS ON THE GROUNDWATER POTENTIAL OF THE MASSIVE TRAP UNIT AT TANORIA IN SHAJAPUR DISTRICT (MP),
Central Ground water Board, Nagpur (India).
For primary bibliographic entry see Field 4B.
W76-09614

DESIGN OF WATER RESOURCES PROJECT WITH INADEQUATE DATA IN INDIA - GENERAL AND PARTICULAR CASE STUDIES,
International Hydrological Decade, New Delhi (India). Indian National Committee.
For primary bibliographic entry see Field 4A.
W76-09621

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 4A.
W76-09622

MAXIMUM INFORMATION OBTAINABLE FROM INADEQUATE DESIGN DATA: FROM MULTIVARIATE TO BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Management.
For primary bibliographic entry see Field 4A.
W76-09625

EVALUATION OF FLOOD CONTROL UNDER CHANGING CONDITIONS,
Tokyo Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-09630

HYDROLOGY FOR ENGINEERS, SECOND EDITION,
Stanford Univ., Calif.
R. K. Linsley, M. A. Kohler, and J. L. H. Paulhus.
McGraw-Hill, New York, N. Y. 1975. 482 p.

Descriptors: *Hydrologic data, *Engineering, *Hydrologic aspects, Climatic data, Precipitation(Atmospheric), Streamflow, Evaporation, Transpiration, Subsurface waters, Groundwater, Hydrographs, Runoff, Probability, Synthetic hydrology, Stochastic processes, Mathematical studies, Sedimentation, Channel morphology, Flooding, Floodwater, Watersheds(Basins).
Identifiers: *Engineering hydrology.

Hydrology describes the occurrence, circulation, distribution, and chemical and physical properties of the earth's waters. Engineering hydrology includes those segments of the field pertinent to design and operation of engineering projects, mainly hydraulic structures, for the control and use of water. Data collection and methods of analysis are broad catagories encompassing the design phase of hydrological engineering. Other factors which affect hydrologic conditions are weather, precipitation, streamflow, evaporation, transpiration, and subsurface water. Probability and stochastic hydrology are important considerations in the design of hydrologic structures. Sedimentation and river basin morphology are topics which lend themselves to an understanding and development of watershed analysis and planning. Each of these subjects are treated individually and in combination to provide a broad base for the study of engineering hydrology. (Heiss-NWWA)
W76-09661

THE WIND DRIFT AND WAVE BREAKING,
Naval Research Lab., Washington, D.C. Ocean Sciences Div.
For primary bibliographic entry see Field 2L.
W76-09724

THE INFLUENCE OF URBANIZATION ON STREAM CHANNEL BEHAVIOR,
State Univ. of New York at Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W76-09744

WAVE BREAKING IN THE PRESENCE OF WIND DRIFT AND SWELL,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 2L.
W76-09874

ENGINEERING AND ECOLOGICAL EVALUATION OF ARTIFICIAL-ISLAND DESIGN, RINCON ISLAND, PUNTA GORDA, CALIFORNIA,
Blume (John A.) and Associates Research Div., San Francisco, Calif.
For primary bibliographic entry see Field 2L.
W76-09903

A POST CONSTRUCTION SURVEY OF SEVERAL MANMADE ISLANDS OFF THE COAST OF CALIFORNIA,
Dames and Moore, Los Angeles, Calif.
For primary bibliographic entry see Field 2L.
W76-09911

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME I.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 2A.
W76-09941

HYBRID-ELEMENT METHOD FOR WATER WAVES,
Massachusetts Inst. of Tech., Cambridge, Dept. of Civil Engineering.
C. C. Mei, and H. S. Chen.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 63-81, 1975. 4 fig, 10 ref.

Descriptors: *Model studies, *Waves(Water), *Numerical analysis, Mathematical models, Computer models, Shallow water, Coasts, Harbors, Equations, Coastal engineering, Fluid mechanics, Hydraulics.
Identifiers: *Hybrid-element method.

A hybrid-element method for calculating water waves in an infinite fluid region was summarized. By introducing artificial boundaries the fluid region was divided into the finite-element region

vhich is the neighborhood of solid bodies and the uper-elements which are the neighborhoods of in-inity or of singular points. In the finite-element re-ion polynomial interpolating functions were used o represent the unknown function approximately. n the super-elements infinite series solutions were sed which satisfy exactly the governing equation nd the boundary condition at infinity or at the sin-ular point. Matching of the two regions at the ommon boundary was made easy by a special ariational principle. Numerical computations nly involved integrations in a finite domain and he inversion of a banded symmetric matrix. Ex-mples for shallow water waves in a harbor were iven. (See also W76-09941) (Sims - ISWS)
V76-09945

LARGE WAVE CHANNEL FOR 'FULL SCALE-MODELING' OF WAVE DYNAMICS IN SURF ZONES,
Technische Hochschule, Hanover (West Ger-many). Franzius-Institut fuer Grund und Wasser-au.
. Grune, and A. Fuhrboter.
n: Symposium On Modeling Techniques, Volume ; 2nd Annual Symposium of the Waterways, Har-ors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 975. American Society of Civil Engineers, New ork, p 82-100, 1975. 11 fig, 13 ref.

Descriptors: *Model studies, *Hydraulic models, Facilities, *Waves(Water), Surf, Beaches, Equipment, Research equipment, Research facili-ies, Fluid mechanics, Flumes, Channels, Hydrau-ics.

Simulation of wave dynamics in models is an ap-roved method for solving coastal engineering roblems. However, recent investigations have hown that the strong interactions in surf zones an neither be reproduced in small scale models ior described by theoretical derivations. Scale ef-ects due to air entrainment and to the scaling of each materials (sand) and certain structure naterials necessitate a 'modeling in full scale'. For his purpose, a full-scale wave channel is under reparation by SONDERFORSCHUNGBEREICH 79' at the niversity Hannover; the main dimensions of the hannel are: full depth 7.2 m, maximum water epth 5.0 m, width 5.0 m, length 320 m. Regular aves or wave spectra with wave heights up to 2.0 n will be generated. A description of this large ave channel was presented and an example of he need for modeling surf dynamics in full scale as given. (See also W76-09941) (Sims - ISWS)
V76-09946

WAVE MOTIONS IN AN OFFSHORE HARBOR,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
O. S. Madsen, and Y. K. Vyas.
n: Symposium on Modeling Techniques, Volume ; 2nd Annual Symposium of the Waterways, Har-ors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 975. American Society of Civil Engineers, New ork, p 101-119, 1975. 12 fig, 1 tab, 9 ref.

Descriptors: *Model studies, *Waves(Water), Nuclear powerplants, *Harbors, Hydraulic models, Breakwaters, Laboratory tests, Hydrau-ics.
Identifiers: *Offshore powerplants, Offshore har-ors.

Results of an experimental investigation of wave nduced oscillations in a model of an offshore uclear power plant were presented. The purpose f the investigation was to compare experimental nd theoretical results. The model was designed to eproduce as closely as possible the harbor model ssumed in the theoretical study. A thorough calibration of the test facility was presented, including an estimate of the expected accuracy of the results. Experimental results showed a fair agreement with theoretical predictions for tests performed with an empty breakwater enclosure, whereas a definitely poor agreement was obtained for the case of bottom seated power plants in place within the breakwater enclosure. The poor agreement was attributed to real fluid effects not accounted for in the theoretical model. The conclusion of the study was that the accuracy of model tests of this type primarily is governed by the degree to which the wave absorbers lining the basin are perfect. It is also found that the requirement of locating the model within the region of uniform incident waves in some cases may be relaxed. This may enable testing of large models in test basins of reasonable size. (See also W76-09941) (Sims - ISWS)
W76-09947

MODELING OF WIND-WAVES WITH JONSWAP SPECTRA,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
S. K. Chakrabarti, and R. H. Snider.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 120-139, 1975. 12 fig, 9 ref, 1 append.

Descriptors: *Model studies, *Waves(Water), *Ocean waves, *Atlantic Ocean, Oceans, Winds, Storms, On-site investigations, On-site data collections, Mathematical models, Hydraulics.
Identifiers: *North Sea, *Wave spectra, Overshoot parameter, Spectral energy, JONSWAP wave spectra.

The Joint North Sea Wave Project (JONSWAP) spectra represent the best least square fit to the observed spectra during ideal generation conditions in the North Sea. It is more sharply peaked than the Pierson-Moskowitz spectrum for the fully-developed sea. The mean overshoot parameter for the North Sea Project was found to be 3.3. Wave energy spectra recorded during past and recent North Atlantic storms were compared here with the spectral model empirically derived during the Joint North Sea Wave Project. For these North Atlantic storms, the overshoot parameter was found to vary between 1 and 4.4. The overall comparison of the recorded unimodal energy spectra with the JONSWAP model was found to be generally good. Also, the measured significant wave heights correlated well with the significant JONSWAP heights. (See also W76-09941) (Sims - ISWS)
W76-09948

USE OF MATHEMATICAL MODELS IN THE PALO ALTO MARSHLAND REHABILITATION PROJECT,
Water Resources Engineers, Walnut Creek, Calif.
D. L. Tucker, D. F. Kibler, J. R. Monser, L. C. White, and B. L. Pawloski.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 140-158, 1975. 12 fig, 1 tab, 4 ref.

Descriptors: *Model studies, *Marshes, *Rehabilitation, *California, Mathematical models, Wetlands, Coasts, Tidal waters, Tidal marshes, Hydraulic properties, Flood control, Harbors.
Identifiers: *Palo Alto(Calif), Flood basins.

This paper described the recent use of mathematical models in the Palo Alto marshland restoration and Yacht Harbor study conducted by Water Resources Engineers for the City of Palo Alto. The 600 acre marshland area to be restored presently serves as a flood basin created 25 years ago by perimeter levees and a tidal headworks which closed the basin to tidal inflows from San Francisco Bay. The basin area has been designated recently by the City as a wetland preserve in which it is desired to establish a balanced marsh habitat having both fresh and salt water communities. At the same time, the restored marshland must retain its present function as a flood storage basin for protection of the City during periods of excessive urban runoff and high tides. The primary objective of the study thus was to devise and simulate hydraulic measures for introducing an artificial tidal circulation in the Flood Basin which also would meet the essential flood storage requirements. A second objective was to simulate the increase in hydraulic circulation and reduction in channel shoaling in the adjoining Yacht Harbor resulting from controlled Flood Basin releases. Details of the model structure for both the Flood Basin and Yacht Harbor, together with their respective roles in guiding engineering judgment, were provided. Sedimentation and other environmental factors were also discussed. (See also W76-09941) (Sims - ISWS)
W76-09949

SOME HARD LESSONS IN NUMERICAL HYDRAULICS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
R. H. Multer.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 208-219, 1975. 7 ref, append.

Descriptors: *Model studies, *Hydraulic models, *Mathematical models, *Numerical analysis, Hydraulics, Mathematics, Mathematical studies, Computer models, Equations.
Identifiers: *Boundary conditions.

Methods which may be used to solve problems in numerical hydraulics were surveyed. Available techniques have been used satisfactorily in a number of numerical studies. There are, however, basic pitfalls which may trap the unwary modeler and cause him to produce highly erroneous results. The most significant of these would seem to be the improper specification of boundary conditions and/or careless interpretation of numerical results relative to the boundary condition specified. The problem of boundary conditions is not a special characteristic of numerical models; it also occurs in physical model studies. Boundary conditions may be particularly troublesome in investigations in which modifications of the hydraulic system are to be studied. Numerical modeling results should be carefully examined to determine if system modifications are influencing boundary conditions. If this is the case, it may be essential to use alternate boundary conditions. (See also W76-09941) (Sims - ISWS)
W76-09952

SIMULATION OF TIDAL HYDRODYNAMICS - MASONBORO INLET,
Water Resources Engineers, Inc., Austin, Tex.
F. D. Masch, and R. J. Brandes.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 220-239, 1975. 8 fig, 11 ref. CERC DACW72-72-C-0028.

Descriptors: *Model studies, *Inlets(Waterways), *Mathematical models, *North Carolina, Channels, Jetties, Estuaries, Coasts, Velocity, Tides, Tidal waters, Flow, Hydraulics, Hydrodynamics.
Identifiers: *Masonboro Inlet(NC).

A two-dimensional finite difference tidal hydrodynamics model has been adapted to Masonboro Inlet, North Carolina. The model was calibrated for prototype conditions of September and October, 1969. Operational runs simulated tides and currents corresponding to pre-project undeveloped inlet conditions of November 1964, and modified inlet and north jetty conditions of June 1967. For each case, the model was operated with mean and spring tides. The model applied uses an explicit numerical solution of the two-dimensional equations of motion and continuity. It accounts for the effects of variable bathymetry, bottom roughness, tidal inundation, wind setup, weir flow over a section of the jetty and other system features. Because of the size and detail required in the simulations, a dual-model approach was employed. In this procedure, a coarse grid model was used to compute tidal flows which were then applied as boundary conditions to a fine grid sub-model of the immediate inlet area. Verification of the dual-grid model was accomplished through comparisons of measured and simulated tides at six gage locations and measured and simulated tidally generated velocities at fifteen stations throughout the inlet area. Further verification was obtained through comparisons of tidal prisms in selected areas common to the coarse and fine grid models. Results of operating the models under different ocean tides and with pre- and post-project bathymetry included water surface elevation and tidal velocity simulations at each of the stations used in the model verification. (See also W76-09941) (Sims - ISWS)
W76-09953

ANISOTROPIC SAND TRANSPORT IN TIDAL INLETS,
Foundation for Ocean Research, San Diego, Calif.
For primary bibliographic entry see Field 2L.
W76-09955

MODELING SEDIMENT MOVEMENT FOR MASONBORO INLET,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2L.
W76-09956

MASONBORO INLET FIXED-BED MODEL EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. C. Seabergh, and C. Mason.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 294-314, 1975. 10 fig, 4 tab, 3 ref.

Descriptors: *Hydraulic models, *Evaluation, *Inlets(Waterways), Velocity, Flow, Tides, Waves(Water), Ocean waves, Model studies, Coasts, Beaches, Estuaries, Jetties, Hydraulics.
Identifiers: *Masonboro Inlet(NC).

An evaluation of state-of-the-art tidal inlet hydraulic model procedures was performed to determine the usefulness and reliability of a physical model to accurately predict the hydraulic characteristics of an inlet-bay system. Masonboro Inlet, a single-jettied inlet on the North Carolina coast, was selected as the prototype. The Masonboro Inlet tidal model was constructed to scales of 1:300 horizontally and 1:60 vertically. Model calibration tests assured that the model tidal heights and velocities were in agreement with those of the prototype 1969 conditions. To evaluate the model's predictive capability under different conditions, an additional set of hydraulic data was collected in July 1974, after the inlet thalweg had migrated further northward against the jetty. Tidal heights, velocities, and surface flow patterns using dye streaks were obtained in the prototype. The model was remolded to the 1974 bathymetry, and data were collected at identical locations as in the prototype. Using the same roughness distribution as the verified 1969 condition, velocity and tides were shifted one-half hour due to too much roughness at the entrance because of the narrower but deeper cross section. Model bay tide ranges were 11% less than the prototype and velocities averaged 0.6 ft/sec different than prototype, although the average difference in maximum velocities was only 0.3 ft/sec. Model dye streak patterns showed good agreement with the prototype when wind waves were reproduced, better than a nonwave condition. Also wave reproduction improved model-prototype velocity comparisons at the inlet entrance. (See also W76-09941) (Sims-ISWS)
W76-09957

PRINCIPLE OF MANAGEMENT OF DEGENERATED INLETS AND ESTUARIES,
Laval Univ., Quebec. Dept. of Civil Engineering.
M. Frenette, Y. Ouellet, A. Poire, and J-L. Verrette.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 315-334, 1975. 12 fig, 1 tab, 13 ref.

Descriptors: *Management, *Inlets(Waterways), *Model studies, Hydraulic models, Estuaries, Coasts, Channels, Erosion, Sedimentation, Salinity, Saline water intrusion, Tides, Waves(Water), Rivers, Discharge(Water), Hydraulics.

Efficient and proper utilization of inlets and estuaries requires a good knowledge of the evolution of the physical, hydraulic, sedimentological and biological components. Very often, a management can serve a cause to the detriment of another one. Research on scale model has been undertaken in order to define some principles of solutions for the management of degenerated inlets and estuaries so that a channel could be created without bringing too much change to the other aspects of the inlets or estuaries. The model itself represented a river interconnected with a maritime basin by means of an estuary. Fluvial hydrograms, sediment histograms, bed morphology, tides, salt-water and freshwater, and coastal currents and waves, as well as different techniques of management, were simulated in the model. (See also W76-09941) (Sims-ISWS)
W76-09958

PARTICLE-LADEN JETS WITH APPLICATION TO OCEAN DUMPING,
Delaware Univ., Newark. Dept. of Civil Engineering and Marine Studies.
For primary bibliographic entry see Field 5B.
W76-09959

PHYSICAL MODEL OF DISCHARGE IN A TWO-LAYER STRATIFIED AMBIENT,
Duke Power Co., Charlotte, N. C.
B. L. Sill, and B. L. Edge.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 388-406, 1975. 13 fig, 1 tab, 12 ref.

Descriptors: *Model studies, *Stratification, *Jets, *Reservoirs, Hydraulic models, Density stratification, Pumped storage, Mixing, Buoyancy, Thermal stratification, Conductivity, Measurement, Instrumentation, Dye releases, Diffusion, Dispersion.

A physical model was used to study the degree of mixing produced by neutrally buoyant discharges into stratified ambients. The discharge was located at the interface between the hypolimnion and the epilimnion to produce as much mixing from these two layers as possible. The physical model used a salt solution to create the original stratification. The most important results were: (1) large volumes and surface areas (over 1000 gallons and 150 sq ft) can be stratified quickly and uniformly with the floating diffuser technique developed; (2) except in the zone of flow development, visual and conductivity measurements show that the discharge moves as an interlayer between the epilimnion and hypolimnion and does not effectively mix fluid from above and below; (3) a simple analytical model developed to describe plume movement into a stagnant thermocline agrees well with experimental values; and (4) for condition test, discharge into the epilimnion did not adversely affect the stratification in the far field. (See also W76-09941) (Sims - ISWS)
W76-09963

NUMERICAL TWO-DIMENSIONAL FLOW MODEL FOR RIVER SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
For primary bibliographic entry see Field 2E.
W76-09964

TWO-DIMENSIONAL MODEL OF FLOW TOWARD INTAKES,
Nuclear Regulatory Commission, Washington, D.C. Hydrologic Engineering Section.
For primary bibliographic entry see Field 2E.
W76-09965

MATHEMATICAL MODELING OF ALLUVIAL CHANNELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Y. H. Chen, and D. B. Simons.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 466-483, 1975. 8 fig, 2 tab.

Descriptors: *Model studies, *Alluvial channels, *Mississippi River, Mathematical models, Erosion, Sedimentation, Sediments, Geomorphology, Channel morphology, Rivers, River beds, Sand waves, Flow, Unsteady flow, Streamflow.

For study of the important aspects of the unsteady flow phenomena in alluvial channels, a mathematical model was utilized to represent the original hydraulic system. The model was developed by formulating the unsteady flow of sediment-laden water with the one-dimensional partial differential equations representing the conservation of mass for sediment, and the conservation of mass and momentum for sediment-laden water. The effects of lateral water and sediment inflow, the sediment motion, the fluid friction, and the irregular channel geometry were considered. The set of equations were solved by a linear-implicit method using a digital computer. The mathematical model developed was valuable for studying various types of unsteady flow problems in open channels such as the flood routing of water and sediment in channels, degradation and aggradation near hydraulic structures, and channel response to development. To test the mathematical model two practical applications were analyzed. First, a mathematical model was used to simulate the propagation of sand waves in a laboratory flume. Second, a mathematical model was utilized to study the geomorphic changes in the Upper Mississippi River and the adjacent land. The simulated flows generated by the mathematical model compared well with field measured data. (See also W76-09941) (Sims - ISWS)
W76-09968

NDISTORTED MOVABLE-BED MODEL TUDY FOR A RIVER AND POWER PLANT IN-AKE SYSTEM,
attelle Memorial Inst., Richland, Wash.
. Onishi, M. J. Hroncich, and W. W. Sayre.
n: Symposium On Modeling Techniques, Volume 2nd Annual Symposium of the Waterways, Har-ors and Coastal Engineering Division of ASCE (2 ol.), San Francisco, California, September 3-5, 975. American Society of Civil Engineers, New ork, p 521-539, 1975. 10 fig, 5 tab, 6 ref, 2 ap-end.

escriptors: *Model studies, *Intakes, *Rivers, Powerplants, *Missouri River, Nuclear power-lants, Hydraulic models, Sediments, Suspended olids, Structures, Intakes structures, Hydraulic tructures, Hydraulics.

ndistorted movable-bed model similarity criteria or quasi-steady flows around and inside hydraulic tructures located along curved alluvial streams ere developed. These similarity conditions were pplied to a model study of flow conditions and ediment movement of the Missouri River in the icinity of and within an intake structure of the ooper Nuclear Station, near Brownville, ebraska. The test results confirmed their applica-ility. The model study revealed that a combina-on of trailing wall and skimming weir placed arallel to the face of the intake structure was the ost effective sediment-reducing scheme that also atisfies the Corps of Engineers channel-en-roachment constraint. This scheme was installed n the Missouri River in August 1974, and has esulted in significant reduction in size and quanti-y of sediment entering the circulating/service ater systems. (See also W76-09941) (Sims - SWS)
V76-09971

HYSICAL MODELING TECHNIQUES USED N RIVER MODELS,
rmy Engineer Waterways Experiment Station, icksburg, Miss. River Regulation Branch.
or primary bibliographic entry see Field 2E.
V76-09972

RIVERBANK RECESSIONS FOR POWER LANT FACILITIES,
olorado State Univ., Fort Collins. Dept. of Civil ngineering.
. A. Stevens, Y. H. Chen, and D. B. Simons.
n: Symposium On Modeling Techniques, Volume ; 2nd Annual Symposium of the Waterways, Har-ors and Coastal Engineering Division of ASCE (2 ol.), San Francisco, California, September 3-5, 975. American Society of Civil Engineers, New ork, p 560-574, 1975. 9 fig, 1 tab, 1 ref.

escriptors: *Model studies, *Intakes, *Rivers, ntakes structures, Powerplants, Sediments, Sedi-entation, Flow, Vortices, Hydraulic models, ydraulics, Banks.
dentifiers: *Riverbank recessions.

ocking facilities and cooling water intake struc-ures along large rivers are sometimes expensive nd difficult to construct because of bankline in-tabilities and large velocities in the river. These ifficulties can be overcome by excavating a ecession in the river bankline for the facilities. ithin the recession, the flow field is charac-erized by one or more large vortices with vertical xis. The vortices pump sediment and floating ebris from the main channel into the recession nd cause increased turbulence levels along the ankline immediately downstream of the reces-ion. Because of the vortex motion, it is expedient o locate the cooling water discharge structure out-ide and downstream of the recession. To obtain nformation to assist in the design of a bank reces-ion, a 1/50-scale rigid-bed hydraulic model of a 1-nile reach of the Lower MIssissippi River channel vas tested. Velocity fields were measured in the nodel channel and recession and the movements of lightweight sediment and surface debris were mapped. These data and Toffaleti's sediment transport equations were used to estimate sedimentation rates in the recession. The shape and orientation of the recession was varied to achieve a good compromise solution for design. (See also W76-09941) (Sims - ISWS)
W76-09973

MODELING SEDIMENT TRANSPORT IN HYDRAULIC STRUCTURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-09975

SYSTEMS MODELING OF STRATIFIED FLUIDS,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
M. B. Abbott, J. Aa. Bertelsen, A. Kej, and I. R. Warren.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 605-624, 1975. 4 fig, 5 ref.

Descriptors: *Mathematical models, *Stratified flow, *Hydraulics, Sediment transport, Hydrodynamics, Water quality, Stratification, Salinity, Density, Flow, Velocity, Interfaces, Estuaries, Mathematics, Model studies, Computer models.
Identifiers: *Stratified fluids, Modeling techniques.

The 'design system' or 'computational system' builds and runs mathematical models of a given class when presented only with the basic model description. Two design systems for stratified flows were described: the S12/13 for one-dimensional two- and three-layer flows, and the S22/23 for two-dimensional two- and three-layer flows. Each system possesses hydrodynamic, transport-dispersion, and water quality stages. Together, these systems comprise the 'Neptune' project. Some specific difficulties and problems associated with the development of the systems were outlined, with illustrations. The systems approach appears to make possible the simulation of stratified flows and associated water quality phenomena with acceptable accuracy-cost characteristics. (See also W76-09941) (Sims - ISWS)
W76-09976

MODELING OF THREE-DIMENSIONAL FLOWS IN ESTUARIES,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W76-09977

EXPERIENCE WITH A SMALL SCALE, HIGHLY DISTORTED FIXED BED MODEL OF THE LAGO MARACAIBO ESTUARY,
Laboratorio National de Hidraulica, Caracas (Venezuela).
For primary bibliographic entry see Field 2L.
W76-09979

HYDRODYNAMIC AND MATERIAL TRANSPORT MODEL FOR MOBILE BAY, ALABAMA,
Alabama University, University. Department of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-09983

APPLICATION OF PHYSICAL TIDAL MODELS IN HARBOR AND MARINA DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09984

8C. Hydraulic Machinery

GIVE STORMWATER POLLUTANTS THE SPIN,
Municipal Environmental Research Lab., Edison, N.J. Storm and Combined Sewer Section.
For primary bibliographic entry see Field 5D.
W76-09461

CONSTRUCTION PLANNING OF A HYDRO POWER STATION,
Beas Designs Organization, Nangal (India).
O. P. Datta.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 3, p 77-81, March 1975. 3 fig, 6 ref.

Descriptors: *Construction, *Planning, *Hydroelectric plants, Size, Excavation, Design, Water resources, Penstocks, Drainage, Equipment, Storage, Installation, Sites.
Identifiers: Concrete production.

Described are the important features that are associated with the planning and construction of a hydro power station. Factors governing the location of power-houses are discussed with relative merits, and criteria for the type and size of units are explained. Considered are excavation, concrete production and placement, penstock chamber, and drainage arrangements. Composite flow sheet charts for major construction operations of excavation and concrete production would help in judicious planning of sequential operations. After deciding the location and size of a hydro power station, it is advantageous to plan carefully the construction operations, starting from excavation and concrete placement to coordinated installation of generating equipment in order to achieve the targets of completion of the structure and to keep to the commissioning schedule. (Bell-Cornell)
W76-09616

OPTIMAL OPERATION OF THE PUMPING STATIONS IN THE KINNERETH-ESHKOL SECTION OF THE NATIONAL WATER CARRIER,
Mekoroth Water Co. Ltd., (Israel). Research and Desalting Div.; and Technion - Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 4A.
W76-09629

OPERATION OF HYDROGENERATOR AS SYNCHRONOUS CONDENSOR,
Bharat Heavy Electricals Ltd., Hardwar (India).
S. C. Mukhopadhyaya.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 4, p 113-115, April 1975. 4 fig, 4 ref.

Descriptors: *Hydroelectric plants, *Generators, *Condensers, Transmission line, Operations, Costs, Economic efficiency, Equipment.
Identifiers: *India.

A large number of hydro stations in India are either seasonal or peak load stations, and the generators in such stations have long idle time. This idle time of the generators can be economically used to run as synchronous condensors to reduce the transmission line losses and to utilize the available sources of power to maximum extent. Hydro stations mainly situated far away from the load centers, however, offer little advantage in running them as synchronous condensors. But there are many hydrostations in India around which industrial complexes or plants having large consumption of power have been constructed. These consumers are mainly supplied from the

nearby hydro stations. But sometimes power is fed from sources located at long distances. The analysis herein concludes that the running of hydro sets as synchronous condensors is very convenient and the expenditure involved in providing additional equipment is negligible. The modifications required to provide such facilities in existing power houses are also not much, as no change is involved in the main equipment. The only requirement is the provision of air inlet to runner chamber and some minor changes in control circuit. (Bell-Cornell)
W76-09637

A STUDY OF ROTATING-DISC TREATMENT UNITS OPERATING AT DIFFERENT TEMPERATURES,
Loughborough Univ. of Technology (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-09674

SLUICE GATES HELP REGULATE PLANT'S HYDRAULIC FLOWS.
Water and Sewage Works, Vol. 123, No. 5, p 77-79, May, 1976.

Descriptors: *Sluice gates, *Hydraulic gates, Hydraulic structures, *Flow control, *Sewage treatment, *Waste water treatment, Engineering structures, Gates, Sewage lagoons, Activated sludge, Sanitary engineering, Treatment facilities.
Identifiers: Contact stabilization.

A sluice gate arrangement for regulating hydraulic flows at a new Jackson, Mississippi, sewage treatment plant is described. The plant uses an activated sludge treatment process with contact stabilization and is designed so that influent must either be processed or temporarily stored in lagoons when flooding conditions exist. Comminuters and grit chambers in the plant make use of a 16-gate arrangement to control flows. Four 42 by 36-inch sluice gates are arranged around a comminuter pool controlling flows to four additional gates located at the grit chamber influent. Eight other gates are located on the grit chamber. Flow from the grit chambers passes on to the contact stabilization tanks, reaeration tanks, and ultimately to clarifiers. Four 48 by 48-inch gates located in the contact tanks and eight 30-inch diameter gates in the aeration tanks can be modulated to regulate flows in accordance with commands given by a control room operator who has access to flow meter readings. When the plant reaches its hydraulic capacity of 60 million gallons, excess flow is diverted to lagoons via a 60-inch diameter storm water bypass gate. Other gates at the plant include three self-contained gates at the effluent end of the chlorination lagoon and an additional modulating gate at the effluent outfall. (Kreager-FIRL)
W76-09680

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS. RECOMMENDATIONS AND EXECUTIVE SUMMARY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09764

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09765

NEAR-FIELD JET PENETRATION AND RESERVOIR MIXING,
Georgia Inst. of Technology, Atlanta.
P. G. Mayer.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 380-387, 1975. 4 fig.

Descriptors: *Model studies, *Hydraulic models, *Reservoirs, *Jets, Mixing, Dispersion, Circulation, Powerplants, Pump turbines, Pumped storage, Photography, Dye releases.
Identifiers: *Jet penetration.

The objectives were to build and operate hydraulic models which would (1) assist the Georgia Power Company in deciding on relative locations of the power house and the spillway in its Wallace Dam Pumped-Storage project, and (2) define factors pertinent to the locations of four reversible pump-turbine units and of two conventional turbine units within the power house. The laboratory investigations were conducted with two different models. One model was an idealized undistorted model built on a scale of 1:400. This model served to gather information useful to the construction and operation of a second and considerably more comprehensive reservoir model. The reservoir model was built on a distorted scale of 1:400 horizontally and 1:60 vertically. The models were operated on appropriate time-scales. Jet penetration and reservoir mixing were studied by means of dye injections. The operation of the reservoir model included both pumping cycles and generating cycles. Time-lapse color photography was used to study and analyze the jet geometrics and the jet induced reservoir mixing patterns. The results of these studies were immediately useful to the design engineers in the selection of a suitable configuration for turbine settings. The results to date were also useful in the examination of water quality aspects arising from the projects during operation. (See also W76-09941) (Sims - ISWS)
W76-09962

RIVERBANK RECESSIONS FOR POWER PLANT FACILITIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09973

8G. Materials

POLYETHYLENE PIPE TACKLES DIFFICULT SEWER REPAIR JOB,
Water and Sewage Works, Vol. 123, No. 2, p 48, February, 1976.

Descriptors: *Sewers, *Repairing, *Plastic pipes, Installation.
Identifiers: Slip-lining, *Pipe relining.

A difficult sewer repair problem at La Mesa, California, was completed by the insertion of long, fused lengths of polyethylene pipe. A 55-year-old six-inch concrete sewer located in an area of beautifully landscaped homes on a steep, rocky hillside was badly in need of replacement due to heavy infiltration and exfiltration and stubborn root penetration which was causing stoppages. The first step was to inspect the line by video camera, recording the interior. Polyethylene pipe (OD 5.375 inches) was pulled through the pipe in 38-foot sections. As each section was lined, lateral connections were made. The project required five weeks to complete 3000 feet of relining; service was interrupted only when lateral connections were being effected. The final cost was much less than that of direct replacement. (Orr-FIRL)
W76-09403

HOW MANY SEWER LEAKS CAN YOU AFFORD.
Weston (Roy F.), Inc., Houston, Tex.
D. S. Diehl.
The American City and County, Vol. 91, No. 4, p 55-57, April, 1976.

Descriptors: *Sewers, *Sewerage, *Pipelines, *Infiltration, *Inflow, *Repairing, Measurement, Instrumentation, Drainage, Rainfall.
Identifiers: Sewerage construction grants, Infiltration/inflow.

The basic problems caused by infiltration/inflow (i/i) in a sewer system are: excessive maintenance, discharge of poorly treated waste water during periods of high groundwater or rainfall, backups and overflows of raw sewage, surchaged sewer lines which prevent the use of plumbing facilities in low-lying areas; and the overloading of treatment plants, pump stations and interceptors. Sewer systems are eligible for federally funded sewerage construction grants, provided an infiltration/inflow analysis demonstrates that it would be more economical to repair the sewers than to treat the i/i. In order to estimate the magnitude of i/i to which a system is subject, the peak, average and minimum flows during dry and wet weather for major sections must be determined. Three flow measuring devices generally used are Cipolletti weirs with liquid level recorders, event recorders, and bypass times. In evaluating the system, each manhole must be physically inspected on a drainage basin by drainage basin basis. In some systems, it is cost effective to smoke test the manhole and lines leading to it. Other steps in the evaluation include simulation of rainfall and quantification of the rate of infiltration or inflow from a particular source or suspected manhole or sewer section. Those lines with obvious potential for 'excessive' i/i should be cleaned and internally inspected with closed circuit TV. A final evaluation report must show all i/i sources as well as justification and a method for rehabilitation and repair of specific sections. (Kramer-FIRL)
W76-09404

POLYETHYLENE PIPE INSERTION REHABILITATES OLD SEWERS,
Freeport Public Works, N. Y.
E. H. Prefer.
Water and Sewage Works, Vol. 123, No. 4, p 92-94, April, 1976.

Descriptors: *Sewers, *Pipelines, *Plastic pipes, *Inspection, Testing, Equipment, Repairing, Rehabilitation, Sewerage, Costs.
Identifiers: *Pipe relining.

Sewers can be rehabilitated with less cost and disruption by inserting a new polyethylene pipe inside the old sewer pipe than by replacing the whole pipline. The existing sewer line must be inspected before inserting new pipe; TV or other methods may be used for the inspection. Lengths of polyethylene pipe are joined by heat fusion, producing a joint as strong as the pipe itself. The new pipe is inserted by pulling it into the old pipe with a cable. When shallow house service lines are connected to deep sewers by vertical risers, an expandable connector can be inserted through the top of the riser. When excavation down to the connection spot is required, fusion saddles or, when conditions are wet, tapping saddles may be used. After the houses are connected, the annular space between the old and new sewer pipes is sealed. Such a renewal project was carried out in Freeport, New York, where many of the sewers were badly deteriorated and one section had caved in. The initial insertion involved lining a 565-ft length of lightly deteriorated 8-in. pipe. The sewer section that had caved in was replaced with clay pipe, but the parallel section on the other side of the street was lined with polyethylene pipe. No obstructions were encountered in lining the first section, but the second section, which had not been inspected immediately before insertion, became jammed with material flaking off the original pipe. The re-lining and reconnection were nevertheless completed in 5 days, at a savings of 90% as compared to the replacement of clay pipe on the other side of the street. (Snyder-FIRL)

W76-09459

SEWER INSPECTION: CHECKING IT OUT,
L. Fielding.
Water and Wastes Engineering, Vol. 13, No. 4, p 6, April, 1976.

Descriptors: *Sewers, *Maintenance, *Cleaning, Repairing, Inspection, Equipment, Maintenance costs.
Identifiers: *Television inspection.

Trends and commonly used techniques for sewer inspection and maintenance are discussed. Visual on-site inspection is the most commonly used inspection method. Closed circuit television cameras are becoming more commonly used. The sewers in Sparks, Nevada, are inspected visually in manholes and internally by a closed circuit television system. The visual inspection is performed weekly, while television inspection is performed on a time available basis. Rodders, vacuum units, electric eels, and buckets and brushes are all used to varying degrees to clean sewers. Tree roots are the most common problem found in routine maintenance. Slip-liner technology for the replacement of deteriorated mains is being considered by Oklahoma City. The frequency of inspection and maintenance depends on available manpower and time. Money is another important factor. At Sparks, Nevada, about 5% of the system is inspected visually weekly, 10% is cleaned every three months, 5% is cleaned every year, 15% is cleaned every two years, 20% is cleaned every five years, and about 40% is not cleaned. Approximately 48% of the utility budget of Sparks is spent on sewer inspection and maintenance. (Orr-FIRL)
W76-09460

GRP LAUNDERS AT SEWAGE TREATMENT PLANT.
Reinforced Plastics, Vol. 20, No. 2, p 44-45, February, 1976.

Descriptors: *Sewage treatment, Equipment, *Plastics, Construction materials, *Waste water treatment, Corrosion control, Treatment facilities.
Identifiers: Launders, *Reinforced plastics.

New glass fiber reinforced plastic (GRP) launders and diffusers have been developed for use in sewage treatment plants. These plastics give increased strength and a high surface finish, with the incorporation of high density polyurethane foam in their sandwich construction. These launders, or trough-shaped conduits, had formerly been constructed of concrete and steel. With the lighter reinforced plastic construction, the equipment will be easier to transport and hoist and will discourage the growth of algae. (Kramer-FIRL)
W76-09462

VALUE ENGINEERED SEWAGE PLANT MOVES FAST,
For primary bibliographic entry see Field 5D.
W76-09672

METHOD AND APPARATUS FOR THE CONVERSION OF AN AQUEOUS SCALE-FORMED LIQUID,
For primary bibliographic entry see Field 3A.
W76-09872

8I. Fisheries Engineering

EXPERIMENTS ON THE CULTURE OF THE LARGE SNAKE-HEAD OPHICEPHALUS MARULIUS (HAMILTON),
Reg. Cent., Mandapam Camp, Tamil Nadu, India, Cent. Mar. Fish. Res. Inst.
M. Devaraj.
Indian J Fish. 20(1), p 138-147, 1973.

Descriptors: *Fish, Swamps, Fish hatcheries, Wells, *Growth rates, Breeding.
Identifiers: Snake-Head, Ophicephalus-marulius, Tilapia-mossambica, Fish breeding.

The growth of fry and fingerlings of O. marulius is 32 mm/mo. in a swamp, 15.6 mm in a nursery, 6.4 mm in a backyard well and up to 29 mm in irrigation wells under different feeding conditions. During the 1st yr of the experiment in a farm pond where forage fishes were introduced, the monthly growth of 1 and 2 yr old O. marulius was 12 mm and 8 mm respectively. Eutrophification of the pond during the2nd yr increased the growth rate to 33 mm in fingerlings and 27 mm in 1 yr old fish. Survival of fingerlings during the 1st yr was 1.3% in the nursery, 13.6% in backyard wells and 34.0% in irrigation wells. Recovery from farm ponds where adult fishes were grown, ranged from 57.5 to 100% in a period of 1-1 1/2 yr. This was due to breeding in the pond which resulted in the production of younger fish of size-groups much smaller than those stocked. When the juveniles attained about 125 mm in length (4-5 mo. old) they became piscivorous and dispersed from the broods. They should be collected at this stage for stocking purposes. Rate of stocking in wells should not exceed 10 fish/well. For culture in farms, 0.25-0.5 ha ponds and a stock rate of 1000-4000 fingerlings/ha are suggested. Tilapia mossambica of less than 80 mm formed the chief food of O. marulius on the farm. Desparity in the growth rate within the same habitat increased cannibalism and hence mortality of smaller ones was high. The importance of periodic netting for the larger fish is emphasized.--Copyright 1975, Biological Abstracts, Inc.
W76-09487

ENGINEERING RECLAMATION, A MOST IMPORTANT MEANS OF INCREASING FISH PRODUCTIVITY OF WATERS, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
G. I. Shpet, and I. F. Demchenko.
Gidrobiol Zh. 9(4), p 87-90, 1973.

Descriptors: Fish management, *Fish reproduction, *Productivity, *Fisheries, Ponds, Fertilizers, Drainage, Fish diets, Grading.
Identifiers: *Engineering reclamation.

The application of feed and fertilizer is an important means of increasing the productivity of pond fisheries, but engineering reclamation is also important. The productivity of a pond depends on a number of hydrological conditions (pond area, depth, flow, drainability) which can be improved by engineering. Although there is no obvious proportional relationship between pond size and productivity, ponds with an area of 50-150 ha are the most productive since such ponds are more amenable to the use of mechanization and hydraulic engineering. Drainability, cultivation and grading of pond bottom are important features in engineering reclamation. A good reclamation system and graded bottom provide complete draining and shorten fish catching time by 3-4 times.--Copyright 1975,Biological Abstracts, Inc.
W76-09800

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

NATIONAL CONFERENCE OF DISTRICT CHIEFS, ALBUQUERQUE, NEW MEXICO, SEPTEMBER 28-OCTOBER 3, 1975--PROCEEDINGS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 02A.
W76-09838

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

PHYSIOLOGIC RESPONSES TO WATER IMMERSION IN MAN: A COMPENDIUM OF RESEARCH,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
J. Kollias, D. Van Derveer, K. J. Dorchak, and J. E. Greenleaf.
NASA Technical Memorandum, TM X-3308, February, 1976, 74 p, 245 ref.

Descriptors: *Animal behavior, *Animal physiology, *Biology, *Bibliographies, *Abstracts, Environmental effects, Laboratory animals, Mode of action, Moisture stress, Reviews, Information retrieval, Environmental engineering, Manpower.
Identifiers: *Water immersion, Physiological responses(Human), Space flight, Weightlessness, Zero-gravity effects, Fluid immersion, Simulated environments.

Since the advent of space flight programs, scientists have been searching for ways to reproduce the zero-gravity effects of weightlessness. Brief periods of weightlessness up to 1 minute were feasible using Keplerian trajectory, but comprehensive study of the prolonged effects of the weightless state necessitated the development of other methods. Thus far the two approaches most widely used have been complete bedrest and fluid immersion. Surprisingly, these simulated environments have produced essentially all of the symptoms found in astronauts. This compendium contains reports appearing in the literature through December, 1973. When the author's abstract or summary was adequate, it was used. If these were not available a detailed annotation was provided under the subheadings: (a) purpose, (b) procedures and methods, (c) results, and (d) conclusions. The annotations are in alphabetical order by first author; author and subject indexes are included. Additional references are presented in the selected bibliography. (Katz)
W76-09655

BIOLOGICAL INDICATORS OF ENVIRONMENTAL QUALITY. A BIBLIOGRAPHY OF ABSTRACTS,
For primary bibliographic entry see Field 05A.
W76-09860

SUBJECT INDEX

ABSORPTION
A Quantitative Analysis of the Factors Affecting Plant Nutrient Uptake from Some Soils,
W76-09489 2G

ABSTRACTS
Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

Biological Indicators of Environmental Quality. A Bibliography of Abstracts,
W76-09860 5A

ACIDIC SOILS
Requirements and Use of Fertilizer, Lime, and Mulch for Vegetating Acid Mine Spoils,
W76-09469 4D

ACIDIC WATER
Acid-Iron Waste as a Factor Affecting the Distribution and Abundance of Zooplankton in the New York Bight: I. Laboratory Studies on the Effects of Acid Waste on Copepods,
W76-09700 5C

ACTIVATED CARBON
Carbon Wastewater Treatment Process,
W76-09441 5D

Sludge/Activated Carbon Cycle Treats Sewage.
W76-09443 5D

Carbon Made from Sewage Solids Treats Wastewater.
W76-09450 5D

ACTIVATED SLUDGE
Sewage Treatment Facility to be Updated and Expanded at Kitchener Ontario,
W76-09439 5D

Sludge/Activated Carbon Cycle Treats Sewage.
W76-09443 5D

Desert Area Activated Sludge Plant.
W76-09447 5D

Activated Sludge Process with Alum Addition and Heat Treatment,
W76-09456 5D

Some Critical Views of Selected Processes for the Biological Treatment of Sewage,
W76-09457 5D

Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

Least Cost Design of Activated Sludge Systems,
W76-09638 5D

The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

Purification of Waste Water By Polymer Exchangers (Jatevesien puhdistaminen polymeerivaihtajilla),
W76-09675 5D

Assessment of Virus Removal by a Multi-Stage Activated Sludge Process,
W76-09676 5D

The Effluent Lagoons Greifswald-Ladebow (Das Abwasserteichsystem Greifswald-Ladebow),
W76-09682 5D

Development of a Measurement Method for the Total Activity Rate of Activated Sludge (Contribution a La Mise Au Point D'une Methode De Mesure Du Taux D'Activite Totale Des Boues Activees),
W76-09695 5D

Laboratory Centrifuge Saves Time and Money,
W76-09704 5D

Technique Alternatives for a Package Stabilization Plant,
W76-09705 5D

Microbial Aspects of Carbonisation Effluent Treatment,
W76-09712 5D

AERATED LAGOONS
Apparatus for Sewage Treatment and Wastewater Reclamation,
W76-09420 5D

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

AERATION
Aerated Sewerage Disposal,
W76-09415 5D

Apparatus for Sewage Treatment and Wastewater Reclamation,
W76-09420 5D

Sewage Treatment Aeration Systems,
W76-09423 5D

Apparatus for Treating Industrial and Domestic Waste Waters,
W76-09429 5D

Wastewater Treatment System with Controlled Mixing,
W76-09433 5D

Some Critical Views of Selected Processes for the Biological Treatment of Sewage,
W76-09457 5D

The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

New York Takes Another Giant Step,
W76-09710 5D

AERIAL PHOTOGRAPHY
Observation of Linear Features in the Maryland Piedmont as Shown on ERTS-1 MSS Imagery and Aircraft Support Photography,
W76-09567 4A

Airborne Detection and Mapping of Oil Spills, Grand Bahamas,
W76-09891 5A

Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

AEROBIC TREATMENT
Sewage Treatment Process,
W76-09422 5D

AEROMONAS
Presence and Some Properties of Bacteria of the Family Pseudomonadaceae in the River Danube, (In German),
W76-09792 5A

AFRICA
The Sahelian Drought and Its Demographic Implications,
W76-09486 6G

AGRICULTURAL WATERSHEDS
A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

AIR POLLUTION
Apparatus and Method for Recovering Pure Water from Natural Sources and Industrial Polluted Waste Sources,
W76-09867 5G

AIR POLLUTION EFFECTS
Possible Future Effects on the Population of the Federal Republic of Germany of Gaseous Radioactive Effluents from Nuclear Facilities,
W76-09499 5A

Synergistic Effects of Atmospheric Releases of Radioactive Gases and SO2 in Inducing Nucleation in the Atmosphere,
W76-09500 5A

Advantages of Numerical Atmospheric Dispersion Calculations for Estimating Dispersal and Combination Effects of Stack Releases from the Nuclear Industry,
W76-09501 5A

Discussion of Possible Effects Due to Mixing of Radioactive and Thermal Releases to the Atmosphere from Nuclear Power Plants,
W76-09502 5A

Synergistic Effects of Airborne Emissions from Nuclear Power Plants,
W76-09503 5A

AIR TEMPERATURE
Calculation of Water Temperatures in Clear Lake, Iowa,
W76-09879 5B

AIR-WATER INTERFACES
Wave Breaking in the Presence of Wind Drift and Swell,
W76-09874 2L

AIRBORNE SENSORS
Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

ALABAMA
Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

ALASKA
Upwelling Near Samalga Pass,
W76-09585 2L

Hydrologic Unit Map--1974, State of Alaska,
W76-09826 7C

Effects of Petroleum Pollutants on Arctic Microbial Populations,
W76-09909 5C

ALEUTIAN ISLANDS (ALAS)
Upwelling Near Samalga Pass,
W76-09585 2L

ALGAE
Interstitial Protozoa and Algae of Louisiana Salt Marshes,
W76-09593 5C

The Algal Population of Duemmer Lake in the Years 1970/71, (In German),
W76-09812 5C

'Toxic' or 'Poisonous' Water, (In Russian),
W76-09932 5C

The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

ALGAL CONTROL
Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

ALGORITHMS
A Proposed Algorithm for the Solution of the Large-Scale Inverse Problem in Groundwater,
W76-09850 2F

ALLUVIAL CHANNELS
Gravity Geophysics for Groundwater Exploration in Glaciated Areas,
W76-09758 4B

Mathematical Modeling of Alluvial Channels,
W76-09968 8B

Modeling Sediment Transport in Hydraulic Structures,
W76-09975 2J

ALLUVIAL FANS
River Delta Computer Simulation Model (Simudelt),
W76-09954 2L

ALUM
Van Clarifies Sludge Options,
W76-09438 5F

Activated Sludge Process with Alum Addition and Heat Treatment,
W76-09456 5D

AMINO COMPOUNDS
Sanitary Inspection of Surface Waters Polluted with Aromatic Amino and Nitro-Compounds, (In Russian),
W76-09798 5A

AMMONIA
Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W76-09413 5D

AMMONIUM
The Hygienic Quality of the Water in a Growing-Finishing Piggery, (In Romanian),
W76-09883 5B

ANAEROBIC CONDITIONS
Microbial Reactions in Facultative Oxidation Ponds -- I. The Anaerobic Nature of Oxidation Pond Sediments,
W76-09435 5D

ANAEROBIC DIGESTION
Anaerobic Treatment of Leachate with High Sodium Concentrations,
W76-09641 5D

Anaerobic Treatment of Dilute Waste Waters,
W76-09673 5D

ANALYTICAL TECHNIQUES
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Analytical Studies on Sewage Sludge and Plant Material,
W76-09552 5D

Methods for Measurement of Biodegradability of Chemical Compounds,
W76-09599 5C

The Role of Bioassays in Environmental Research,
W76-09644 5A

A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. I. Computerized High Resolution Mass Spectrometry and Gas Chromatography-Low Resolution Mass Spectrometry,
W76-09687 5A

Dissolved Oxygen Analyzer T-01 Analyzer. A Simple Apparatus for Electrochemical Determination of Dissolved Oxygen in Water (Tlenomierz T-01 uproszczony przyrzad elektrochemicznego oznaczania tleunu roxpuszczomego w roztworach wodnych),
W76-09688 5A

Organic Contaminants of Water,
W76-09689 5A

Turbidimeter Lights the Way to Accurate Process Control,
W76-09694 5A

Development of a Measurement Method for the Total Activity Rate of Activated Sludge (Contribution a La Mise Au Point D'une Methode De Mesure Du Taux D'Activite Totale Des Boues Activees),
W76-09695 5D

Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

Laboratory Centrifuge Saves Time and Money,
W76-09704 5D

Runoff Frequency Procedure for Synthetic Hydrograph Development,
W76-09733 2A

A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

ANIMAL BEHAVIOR
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

ANIMAL PHYSIOLOGY
Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

ANIONS
Removal of Phosphate from Waste Water,
W76-09458 5D

ANODIC STRIPPING VOLTAMETRY
Evaluation of Combined Applications of Ultrafiltration and Complexation Capacity Techniques to Natural Waters,
W76-09690 5A

ANTECEDENT PRECIPITATION
Effects of Management Practices on Water Quality and Quantity: Baltimore, Maryland, Municipal Watersheds,
W76-09464 4D

ANTHROPOGENIC EFFECTS
Anthropogenic Effect on Continental, Marine, and Oceanic Biohydrocoenoses, (In Russian),
W76-09819 5C

ANTITRANSPIRANTS
The Effect of Silicon Oils on the Water Loss of Hordeum Vulgare L, (In German),
W76-09806 3B

APPALACHIAN MOUNTAIN REGION
Additional Observations on the Effects of Strip Mining on Small-Stream Fishes in East-Central Kentucky,
W76-09468 5C

AQUATIC ALGAE
Environmental Quality Research, First Annual Report,
W76-09654 5C

AQUATIC FUNGI
Microbial Degradation of Model Petroleum at Low Temperatures,
W76-09648 5C

AQUATIC PLANTS
The Vegetation of the 'Lukniany Lake' Nature Reserve in the Mazurian Lake District,(In Polish),
W76-09990 5C

AQUATIC WEED CONTROL
Possibilities and Limitations in Biological Control of Weeds,
W76-09920 4A

Recent Trends in Weed Control in Freshwater,
W76-09921 4A

The Eradication of the Seaweed Sargassum Muticum from Britain,
W76-09989 5G

AQUEDUCTS
Aqueduct Optimization with Intermediate Storage,
W76-09636 4A

AQUEOUS SOLUTIONS
Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

AQUICLUDES
Theory of Multiple Leaky Aquifers 1. The Integrodifferential and Differential Equations for Small and Large Values of Time,
W76-09563 2F

AQUIFER CHARACTERISTICS
Hydrology of the Madison Formation and its Potential use for Water Supply for Energy Development,
W76-09757 2F

AQUIFERS
The Over-Exploitation of Groundwater Resources in Dry Regions,
W76-09479 4B

Optimal Ground Water Quality Management: Well Injection of Waste Waters,
W76-09511 5D

Theory of Multiple Leaky Aquifers 1. The Integrodifferential and Differential Equations for Small and Large Values of Time,
W76-09563 2F

Characterization of Nitrogen Sources Contaminating Shallow Ground Water in an Arid Basin. Las Vegas Area, Nevada,
W76-09762 5B

Mathematical Model of Flow in a Stream-Aquifer System,
W76-09966 2E

AQUITARDS
A Three-Dimensional Galerkin Finite Element Solution of Flow Through Multiaquifers in Sutter Basin, California,
W76-09562 2F

Theory of Multiple Leaky Aquifers 1. The Integrodifferential and Differential Equations for Small and Large Values of Time,
W76-09563 2F

ARCTIC
Oil in the Arctic,
W76-09902 5C

ARID CLIMATES
Micro-Climate Effects on Water Use Efficiency by Plants in an Arid Climate,
W76-09480 3B

ARID LANDS
New Technologies in Water Purification and Their Application to Arid Lands,
W76-09481 3A

Water Utilization and Soil Salinity: Control in Arid Zone Agriculture,
W76-09482 3C

Water System Behavior: Determinants in an Arid Region,
W76-09483 4A

The Sahelian Drought and Its Demographic Implications,
W76-09486 6G

ARIZONA
Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

Distribution of Ponderosa Pine Forest Densities on the Salt-Verde River Basin,
W76-09477 4A

Arizona Energy: A Framework for Decision.
W76-09484 6D

Power Generation in Arizona and Its Environmental Implications,
W76-09485 6D

ARKANSAS RIVER BASIN (KAN)
Variation and Causative Factors of Sediment Yields in the Arkansas River Basin, Kansas,
W76-09839 2J

AROMATIC COMPOUNDS
Sanitary Inspection of Surface Waters Polluted with Aromatic Amino and Nitro-Compounds, (In Russian),
W76-09798 5A

ARSENIC
Metabolic Cycles for Toxic Elements in Aqueous Systems,
W76-09933 5C

ARTIFICIAL ISLAND
Engineering and Ecological Evaluation of Artificial-Island Design, Rincon Island, Punta Gorda, California,
W76-09903 2L

ARTIFICIAL ISLANDS
A Post Construction Survey of Several Man-made Islands Off the Coast of California,
W76-09911 2L

An Environmental Research Program for Drilling in the Canadian Beaufort Sea,
W76-09912 5G

ATLANTIC MACKEREL
The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

A Description of Atlantic Mackerel, Scomber Scombrus, Eggs and Early Larvae,
W76-09656 2I

ATLANTIC OCEAN
The Relationship of the Nearshore Longshore Bar and Sand Waves at Ocean City, Maryland,
W76-09569 2L

Modeling of Wind-Waves with Jonswap Spectra,
W76-09948 8B

ATMOSPHERE
Advantages of Numerical Atmospheric Dispersion Calculations for Estimating Dispersal and Combination Effects of Stack Releases from the Nuclear Industry,
W76-09501 5A

ATOMIC ABSORPTION SPECTROPHOTOMETRY
The Heavy Metal Concentrations in the Waters Along the Coast of Fukuyama, (In Japanese),
W76-09815 5A

ATRIPLEX-CANESCENS
Contribution of Salts to the Water Potential of Woody Plants,
W76-09691 3C

ATRIPLEX-CONFERTIFOLIA
Contribution of Salts to the Water Potential of Woody Plants,
W76-09691 3C

ATTITUDES
Considerations in the Public Acceptance of Sewage Sludge Irradiation Systems,
W76-09543 5D

The Contribution of a Water Information System for Environmental Planning in Minnesota,
W76-09753 6G

AUFWUCHS
Environmental Quality Research, First Annual Report,
W76-09654 5C

AUSTRALIA
Effects of Flooding and of Irrigation Water Salinity on Eucalyptus Camaldulensis Dehn. From Three Seed Sources,
W76-09664 3C

BACTERIA
Surveys on Radiation-Resistant Asporogenic Bacteria in Natural Environments,
W76-09519 5C

Isolation of Water Vibrios in Greece, (In French),
W76-09601 5A

The Relationship Between Dissimilatory Nitrate Reduction and Oxygen Uptake by Cells of an Alcaligenes Strain in Flocs and in Suspension and by Activated Sludge Flocs,
W76-09686 5D

Distribution of Bdellovibrio Bacteriovorus in Sewage Works, River Water, and Sediments,
W76-09698 5A

Microbial Aspects of Carbonisation Effluent Treatment,
W76-09712 5D

Presence and Some Properties of Bacteria of the Family Pseudomonadaceae in the River Danube, (In German),
W76-09792 5A

Hygienic Assessment of Changes in Mineral Water Properties During its Treatment for Use in Internal Balneotherapeutic Procedures, (In Russian),
W76-09795 5C

The Algal Population of Duemmer Lake in the Years 1970/71, (In German),
W76-09812 5C

The Role of Microflora in the Productivity of a Salmon Breeding Lake, (In Russian),
W76-09818 5C

The Hygienic Quality of the Water in a Growing-Finishing Piggery, (In Romanian),
W76-09883 5B

BACTERIA ENTERIC VIRUS
Practical Application of the Germicidal Power of Ultraviolet Irradiation to Drinking-water, (In French),
W76-09646 5F

BACTERICIDES
Synergistic Effects of Irradiation of Waste-Water.
W76-09524 5D

BALANIDAE
Balanidae as Pollution Indicators in the Bay of Guanabara, (In Portuguese),
W76-09823 5A

BALLAST WATER
Development of a Batchwise In-situ Regeneration Type Separator to Remove Oil from Oil-Water Suspensions,
W76-09895 5G

BARBADOS ISLAND
Organic Productivity of Inshore and Offshore Waters of Barbados: A Study of the Island Mass Effect,
W76-09938 5C

BARLEY
The Effect of Silicon Oils on the Water Loss of Hordeum Vulgare L, (In German),
W76-09806 3B

Effect of Excess Soil Moisture on the Content of Phosphorus Compounds in Barley, (In Russian),
W76-09913 3F

BARNACLES
Balanidae as Pollution Indicators in the Bay of Guanabara, (In Portuguese),
W76-09823 5A

BAROCLINIC DISTURBANCES
Finite-Amplitude Baroclinic Disturbances in Downstream Varying Currents,
W76-09560 2L

BASE FLOW
A Proposed Algorithm for the Solution of the Large-Scale Inverse Problem in Groundwater,
W76-09850 2F

BASELINE STUDIES
Academic Data-Needs for Environmental Assessments of Offshore Technological Operations,
W76-09914 6G

BASIC DATA COLLECTIONS
Report of Water Levels in Selected Observation Wells in Utah--April 1976,
W76-09832 4B

BAY OF VALPARAISO (CHILE)
Studies of Phytoplankton Ecology in the Bay of Valparaiso: II. Phytoplankton 1970-1971, (In Spanish),
W76-09408 5A

BAYESIAN DECISION ANALYSIS
Maximum Information Obtainable from Inadequate Design Data: from Multivariate to Bayesian Methods,
W76-09625 4A

BAYS
Marine Soil Pollution and Self-Purification, (In Russian),
W76-09789 5A

BDELLOVIBRIO BACTERIOVIRUS
Distribution of Bdellovibrio Bacteriovorus in Sewage Works, River Water, and Sediments,
W76-09698 5A

BEACH EROSION
Origin, Effect and Suppression of Secondary Waves,
W76-09878 2J

BEACHES
Research and Investigation of Geology, Mineral, and Water Resources of Maryland.
W76-09565 4A

Maryland Chesapeake Bay Beaches - General Distribution and Classification,
W76-09568 2L

BEAUFORT SEA
An Environmental Research Program for Drilling in the Canadian Beaufort Sea,
W76-09912 5G

BEDROCK
Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

Reconnaissance Map Showing Relative Amounts of Soil and Bedrock in the Mountainous Part of the Morrison-Evergreen Quadrangles and Adjoining Areas to the West in Jefferson County, Colorado,
W76-09825 7C

BELGIUM (RIVER SAMBRE)
The Aquatic and Subaquatic Bryophytic Vegetation of the Belgian Part of the River Sambre, Related to Ecological Conditions and Water Pollution, (In French),
W76-09986 5C

BENCH SHEET RECORDS
How to Build a Better Bench Sheet,
W76-09701 5D

BENTHIC FAUNA
Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

Species Composition and Diversity of Polychaetes in the New York Bight,
W76-09650 5C

BENTHIC FLORA
An Assessment of Possible Pollution Effects Over a Century of the Benthic Marine Algae of Co. Durham, England,
W76-09595 5C

BENTHOS
Concentration of Cesium-137 in Aquatic Organisms, Water and Bottom Deposits of Water Bodies with a Different Mineral Compositions of the Water, (In Russian),
W76-09410 5C

Species Composition and Diversity of Polychaetes in the New York Bight,
W76-09650 5C

Primary Production in the Frozen Lake Balaton,
W76-09991 5C

BIBLIOGRAPHIES
Recent Advances in the Treatment of Solid Wastes,
W76-09553 5D

Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

Biological Indicators of Environmental Quality. A Bibliography of Abstracts,
W76-09860 5A

Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

BIOASSAY
Studies of Phytoplankton Ecology in the Bay of Valparaiso: II. Phytoplankton 1970-1971, (In Spanish),
W76-09408 5A

A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

Environmental Quality Research, First Annual Report,
W76-09654 5C

BIOASSAYS
Development of Laboratory Model Ecosystems as Early Warning Elements of Environmental Pollution,
W76-09643 5C

The Role of Bioassays in Environmental Research,
W76-09644 5A

Substitute Chemical Program - Initial Scientific and Minieconomic Review of Captan.
W76-09651 5C

BIOCHEMICAL OXYGEN DEMAND
Wastewater Treatment System with Controlled Mixing,
W76-09433 5D

A Study of Rotating-Disc Treatment Units Operating at Different Temperatures,
W76-09674 5D

Effluent Detention Ponds Dechlorinate Wastewater,
W76-09678 5D

The Effluent Lagoons Greifswald-Ladebow (Das Abwasserteichsystem Greifswald-Ladebow),
W76-09682 5D

Possibilities and Limits of Extended Waste Water Purification (Moeglichkeiten und Grenzen der Weitergehanded Abwasserreinigung),
W76-09683 5D

Technique Alternatives for a Package Stabilization Plant,
W76-09705 5D

Biological Production Processes in the Ural River, (In Russian),
W76-09919 5C

BIOCHEMISTRY
Studies on the Metabolism of a Sulfur-Oxidizing Bacterium. VII. Purification and Characterization of Soluble Components Indispensables for Sulfur Oxidation by Thiobacillus Thiooxidans,
W76-09592 5C

BIOCONTROL
Possibilities and Limitations in Biological Control of Weeds,
W76-09920 4A

Recent Trends in Weed Control in Freshwater,
W76-09921 4A

BIODEGRADATION
Effects of Gamma Radiation from Co60 on Dilute Aqueous Solutions of Linear Alkyl Sulfonate Surfactants and other Organic Pollutants,
W76-09531 5D

Methods for Measurement of Biodegradability of Chemical Compounds,
W76-09599 5C

Development of Laboratory Model Ecosystems as Early Warning Elements of Environmental Pollution,
W76-09643 5C

Biodegradability and Process for Biological Purification of Waste Water (La Biodegradabilite et Les Procedes D'Epuration Biologique Des Effluents),
W76-09693 5D

BIOGEOCOENOSES
Use of the Principles and Methods of Radio-Ecology in Solving Some Urgent Problems of Man's Effect on the Environment, (In Russian),
W76-09936 6G

BIOHYDROCENOSES
Anthropogenic Effect on Continental, Marine, and Oceanic Biohydrocoenoses, (In Russian),
W76-09819 5C

BIOINDICATORS
Myxobacteria of the Myxococcus Group as Indirect Indicators of Fecal Matter in Surface Water: 1. Communication, (In German),
W76-09591 5A

Species Composition and Diversity of Polychaetes in the New York Bight,
W76-09650 5C

Balanidae as Pollution Indicators in the Bay of Guanabara, (In Portuguese),
W76-09823 5A

Biological Indicators of Environmental Quality. A Bibliography of Abstracts,
W76-09860 5A

BIOLOGICAL COMMUNITIES
Ecosystem Modeling,
W76-09645 5C

BIOLOGICAL ENERGY SOURCES
Arizona Energy: A Framework for Decision.
W76-09484 6D

BIOLOGICAL TREATMENT
Sludge Control and Decant System,
W76-09419 5D

Apparatus for Sewage Treatment and Wastewater Reclamation,
W76-09420 5D

Waste Purification System,
W76-09431 5D

Waste Treatment Apparatus,
W76-09432 5D

Who Says Sewage Treatment Plants Have to be Ugly,
W76-09437 5D

Some Critical Views of Selected Processes for the Biological Treatment of Sewage,
W76-09457 5D

A Study of Rotating-Disc Treatment Units Operating at Different Temperatures,
W76-09674 5D

Assessment of Virus Removal by a Multi-Stage Activated Sludge Process,
W76-09676 5D

Possibilities and Limits of Extended Waste Water Purification (Moeglichkeiten und Grenzen der Weitergehanded Abwasserreinigung),
W76-09683 5D

Biodegradability and Process for Biological Purification of Waste Water (La Biodegradabilite et Les Procedes D'Epuration Biologique Des Effluents),
W76-09693 5D

Technique Alternatives for a Package Stabilization Plant,
W76-09705 5D

Method of Biological Purification of Industrial Effluents from Chromates and Bichromates,
W76-09856 5D

BIOLOGICAL TREATMENTS
Sanitary Waste Treatment Plant,
W76-09414 5D

BIOLOGY
Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

BIOMASS
Studies of Phytoplankton Ecology in the Bay of Valparaiso: II. Phytoplankton 1970-1971, (In Spanish),
W76-09408 5A

Rotifer Production in Lake Baikal, (In Russian),
W76-09791 5C

The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

BIXLER RUN BASIN (PA)
Hydrology and Sedimentation of Bixler Run Basin, Central Pennsylvania,
W76-09830 2J

BLUEFISH
The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

BOGS
The Qualitative Organic Matter Composition of Some Marshy Soils of Nizhnevelikoretsk Plain, (In Russian),
W76-09888 2G

BOND ISSUES
Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries.
W76-09766 5G

Role of the Underwriter in Tax Exempt Financing for Industrial Expansion and Pollution Control,
W76-09768 5G

The Industrial Revenue Bond for Pollution Control: One Company's Perspective,
W76-09769 5G

Financing Pollution Control Projects in South Carolina Using Tax-Exempt Industrial Revenue Bonds,
W76-09770 5G

The Pollution Control Bond,
W76-09771 5G

BOREHOLES
Operation and Maintenance of a Deep-Well Water-Level Measurement Device, 'The Iron Horse',
W76-09835 4B

BORON
Removal of Dissolved Boron and Silicon During Estuarine Mixing of Sea and River Waters,
W76-09725 2K

Experimental Effect of Boron on Anticarious Action of Fluorine in Drinking Water, (In Russian),
W76-09885 5F

BOTTOM SAMPLING
Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

BOTTOM SEDIMENTS
Interstitial Protozoa and Algae of Louisiana Salt Marshes,
W76-09593 5C

Marine Soil Pollution and Self-Purification, (In Russian),
W76-09789 5A

Bottom Deposits of the Kuban Deltaic Limans, (In Russian),
W76-09935 2L

BOUGHTON MODEL
Parameter Optimization for Watershed Models,
W76-09853 2A

BOUNDARY CONDITIONS
Some Hard Lessons in Numerical Hydraulics,
W76-09952 8B

BRACKISH WATER
New Technologies in Water Purification and Their Application to Arid Lands,
W76-09481 3A

Chemistry of Dissolved Inorganic Carbon in Estuarine and Coastal Brackish Waters,
W76-09597 2L

Method and Apparatus for Converting Saline Water to Fresh Water,
W76-09871 3A

Method and Apparatus for the Conversion of an Aqueous Scale-Formed Liquid,
W76-09872 3A

BRAIDING
Modeling of Meandering and Braiding in Rivers,
W76-09974 2J

BRAZIL (BAY OF GUANABARA)
Balanidae as Pollution Indicators in the Bay of Guanabara, (In Portuguese),
W76-09823 5A

BREAKING WAVES
Probability Distributions of Breaking Wave Heights Emphasizing the Utilization of the Jonswap Spectrum,
W76-09721 2L

BREAKWATERS
Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

BRYOPHYTIC VEGETATION
The Aquatic and Subaquatic Bryophytic Vegetation of the Belgian Part of the River Sambre, Related to Ecological Conditions and Water Pollution, (In French),
W76-09986 5C

BUDGETING
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

BULGARIA (OGOSTA RIVER)
Pollution Influence on the Infusorial Fauna (Protozoa, Ciliata) of Bulgarian Rivers II. The Ogosta River and its Effluents,
W76-09714 5A

BUNGER VALVES
Howell Bunger Valves as Irrigation Outlets,
W76-09615 3F

CADMIUM
Environmental Pollution by Cadmium and Zinc Discharged from a Braun Tube Factory, (In Japanese)
W76-09405 5B

CALCIUM HYPOCHLORITE
On the Extermination of Polyclads: Calcium Hypochlorite (CaOC12) Treatment in the Period of High Water Temperature, (In Korean),
W76-09801 5C

CALIFORNIA
A Three-Dimensional Galerkin Finite Element Solution of Flow Through Multiaquifers in Sutter Basin, California,
W76-09562 2F

Contribution of Salts to the Water Potential of Woody Plants,
W76-09691 3C

Investment Sequencing, Allocation, and Learning in the Design of Water Resources Systems: An Empirical Application,
W76-09846 6A

Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

A Post Construction Survey of Several Manmade Islands Off the Coast of California,
W76-09911 2L

Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

Forecasts for the Sacremento River System,
W76-09967 2E

Results of Salinity Tests on the San Francisco Bay-Delta Hydraulic Model,
W76-09978 2L

CANADA
Observations of the California Undercurrent Off Washington and Vancouver Island,
W76-09584 2L

Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

An Environmental Research Program for Drilling in the Canadian Beaufort Sea,
W76-09912 5G

CANALS
Irrigation Systems in Taiwan: Management of a Decentralized Public Enterprise,
W76-09848 3F

Application of Water Quality Models to Finger Fill Canals,
W76-09981 5B

CANOPY
Micro-Climate Effects on Water Use Efficiency by Plants in an Arid Climate,
W76-09480 3B

CAPACITY EXPANSION
On the Capacity-Expansion of Desalination Plants and Storage Tanks,
W76-09618 3A

CAPTAN
Substitute Chemical Program - Initial Scientific and Minieconomic Review of Captan.
W76-09651 5C

CAPTAN METABOLITES
Substitute Chemical Program - Initial Scientific and Minieconomic Review of Captan.
W76-09651 5C

CARBOHYDRATE OXIDIZING MICROORGANISMS
Marine Soil Pollution and Self-Purification, (In Russian),
W76-09789 5A

CARBON
Chemistry of Dissolved Inorganic Carbon in Estuarine and Coastal Brackish Waters,
W76-09597 2L

CARBONATE ROCKS
Role of Carbonate Rocks in Modifying Flood Flow Behavior,
W76-09784 2A

CARBONATES
Using a CHN Analyzer to Reduce Carbonate Interference in Particulate Organic Carbon Analyses,
W76-09940 5A

CARBONIZATION EFFLUENTS
Microbial Aspects of Carbonisation Effluent Treatment,
W76-09712 5D

CARDIUM
Bottom Deposits of the Kuban Deltaic Limans, (In Russian),
W76-09935 2L

CARIES PREVENTION
Experimental Effect of Boron on Anticarious Action of Fluorine in Drinking Water, (In Russian),
W76-09885 5F

CENTRIFUGATION
Laboratory Centrifuge Saves Time and Money,
W76-09704 5D

CERATIUM-HIRUNDINELLA
The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

CEREAL CROPS
The Leaching Behavior of Different Nitrogen Sources in Lysimeter Experiments, (In German),
W76-09793 2G

CERIUM
Determination of Fluorine in Drinking Water with a Cerium(III)- or Lanthanum Alizarin Complex, (In Russian),
W76-09796 5A

CESIUM-137
Concentration of Cesium-137 in Aquatic Organisms, Water and Bottom Deposits of Water Bodies with a Different Mineral Compositions of the Water, (In Russian),
W76-09410 5C

CHANNEL BEHAVIOR
The Influence of Urbanization on Stream Channel Behavior,
W76-09744 4C

CHANNEL FLOW
The Influence of Urbanization on Stream Channel Behavior,
W76-09744 4C

CHARALES
The Vegetation of the 'Lukniany Lake' Nature Reserve in the Mazurian Lake District,(In Polish),
W76-09990 5C

CHEMCONTROL
Water Conservation in Arid-Zone Soils,
W76-09478 3B

Recent Trends in Weed Control in Freshwater,
W76-09921 4A

CHEMICAL ANALYSIS
Hydrologic and Chemical Analysis of the Principal Piedmontese Tributaries of Lago Maggiore in Relation to its Trophic Modifications, (In Italian),
W76-09576 5C

Water Chemistry of the St. Lawrence Estuary,
W76-09581 5A

Geochemical and Isotopic Analyses of Waters Associated with the Edwards Limestone Aquifer, Central Texas,
W76-09836 2K

CHEMICAL DEGRADATION
Radiation Chemical Destruction of Phenol in Oxygenated Aqueous Solutions,
W76-09530 5D

Effects of Gamma Radiation from Co60 on Dilute Aqueous Solutions of Linear Alkyl Sulfonate Surfactants and other Organic Pollutants,
W76-09531 5D

Effects of Gamma Irradiation on the Degradation of Dyes,
W76-09532 5D

Possible use of High-Level Radiation for the Degradation of Some Substances Present in Urban and Industrial Waters,
W76-09533 5D

CHEMICAL PRECIPITATION
Removal of Phosphate from Waste Water,
W76-09458 5D

CHEMICAL TREATMENT
Phosphate Removal--Tackling Eutrophication from the Other Side,
W76-09436 5D

CHEMICAL WASTES
Furnace for Thermal Treatment of Liquid Industrial Waste Waters Containing Toxic Organic Impurities (Pech' Dlya Termicheskogo Obezvrezhivaniya Zhidkikh Promyshlennykh Stokov S Toksicheskimi Organicheskimi Primesyami),
W76-09875 5D

CHEMICALS
Interaction Mechanisms of Radioactive, Chemical and Thermal Releases from the Nuclear Industry, Methodology for Considering Co-Operative Effects,
W76-09491 5C

Methods for Measurement of Biodegradability of Chemical Compounds,
W76-09599 5C

ERNOZEMS
Studies on the Relationships Between Moisture and Suction in Some Soils of the Tisa Plain, (In Rumanian),
W76-10000 2G

ESAPEAKE BAY
Research and Investigation of Geology, Mineral, and Water Resources of Maryland.
W76-09565 4A

Maryland Chesapeake Bay Beaches - General Distribution and Classification,
W76-09568 2L

Visual Observation of the Suspended Sediments and Nearshore Ice Signatures in Chesapeake Bay,
W76-09571 2L

Modeling the Chesapeake Bay and Tributaries: A Synopsis,
W76-09587 2L

Effects of Discharge from a Dredge Spoils Site in Carroll Island, Maryland,
W76-09647 5C

Microbial Degradation of Model Petroleum at Low Temperatures,
W76-09648 5C

Modeling of Three-Dimensional Flows in Estuaries,
W76-09977 2L

ISELING
Crop Response to Chiseling and Irrigation in Soils with a Compact A2 Horizon,
W76-09985 3F

LORINATION
Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

LORINE
Effluent Detention Ponds Dechlorinate Wastewater,
W76-09678 5D

LORINE ANALYZER
Effluent Detention Ponds Dechlorinate Wastewater,
W76-09678 5D

LOROPHYLL
Primary Production in the Frozen Lake Balaton,
W76-09991 5C

LOROPHYTA
An Observation of Water Quality and Red Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

N ANALYZER
Using a CHN Analyzer to Reduce Carbonate Interference in Particulate Organic Carbon Analyses,
W76-09940 5A

OLERA VILRIOS
Ecology of Cholera Vibrios, (In Russian),
W76-09409 5C

ROMATOGRAPHY
Presence and Some Properties of Bacteria of the Family Pseudomonadaceae in the River Danube, (In German),
W76-09792 5A

CITIES
The Distribution of Heavy Rainfall in a Major Urban Area,
W76-09734 2B

CLAMS
Pathology of Acute Poisoning with the Insecticide Sevin in the Bent-Nosed Clam, Macoma Nasuta,
W76-09649 5C

CLARIFIER TANKS
Sludge Removal System,
W76-09416 5D

CLAY-POLYMER SLUDGE
Van Clarifies Sludge Options,
W76-09438 5F

CLAYS
Volume Changes in Swelling Clays,
W76-09881 2G

CLEANING
Sewer Inspection: Checking it Out,
W76-09460 8G

CLEAR-CUTTING
Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

CLEAR LAKE (IOWA)
Calculation of Water Temperatures in Clear Lake, Iowa,
W76-09879 5B

CLIMATES
A Model for the Thermodynamic Growth of Sea Ice in Numerical Investigations of Climate,
W76-09722 2C

CLUSTER ANALYSIS
Role of Carbonate Rocks in Modifying Flood Flow Behavior,
W76-09784 2A

COAGULATION
Purification of Waste Water By Polymer Exchangers (Jatevesien puhdistaminen polymeerivaihtajilla),
W76-09675 5D

COAL MINES
Water-Resources Investigations of the U.S. Geological Survey in the Major Coal and Oil Shale Areas of Wyoming, 1975-76,
W76-09833 4A

COASTAL ENGINEERING
Energy Dissipation on a Rough Slope,
W76-09582 8B

Transverse Forces on Vertical Cylinders in Waves,
W76-09583 8B

COASTAL MARSHES
Linear Distribution of the High Marsh Vegetation Communities of the Lower Eastern Shore and its Geological Significance,
W76-09570 2L

COASTAL STRUCTURES
Energy Dissipation on a Rough Slope,
W76-09582 8B

Transverse Forces on Vertical Cylinders in Waves,
W76-09583 8B

COASTS
The Relationship of the Nearshore Longshore Bar and Sand Waves at Ocean City, Maryland,
W76-09569 2L

Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

COBALT-60
Effects of Gamma Radiation from Co60 on Dilute Aqueous Solutions of Linear Alkyl Sulfonate Surfactants and other Organic Pollutants,
W76-09531 5D

Fission Product Gamma-Ray Sources as an Alternative to Cobalt-60 Sources for Sewage Sludge Sterilization,
W76-09541 5D

Dosimetry at a High-Activity Co60 Waste Treatment Facility,
W76-09547 5D

COLD REGIONS
Oil in the Arctic,
W76-09902 5C

COLIFORMS
The Microbiological Pollution of North Sea and English Channel Shore, (In French),
W76-09657 5C

Steroids in Effluents,
W76-09696 5A

Hygienic Assessment of Changes in Mineral Water Properties During its Treatment for Use in Internal Balneotherapeutic Procedures, (In Russian),
W76-09795 5C

The Distribution of Coliforms in Fresh Water, (In Japanese),
W76-09934 5C

COLLOIDS
Purification of Waste Water By Polymer Exchangers (Jatevesien puhdistaminen polymeerivaihtajilla),
W76-09675 5D

COLORADO
Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colorado,
W76-09761 2F

Appraisal of Water Resources of Northwestern El Paso County, Colorado,
W76-09828 2E

COLORIMETRY
Determination of Tetramethylthiuram Disulfide (TMTD) in Water and Air by Colimetry, (In Russian),
W76-09590 5A

COLUMBIA RIVER
Cycling of Fe55 and Zn65 in Columbia River Carp Following Reactor Shutdown,
W76-09508 5C

COMBINED EFFECTS (POLLUTANTS)
Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment,
W76-09490 5C

COMBINED SEWERS
Give Stormwater Pollutants the Spin,
W76-09461 5D

An Application of the Storm Water Management Model,
W76-09738 5D

Is the Separation of Sewers Desirable,
W76-09739 5D

Combined Sewage Overflows - Frequency, Environmental Effects, and a Corrective Program,
W76-09741 5D

COMBINED TREATMENT
Apparatus for Treating Industrial and Domestic Waste Waters,
W76-09429 5D

COMMERCIAL FISH
The Mercury Content of Industrial Fish Products: Its Relative Variation with the Treatment (Cooking in Salt Water, Pickling and Fish Production), (In Spanish),
W76-09802 5C

COMPUTER ESTIMATES
Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colorado,
W76-09761 2F

COMPUTER MODELS
ILLUDAS - The Illinois Urban Drainage Area Simulator,
W76-09735 2E

Hydrologic Forecasting for the Ohio River Waterway,
W76-09944 2E

Anisotropic Sand Transport in Tidal Inlets,
W76-09955 2L

COMPUTER PROGRAMS
Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

Proposed Revision to the Modified Einstein Method of Computing Total Sediment Discharge,
W76-09842 2J

Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

CONCEPTUAL MODELS
Conceptual Hydrological Model for an Averaged-Sized Catchment Area, I. Concepts and Relationships,
W76-09579 2A

CONDENSATION
Apparatus and Method for Recovering Pure Water from Natural Sources and Industrial Polluted Waste Sources,
W76-09867 5G

CONDENSERS
Operation of Hydrogenerator as Synchronous Condensor,
W76-09637 8C

CONFERENCES
Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment,
W76-09490 5C

Radiation for a Clean Environment.
W76-09512 5D

National Conference of District Chiefs, Albuquerque, New Mexico, September 28-October 3, 1975--Proceedings,
W76-09838 2A

CONFINED WATER
Method and Composition for Preventing Water Contaminated with Industrial Waste from Seeping Through Soil Containing Said Water,
W76-09858 5G

CONNECTICUT
A Floodplain Management Framework with Structural and Non-Structural Measures,
W76-09754 6F

CONSTRUCTION
Construction Planning of a Hydro Power Station,
W76-09616 8C

Erosion Control During Pipeline Construction,
W76-09743 5G

Storm-Period Variables Affecting Sediment Transport from Urban Construction Areas,
W76-09840 2J

Urban-Area Sediment Yield--Effects of Construction-Site Conditions and Sediment-Control Methods,
W76-09841 4D

CONSTRUCTION MATERIALS
Value Engineered Sewage Plant Moves Fast,
W76-09672 5D

CONTACT STABILIZATION
Technique Alternatives for a Package Stabilization Plant,
W76-09705 5D

CONTAINER FACILITIES
Specifications for Container Facilities by Simulation,
W76-09943 6A

CONTROL
Cost Effectiveness of Release Prevention Controls for Tritium and Krypton-85,
W76-09506 5G

Monitoring and Automatic Filter Control of the Dreis-Tiefenback Treatment Plant (Betriebsueberwachung und Automatische Filtersteuerung der Aufbereitungsanlage Dreis-Tiefenbach),
W76-09679 5F

CONVEYANCE STRUCTURES
Irrigation Vehicle,
W76-09869 3F

COOLING PONDS
Effect of Heated Water Discharge of Thermal and Nuclear Power Plants on Invertebrates of Cooling Ponds, (In Russian),
W76-09811 5C

COOLING TOWERS
Water Use Policies and Power Plant Economics,
W76-09776 5G

COOLING WATER
Environmental Responses to Thermal Discharges from the Chesterfield Station, James River, Virginia,
W76-09652 5C

COPEPODS
The Relationship Between Temperature and Duration of Egg Development in Some Epiphytic Cladocera and Copepoda from the River Thames, Reading, with a Discussion of Temperature Functions,
W76-09659 5C

Organic Productivity of Inshore and Offshore Waters of Barbados: A Study of the Island Mass Effect,
W76-09938 5C

Changes in the Population of Cladocera and Copepoda in Three Fishponds of the Dombes (In French),
W76-09995 2

COPROSTANOL
Steroids in Effluents,
W76-09696 5A

CORES
Upward Water Movement in Field Cores,
W76-09726 3I

CORN (FIELD)
Effect of Different Spring Soil Moisture Level on Moisture Stress,
W76-09412 3I

Crop Response to Chiseling and Irrigation i Soils with a Compact A2 Horizon,
W76-09985 3I

CORPS OF ENGINEERS PROJECTS
Hydroelectric Power Potential at Corps of En gineers Projects. Recommendations and Executive Summary,
W76-09764 6I

Hydroelectric Power Potential at Corps of En gineers Projects,
W76-09765 6I

CORROSION
Method and Apparatus for the Conversion o an Aqueous Scale-Formed Liquid,
W76-09872 3A

COST ALLOCATION
The Cost Assignment of the Cooperative Wate Resource Development: A Game Theoretic Approach,
W76-09619 6A

Investment Sequencing, Allocation, and Learning in the Design of Water Resources Systems An Empirical Application,
W76-09846 6A

COST ANALYSIS
Cost of Producing Crops in the Irrigate Southwest, Part II: New Mexico,
W76-09475 3

COST COMPARISONS
Sioux Falls Restores Four Wells with Collecto Pipe,
W76-09510 3

Water Authority Rate Making,
W76-09717 6

A Guide to the Selection of Cost-Effectiv Wastewater Treatment Systems,
W76-09772 5

Wastewater Sludge Utilization and Disposa Costs,
W76-09773 5

Costs of Wastewater Treatment by Land Application,
W76-09774 5D

OST EFFECTIVENESS
The Cost-Effectiveness of Water Resources Systems Considering Inadequate Hydrological Data,
W76-09626 6A

OST MINIMIZATION
On the Capacity-Expansion of Desalination Plants and Storage Tanks,
W76-09618 3A

Least Cost Design of Activated Sludge Systems,
W76-09638 5D

Development of a Dynamic Programming Model for the Regionalization and Staging of Wastewater Treatment Plants,
W76-09845 5D

OSTS
Cost Effectiveness of Release Prevention Controls for Tritium and Krypton-85,
W76-09506 5G

Costs and Hygienic Necessity of Sewage Sludge Pasteurization in Switzerland,
W76-09542 5D

A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

Least Cost Design of Activated Sludge Systems,
W76-09638 5D

Value Engineered Sewage Plant Moves Fast,
W76-09672 5D

Landslide Hazard in the United States: A Research Assessment,
W76-09781 6F

OTTON
Planting Pattern, Plant Population, Irrigation, and Insect Interactions in Cotton.
W76-09998 3F

REEKS
Re-Evaluation of the Effects of Man-Made Modifications on Gordon Creek Between 1887 and 1973 and Especially as Regards its Fish Fauna,
W76-09407 4C

ROP PRODUCTION
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

Dependence of Pasture Grass Yield on Soil Moisture Level, (In Russian),
W76-09930 4A

Crop Response to Chiseling and Irrigation in Soils with a Compact A2 Horizon,
W76-09985 3F

ROP RESPONSE
Crop Response to Chiseling and Irrigation in Soils with a Compact A2 Horizon,
W76-09985 3F

ROP YIELD
Effect of Different Spring Soil Moisture Levels on Moisture Stress,
W76-09412 3F

CROSSLINKED AROMATIC POLYAMIDE MEMBRANES
Reverse Osmosis Process Using Crosslinked Aromatic Polyamide Membranes,
W76-09877 3A

CRUSTACEA
Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

CRUSTACEANS
Generation Time, Length of Life, Instar Duration and Frequency of Moulting, and their Relationship to Temperature in Eight Species of Cladocera from the River Thames, Reading,
W76-09658 5C

The Relationship Between Temperature and Duration of Egg Development in Some Epiphytic Cladocera and Copepoda from the River Thames, Reading, with a Discussion of Temperature Functions,
W76-09659 5C

Changes in the Population of Cladocera and Copepoda in Three Fishponds of the Dombes, (In French),
W76-09995 2I

CULTIVATED LAND
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

CURRENTS (WATER)
Finite-Amplitude Baroclinic Disturbances in Downstream Varying Currents,
W76-09560 2L

Velocity Observations in the West Passage of Narragansett Bay: A Partially Mixed Estuary,
W76-09561 2L

CYANIDE
Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

CYANOPHYTA
Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

An Observation of Water Quality and Red Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

CYCLING NUTRIENTS
Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

Phosphorus and Nitrogen Cycle on a Transect in Lake Ontario During the International Field Year 1972-1973 (IFYGL),
W76-09594 5C

Materials Budgets of Lake Champlain,
W76-09756 5A

Sedimentation and Phosphorus Balance in Lake Lucerne (Horw Bay) and in the Rotsee, (In German),
W76-09790 5C

CYCLOTELLA-BODANICA
The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

CYTOLOGICAL STUDIES
Effecto De La Temperatura De Aclimatacion Sobre La Proliferacion De Precursores Eritropoyeticos En Carassius Auratus, (The Effect of Acclimation Temperature on Proliferation of Erythropoietic Precursors in Carrassius Auratus and on the Uptake of Tritiated Thymidine in Haematopoietic and Intestinal Tissue),
W76-09509 5C

DAMAGES
A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

DAPHNIA
A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

The Action of Some Pollutants on the Growth of Daphnia Magna Strauss, (In French),
W76-09937 5C

DAPHNIA PULEX
A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

DATA COLLECTIONS
On Long-Term Stability of Zooplankton Composition,
W76-09600 5C

A Water-Land Use Management Model for the Sevier River Basin Phases I and II,
W76-09844 4A

DATA PROCESSING
Evaluation of Mean Square Error Involved in Approximating the Areal Average of a Rainfall Event by a Discrete Summation,
W76-09572 2B

How to Build a Better Bench Sheet,
W76-09701 5D

DATA REQUIREMENTS
Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W76-09622 4A

DECANTING (WASTES)
Sludge Control and Decant System,
W76-09419 5D

DECHLORINATION
Effluent Detention Ponds Dechlorinate Wastewater,
W76-09678 5D

DECISION MAKING
Energy Consumption and Fuel Choice by Residential and Commercial Consumers in the United States,
W76-09609 6A

DECOMPOSING ORGANIC MATTER
The Role of Microflora in the Productivity of a Salmon Breeding Lake, (In Russian),
W76-09818 5C

Biological Production Processes in the Ural River, (In Russian),
W76-09919 5C

DEEP WELLS
Operation and Maintenance of a Deep-Well Water-Level Measurement Device, 'The Iron Horse',
W76-09835 4B

DEEPWATER PORTS
Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

Recommended Procedure for Developing Deepwater Ports Design Criteria,
W76-09907 5G

DEHYDROGENASE ACTIVITY (SLUDGE)
Development of a Measurement Method for the Total Activity Rate of Activated Sludge (Contribution a La Mise Au Point D'une Methode De Mesure Du Taux D'Activite Totale Des Boues Activees),
W76-09695 5D

DELAWARE RIVER
Combined Sewage Overflows - Frequency, Environmental Effects, and a Corrective Program,
W76-09741 5D

DELTAS
Bottom Deposits of the Kuban Deltaic Limans, (In Russian),
W76-09935 2L

River Delta Computer Simulation Model (Simudelt),
W76-09954 2L

Results of Salinity Tests on the San Francisco Bay-Delta Hydraulic Model,
W76-09978 2L

DEMAND
Methdological Issues in the Econometric Estimation of Energy Demand Elasticities,
W76-09607 6A

The Use of Econometrics to Project Energy Demands,
W76-09611 6A

Energy Models and Forecasts: A User's Point of View,
W76-09612 6A

Energy Models and Forecasts: A User's Point of View,
W76-09613 6A

DENITRIFICATION
Waste Treatment Apparatus,
W76-09432 5D

Nitrates: What's Happening in Britain,
W76-09451 5D

Possibilities and Limits of Extended Waste Water Purification (Moeglichkeiten und Grenzen der Weitergehanded Abwasserreinigung),
W76-09683 5D

The Relationship Between Dissimilatory Nitrate Reduction and Oxygen Uptake by Cells of an Alcaligenes Strain in Flocs and in Suspension and by Activated Sludge Flocs,
W76-09686 5D

DENMARK
River and Estuary Modeling with the Siva System,
W76-09982 2A

DESALINATION
New Technologies in Water Purification and Their Application to Arid Lands,
W76-09481 3A

Water Utilization and Soil Salinity: Control in Arid Zone Agriculture,
W76-09482 3C

The Desert War on Pollution,
W76-09711 5D

Method and Apparatus for Converting Saline Water to Fresh Water,
W76-09871 3A

Method and Apparatus for the Conversion of an Aqueous Scale-Formed Liquid,
W76-09872 3A

Preparation of Reverse Osmosis Membranes by Complete Evaporation of the Solvent System,
W76-09876 3A

Reverse Osmosis Process Using Crosslinked Aromatic Polyamide Membranes,
W76-09877 3A

DESALINATION PLANTS
On the Capacity-Expansion of Desalination Plants and Storage Tanks,
W76-09618 3A

DESALINATION PROCESSES
Supported Semi-Permeable Membranes,
W76-09863 3A

DESIGN
Design of Water Resources Project with Inadequate Data in India - General and Particular Case Studies,
W76-09621 4A

Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W76-09622 4A

The Design of Water Quality Management Projects with Inadequate Data,
W76-09623 5G

Improved Techniques for Water Resource Systems Design,
W76-09624 4A

Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

Least Cost Design of Activated Sludge Systems,
W76-09638 5D

Wastewater Treatment in New Zealand,
W76-09670 5D

Investment Sequencing, Allocation, and Learning in the Design of Water Resources Systems: An Empirical Application,
W76-09846 6A

DESIGN CRITERIA
Monitoring Wells,
W76-09558 4B

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

Recommended Procedure for Developing Deepwater Ports Design Criteria,
W76-09907 5G

DESIGN DATA
Maximum Information Obtainable from Inadequate Design Data: from Multivariate to Bayesian Methods,
W76-09625 4A

DESIGN FLOOD
Effect of Sequence Length n on the Choice of Assumed Distribution of Floods,
W76-09851 4A

DETENTION PONDS (WASTES)
Effluent Detention Ponds Dechlorinate Wastewater,
W76-09678 5D

DEWATERING
Effects of Gamma Radiation at Pilot Plant Level Compared with the Effects of Pasteurization on the Dewatering of Sewage Sludge,
W76-09550 5D

Dewatering of Sewage Sludge Viewed as Part of the Purification Process -- Planning Criteria (Klaerschlammentwaesserung als Teil der Gesamten Klaeraufgabe Betrachtet -- Planungskriterien),
W76-09681 5D

Industrial Experience of Sewage Sludge Processing with Zimpro Installations in the Netherlands,
W76-09709 5D

DIATOMS
Organic Productivity of Inshore and Offshore Waters of Barbados: A Study of the Island Mass Effect,
W76-09938 5C

The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

DIPTERA
Insect Growth Regulators for the Control of Aquatic Midges,
W76-09997 5G

DIQUAT
Comparative Effects of Diquat Plus Copper Sulfate on Aquatic Organisms,
W76-09821 5C

DISAGGREGATION MODELS
Disaggregation Models in Hydrology Revisited,
W76-09573 2A

DISINFECTION
Ozone Provides Alternative for Secondary Effluent Disinfection. Part 1,
W76-09445 5D

Methods for Reducing the Infection Hazard of Waste-Water Sludge,
W76-09514 5D

Data on the Disinfection of Liquid Manure by Gamma Irradiation at Baja, Hungary,
W76-09528 5D

Practical Aspects of the Pasteurization of Sewage Sludge by Electron Irradiation,
W76-09540 5D

Use of Sewage Sludge as Fodder,
W76-09554 5D

Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

DISPERSION
Characteristics of Coastal Circulation Affecting the Transport and Dispersion of Material Released from the Nuclear Industry,
W76-09504 5C

Longitudinal Dispersion Coefficients for Streams,
W76-09589 5B

Particle-Laden Jets with Application to Ocean Dumping,
W76-09959 5B

Sampling Network Design for Dispersion Verification,
W76-09961 5B

SPERSION MODELS
Sampling Network Design for Dispersion Verification,
W76-09961 5B

SSOLVED OXYGEN
Environmental Responses to Thermal Discharges from the Chesterfield Station, James River, Virginia,
W76-09652 5C

Dissolved Oxygen Analyzer T-01 Analyzer. A Simple Apparatus for Electrochemical Determination of Dissolved Oxygen in Water (Tlenomierz T-01 uproszczony przyrzad elektrochemicznego oznaczania tleunu roxpuszczonego w roztworach wodnych),
W76-09688 5A

An Observation of Water Quality and Red Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

SSOLVED SOLIDS
The Concentration of Dissolved Solids and River Flow,
W76-09577 5B

STRIBUTION
Presence and Some Properties of Bacteria of the Family Pseudomonadaceae in the River Danube, (In German),
W76-09792 5A

Effect of Sequence Length n on the Choice of Assumed Distribution of Floods,
W76-09851 4A

The Distribution of Coliforms in Fresh Water, (In Japanese),
W76-09934 5C

STRIBUTION SYSTEMS
Modern Techniques of Waste Detection,
W76-09685 5F

Irrigation System Pivot Swivel,
W76-09866 3F

STRICT OF COLUMBIA AREA
Storm-Period Variables Affecting Sediment Transport from Urban Construction Areas,
W76-09840 2J

OCKS
Specifications for Container Facilities by Simulation,
W76-09943 6A

RAINAGE
Sewage Septic System for a Plurality of Drain Fields,
W76-09430 5D

Management of Flood Control and Drainage in the Urbanizing Zone,
W76-09750 4A

RAINAGE SYSTEMS
Field Drainage with Manifold Well Points,
W76-09586 5G

DRAINAGE WELLS
Field Drainage with Manifold Well Points,
W76-09586 5G

DREDGING
Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

Environmental Impact Study of Offshore Sand and Gravel Mining,
W76-09910 6G

DRIP LEVEL IRRIGATION
Drip Level Irrigation,
W76-09870 3F

DROUGHT RESISTENCE
Drought Adaptations in Two Californian Evergreen Sclerophylls,
W76-09476 2I

DROUGHT TOLERANCE
Effectiveness of Water Utilization by Plants, (In Ukranian),
W76-09809 2D

DROUGHTS
The Sahelian Drought and Its Demographic Implications,
W76-09486 6G

DUEMMER LAKE (WEST GERMANY)
The Algal Population of Duemmer Lake in the Years 1970/71, (In German),
W76-09812 5C

DYES
Effects of Gamma Irradiation on the Degradation of Dyes,
W76-09532 5D

DYNAMIC PROGRAMMING
Aqueduct Optimization with Intermediate Storage,
W76-09636 4A

Development of a Dynamic Programming Model for the Regionalization and Staging of Wastewater Treatment Plants,
W76-09845 5D

ECOLOGICAL DISTRIBUTION
The Aquatic and Subaquatic Bryophytic Vegetation of the Belgian Part of the River Sambre, Related to Ecological Conditions and Water Pollution, (In French),
W76-09986 5C

ECOLOGICAL EFFECTS
Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

ECONOMETRICS
The Use of Econometrics to Project Energy Demands,
W76-09611 6A

Energy Models and Forecasts: A User's Point of View,
W76-09613 6A

ECONOMIC ANALYSIS
Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

ECONOMIC EFFICIENCY
An Economist's View of the Oceans,
W76-09617 6E

A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

Costs of Wastewater Treatment by Land Application,
W76-09774 5D

ECONOMIC IMPACT
Economic Analysis of Effluent Guidelines: Grain Processing Segment of the Grain Mills Industry,
W76-09775 5G

Economic Analysis of Effluent Guidelines: Fertilizer Industry,
W76-09777 5G

Economic Analysis of Effluent Guidelines: Apple, Citrus and Potato Processing Segments of the Canned and Preserved Fruits and Vegetable Industry,
W76-09779 5G

Economic Analysis of Effluent Guidelines: Insulation Fiberglass Industry.
W76-09780 5G

Offshore Petroleum and New England - A Study of the Regional Economic Consequences of Potential Offshore Oil and Gas Development,
W76-09893 6B

ECONOMIC JUSTIFICATION
Offshore Petroleum and New England - A Study of the Regional Economic Consequences of Potential Offshore Oil and Gas Development,
W76-09893 6B

ECONOMICS
Energy Modeling and Forecasting.
W76-09602 6A

Coupled Energy System-Economic Models,
W76-09605 6A

Energy Policy and Economic Growth,
W76-09606 6A

Methdological Issues in the Econometric Estimation of Energy Demand Elasticities,
W76-09607 6A

On the Capacity-Expansion of Desalination Plants and Storage Tanks,
W76-09618 3A

Physical and Economic Aspects Associated with Runoff from Urban Growth: A Methodological Approach,
W76-09749 4C

ECOSYSTEMS
Development of Laboratory Model Ecosystems as Early Warning Elements of Environmental Pollution,
W76-09643 5C

Ecosystem Modeling,
W76-09645 5C

Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

EDWARDS LIMESTONE AQUIFER (TEX)
Geochemical and Isotopic Analyses of Waters Associated with the Edwards Limestone Aquifer, Central Texas,
W76-09836 2K

EFFLUENTS
Representative Dirty Water Sampling,
W76-09702 5A

EGGS
A Description of Atlantic Mackerel, Scomber Scombrus, Eggs and Early Larvae,
W76-09656 2I

The Relationship Between Temperature and Duration of Egg Development in Some Epiphytic Cladocera and Copepoda from the River Thames, Reading, with a Discussion of Temperature Functions,
W76-09659 5C

EINSTEIN METHOD (MODIFIED)
Proposed Revision to the Modified Einstein Method of Computing Total Sediment Discharge,
W76-09842 2J

EL PASO COUNTY (COLO)
Appraisal of Water Resources of Northwestern El Paso County, Colorado,
W76-09828 2E

ELECTRIC CURRENTS
Effect of an Electric Current on Water Stability of the Structure of Salinized Solonetz, (In Russian),
W76-09804 2G

ELECTRIC POWER COSTS
Water Use Policies and Power Plant Economics,
W76-09776 5G

ELECTRIC POWER PRODUCTION
Arizona Energy: A Framework for Decision.
W76-09484 6D

Power Generation in Arizona and Its Environmental Implications,
W76-09485 6D

Hydroelectric Power Potential at Corps of Engineers Projects. Recommendations and Executive Summary,
W76-09764 6B

Hydroelectric Power Potential at Corps of Engineers Projects,
W76-09765 6B

ELECTRICAL RESISTANCE
Comparative Study in Measuring Fluid Surface Tension and Fluid Content with the Aid of Electrical Resistance Elements 'In Situ' and in the Laboratory, (In Flemish),
W76-09923 2G

ELECTRODES
Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

ELECTROLYSIS
Water Treatment Process and Apparatus,
W76-09855 5D

ELECTRON ACCELERATOR
Disinfection of Sludge and Waste-Water by Irradiation with Electrons of Low Accelerating Voltage,
W76-09521 5D

ELECTRON ACCELERATORS
Prospects for High-Energy Electron Irradiation of Waste-Water Liquid Residuals,
W76-09538 5D

An Electron Accelerator with Electrons of Low-Accelerating Voltage for Irradiating Sewage Sludge and Waste Water,
W76-09539 5D

Practical Aspects of the Pasteurization of Sewage Sludge by Electron Irradiation,
W76-09540 5D

ELECTROPLATING INDUSTRY
Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

ENERGY
Energy Modeling and Forecasting.
W76-09602 6A

Energy Projections--Relationship to Policy Issues,
W76-09603 6A

Coupled Energy System-Economic Models,
W76-09605 6A

Energy Policy and Economic Growth,
W76-09606 6A

Methdological Issues in the Econometric Estimation of Energy Demand Elasticities,
W76-09607 6A

Energy Systems: Modeling and Policy Planning,
W76-09608 6A

Energy Consumption and Fuel Choice by Residential and Commercial Consumers in the United States,
W76-09609 6A

Joint USA/Japan Project on Global Systems Analysis and Simulation (GLOSAS) of Energy, Resources, and Environmental (ERE) Systems,
W76-09610 6A

The Use of Econometrics to Project Energy Demands,
W76-09611 6A

Energy Models and Forecasts: A User's Point of View,
W76-09612 6A

Energy Models and Forecasts: A User's Point of View,
W76-09613 6A

Hydroelectric Power Potential at Corps of Engineers Projects. Recommendations and Executive Summary,
W76-09764 6B

Hydroelectric Power Potential at Corps of Engineers Projects,
W76-09765 6B

ENERGY CONSUMPTION
Energy Consumption and Fuel Choice by Residential and Commercial Consumers in the United States,
W76-09609 6A

ENERGY CONVERSION
Arizona Energy: A Framework for Decision.
W76-09484 6D

ENERGY DISSIPATORS
Energy Dissipation on a Rough Slope,
W76-09582 8B

ENGINEERING
Hydrology for Engineers, Second Edition,
W76-09661 8B

ENGINEERING HYDROLOGY
Hydrology for Engineers, Second Edition,
W76-09661 8I

ENGINEERING RECLAMATION
Engineering Reclamation, A Most Importan
Means of Increasing Fish Productivity o
Waters, (In Russian),
W76-09800 8

ENGLAND
Investigations into the Yield of an Existing Sur
face Reservoir and Aquifer System,
W76-09631 3I

ENTERIC BACTERIA
Presence and Some Properties of Bacteria o
the Family Pseudomonadaceae in the Rive
Danube, (In German),
W76-09792 5A

ENTEROCOCCI
Hygienic Assessment of Changes in Miner
Water Properties During its Treatment for Us
in Internal Balneotherapeutic Procedures, (I
Russian),
W76-09795 5C

ENTRAINMENT
Effect of Entrainment in Power Station Coolin
Systems Studied Using Periphytic Commun
ties,
W76-09498 5C

ENVIRONMENT
NEPA and a State's Role in Water Resource
Management,
W76-09627 6I

The Contribution of a Water Informatio
System for Environmental Planning in Min
nesota,
W76-09753 6C

ENVIRONMENTAL EFFECTS
The Sahelian Drought and Its Demographic Im
plications,
W76-09486 6C

Combined Effects of Radioactive, Chemica
and Thermal Releases to the Environment,
W76-09490 5C

Interaction Mechanisms of Radioactive
Chemical and Thermal Releases from th
Nuclear Industry, Methodology for Consider
ing Co-Operative Effects,
W76-09491 5C

Impact of Thermal and Radioactive Effluent
on a Tropical Nearshore Ecosystem,
W76-09492 5C

The Effect of Temperature on the Uptake an
Retention of Co 60 and Zn 65 by the Commo
Shrimp Crangon Crangon (L),
W76-09493 5C

Influence De La Temperature Sur La Con
tamination D'Especes Marines Par Le Fer-59
(Influence of Temperature on the Contamina
tion of Marine Species by Iron-59),
W76-09494 5C

Swedish Studies on Combination Effects o
Thermal Discharges in the Aquatic Environ
ment, Some Aspects of Power Plant Siting Po
icy,
W76-09495 5C

Evaluation of the Thermal Effects of a Nuclea
Power Plant,
W76-09496 5C

Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

Effect of Entrainment in Power Station Cooling Systems Studied Using Periphytic Communities,
W76-09498 5C

Possible Future Effects on the Population of the Federal Republic of Germany of Gaseous Radioactive Effluents from Nuclear Facilities,
W76-09499 5A

Synergistic Effects of Atmospheric Releases of Radioactive Gases and SO2 in Inducing Nucleation in the Atmosphere,
W76-09500 5A

Synergistic Effects of Airborne Emissions from Nuclear Power Plants,
W76-09503 5A

Characteristics of Coastal Circulation Affecting the Transport and Dispersion of Material Released from the Nuclear Industry,
W76-09504 5C

A Site Study of the Multiple Effects of Thermal Releases on the Aquatic Life in an Estuarine Area,
W76-09505 5C

Cost Effectiveness of Release Prevention Controls for Tritium and Krypton-85,
W76-09506 5G

The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

Cycling of Fe55 and Zn65 in Columbia River Carp Following Reactor Shutdown,
W76-09508 5C

Effecto De La Temperatura De Aclimatacion Sobre La Proliferacion De Precursores Eritropoyeticos En Carassius Auratus, (The Effect of Acclimation Temperature on Proliferation of Erythropoietic Precursors in Carrassius Auratus and on the Uptake of Tritiated Thymidine in Haematopoietic and Intestinal Tissue),
W76-09509 5C

Environmental Quality Research, First Annual Report,
W76-09654 5C

Generation Time, Length of Life, Instar Duration and Frequency of Moulting, and their Relationship to Temperature in Eight Species of Cladocera from the River Thames, Reading,
W76-09658 5C

Effects of Shock Temperature on Biological Systems,
W76-09660 5C

A Primer on Floodplain Dynamics,
W76-09831 2E

Water-Resources Investigations of the U.S. Geological Survey in the Major Coal and Oil Shale Areas of Wyoming, 1975-76,
W76-09833 4A

Combination Providing Safety Berthing, Unloading of Oil, and Conduit Carriage to Refineries on Land, of Large Deep-Sea-Requiring Tankers,
W76-09865 5G

Assessing Potential Ocean Pollutants,
W76-09889 5G

Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

Oil in the Arctic,
W76-09902 5C

Engineering and Ecological Evaluation of Artificial-Island Design, Rincon Island, Punta Gorda, California,
W76-09903 2L

Recommended Procedure for Developing Deepwater Ports Design Criteria,
W76-09907 5G

Environmental Impact Study of Offshore Sand and Gravel Mining,
W76-09910 6G

A Post Construction Survey of Several Manmade Islands Off the Coast of California,
W76-09911 2L

An Environmental Research Program for Drilling in the Canadian Beaufort Sea,
W76-09912 5G

Academic Data-Needs for Environmental Assessments of Offshore Technological Operations,
W76-09914 6G

Coast Guard's Response to Spilled Oil,
W76-09915 5A

ENVIRONMENTAL IMPACT

NEPA and a State's Role in Water Resources Management,
W76-09627 6E

Environmental Impact Study of Offshore Sand and Gravel Mining,
W76-09910 6G

ENVIRONMENTAL PLANNING

The Contribution of a Water Information System for Environmental Planning in Minnesota,
W76-09753 6G

ENVIRONMENTAL SANITATION

Radiation for a Clean Environment.
W76-09512 5D

Types and Treatment of Sewage Sludges Practice in the Federal Republic of Germany,
W76-09513 5D

Methods for Reducing the Infection Hazard of Waste-Water Sludge,
W76-09514 5D

Current Technology and Advances in True Re-Use of Effluents,
W76-09515 5D

Public Health Aspects of Waste-Water Treatment,
W76-09516 5D

Radiation Treatment of Wastes, A Review,
W76-09517 5D

The Need for the Use of High-Level Radiation in Water Treatment and in Waste-Water (Sewage) Treatment,
W76-09518 5D

Viruses and Ionizing Radiation in Respect to Waste-Water Treatment,
W76-09520 5D

Disinfection of Sludge and Waste-Water by Irradiation with Electrons of Low Accelerating Voltage,
W76-09521 5D

Treatment of Sewage Sludge with Combinations of Heat and Ionizing Radiation (Thermoradiation),
W76-09523 5D

Synergistic Effects of Irradiation of Waste-Water.
W76-09524 5D

Gamma Irradiation for Sewage Treatment at US Army Facilities,
W76-09525 5D

Scope for Utilizing Gamma Radiation for Microbiological Control of Sewage Waste-Water in India,
W76-09526 5D

Sanitary Effect of Gamma Irradiation on Sewage Sludge,
W76-09527 5D

Degradation of Persistent Organochlorine Pollutants by Gamma Radiation and its Possible use for Waste-Water Treatment,
W76-09534 5D

Comparison of the Chemical Effects of Oxone and of Irradiation on Organic Impurities in Water,
W76-09535 5D

Alternative High-Level Radiation Sources for Sewage and Waste-Water Treatment,
W76-09536 5D

Use of High-Power Electron Beam Radiation for the Treatment of Municipal and Industrial Wastes,
W76-09537 5D

Prospects for High-Energy Electron Irradiation of Waste-Water Liquid Residuals,
W76-09538 5D

Practical Aspects of the Pasteurization of Sewage Sludge by Electron Irradiation,
W76-09540 5D

Fission Product Gamma-Ray Sources as an Alternative to Cobalt-60 Sources for Sewage Sludge Sterilization,
W76-09541 5D

Costs and Hygienic Necessity of Sewage Sludge Pasteurization in Switzerland,
W76-09542 5D

Pilot Plant Experience in the Treatment of Industrial and Municipal Waste-Water by Means of Radiation-Induced Oxidation,
W76-09545 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

Dosimetry at a High-Activity Co60 Waste Treatment Facility,
W76-09547 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Bacterial and Parasitological Studies AfterIrradiation.
W76-09548 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Experiments on the Inactivation of Viruses in Sewage Sludge after Radiation Treatment,
W76-09549 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Results on the Effect of Differently Treated Sewage Sludge on Plants and Soil,
W76-09551 5D

Use of Sewage Sludge as Fodder,
W76-09554 5D

Potential of Radiation Sterilization in Solid Waste Treatment, A Status Report,
W76-09555 5D

ENZYMES
Development of a Measurement Method for the Total Activity Rate of Activated Sludge (Contribution a La Mise Au Point D'une Methode De Mesure Du Taux D'Activite Totale Des Boues Activees),
W76-09695 5D

EPHEMERAL STREAMS
Water System Behavior: Determinants in an Arid Region,
W76-09483 4A

EQUATIONS
Stability Analysis of Infiltration,
W76-09588 2G

Proposed Revision to the Modified Einstein Method of Computing Total Sediment Discharge,
W76-09842 2J

EROSION
Effects of Management Practices on Water Quality and Quantity: Baltimore, Maryland, Municipal Watersheds,
W76-09464 4D

A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

Overview of the Urban Erosion and Sedimentation Processes,
W76-09731 4C

Predicting Sediment Yield in Urban Areas,
W76-09746 4D

Investigations on the Erodibility of a Deeply Plowed Gray-Brown Podzolic Soil from Loess on a Slope by Means of Simulated Rain, (In German),
W76-09917 2J

EROSION CONTROL
National Symposium on Urban Rainfall and Runoff and Sediment Control,
W76-09729 4C

Evaluation and Control of Soil Erosion in Urbanizing Watersheds,
W76-09742 4D

Erosion Control During Pipeline Construction,
W76-09743 5G

Legal Approaches to Control Runoff and Sedimentation: A Case Study of Georgia,
W76-09747 4D

The Erodibility of Pumice Soils of the North Island, New Zealand,
W76-09787 4D

ERTS
Research and Investigation of Geology, Mineral, and Water Resources of Maryland.
W76-09565 4A

Differentiation of Serpentinitic from Non-Serpentinitic Ultramafic Rocks in ERTS-1 MSS Imagery,
W76-09566 4A

Observation of Linear Features in the Maryland Piedmont as Shown on ERTS-1 MSS Imagery and Aircraft Support Photography,
W76-09567 4A

Maryland Chesapeake Bay Beaches - General Distribution and Classification,
W76-09568 2L

The Relationship of the Nearshore Longshore Bar and Sand Waves at Ocean City, Maryland,
W76-09569 2L

Linear Distribution of the High Marsh Vegetation Communities of the Lower Eastern Shore and its Geological Significance,
W76-09570 2L

Visual Observation of the Suspended Sediments and Nearshore Ice Signatures in Chesapeake Bay,
W76-09571 2L

ESTIMATED COSTS
Sioux Falls Restores Four Wells with Collector Pipe,
W76-09510 3B

Costs of Wastewater Treatment by Land Application,
W76-09774 5D

ESTIMATING
Methdological Issues in the Econometric Estimation of Energy Demand Elasticities,
W76-09607 6A

A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-09633 6D

Ecosystem Modeling,
W76-09645 5C

Estimating Selected Parameters for the Kentucky Watershed Model from Watershed Characteristics,
W76-09852 2A

ESTUARIES
A Site Study of the Multiple Effects of Thermal Releases on the Aquatic Life in an Estuarine Area,
W76-09505 5C

Velocity Observations in the West Passage of Narragansett Bay: A Partially Mixed Estuary,
W76-09561 2L

Water Chemistry of the St. Lawrence Estuary,
W76-09581 5A

Modeling the Chesapeake Bay and Tributaries a Synopsis,
W76-09587 2L

Chemistry of Dissolved Inorganic Carbon in Estuarine and Coastal Brackish Waters,
W76-09597 2L

Scope of Tidal Power from Indian Estuaries,
W76-09639 2L

Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

Estuarine Ecologic Simulations,
W76-09950 2L

Modeling of Three-Dimensional Flows in Estuaries,
W76-09977 2L

Results of Salinity Tests on the San Francisco Bay-Delta Hydraulic Model,
W76-09978 2L

Experience with a Small Scale, Highly Distorted Fixed Bed Model of the Lago Maracaibo Estuary,
W76-09979 2L

Hydrodynamic Transport Phenomena in Estuaries and Coastal Waters: Scope of Mathematical Models,
W76-09980 5B

River and Estuary Modeling with the Siva System,
W76-09982 2A

Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

ESTUARINE ENVIRONMENT
An Assessment of Estuarine and Nearshore Marine Environments,
W76-09665 6C

ESTUARINE FISHERIES
An Assessment of Estuarine and Nearshore Marine Environments,
W76-09665 6C

EUCALYPTUS CAMALDULENSIS
Effects of Flooding and of Irrigation Water Salinity on Eucalyptus Camaldulensis Dehn From Three Seed Sources,
W76-09664 3C

EUTROPHICATION
Improving Water Quality by control of Algae Cellular and Extracellular Blue-Green Alga Polysaccharides,
W76-09760 5G

Sedimentation and Phosphorus Balance in Lake Lucerne (Horw Bay) and in the Rotsee, (In German),
W76-09790 5C

An Observation of Water Quality and Rec Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

The Algal Population of Duemmer Lake in the Years 1970/71, (In German),
W76-09812 5C

nduced Change of Nitrate Reductase Activity
n Microcystis Aeruginosa Kutz. Emend.
Elenk, (In Russian),
W76-09816 5C

The Vegetation of the 'Lukniany Lake' Nature
Reserve in the Mazurian Lake District,(In
Polish),
W76-09990 5C

ALUATION
Evaluation of Flood Control Under Changing
Conditions,
W76-09630 4A

Masonboro Inlet Fixed-Bed Model Evaluation,
W76-09957 8B

APORATION
Evaporation from Highly Saline Soils in an Ex-
perimental Plot in the Turkmen SSR, (In Rus-
sian),
W76-09887 2D

APORATION CONTROL
Water Conservation in Arid-Zone Soils,
W76-09478 3B

APORITE DISSOLUTION
Cenozoic Deposits of Southeastern New Mex-
ico and an Outline of the History of Evaporite
Dissolution,
W76-09837 2J

ERGREENS
Drought Adaptations in Two Californian Ever-
green Sclerophylls,
W76-09476 2I

CESSIVE PRECIPITATION
The Distribution of Heavy Rainfall in a Major
Urban Area,
W76-09734 2B

Relationship of Heavy Rainfall to Soil Erosion
in View of its Forecasting, (In Bulgarian),
W76-09807 2J

TRACELLULAR PRODUCTS
Improving Water Quality by control of Algae:
Cellular and Extracellular Blue-Green Algal
Polysaccharides,
W76-09760 5G

CILITIES
Specifications for Container Facilities by Simu-
lation,
W76-09943 6A

Large Wave Channel for 'Full Scale-Modeling'
of Wave Dynamics in Surf Zones,
W76-09946 8B

CTOR ANALYSIS
Role of Carbonate Rocks in Modifying Flood
Flow Behavior,
W76-09784 2A

IRFAX COUNTY (VA)
Evaluation and Control of Soil Erosion in Ur-
banizing Watersheds,
W76-09742 4D

Management of Flood Control and Drainage in
the Urbanizing Zone,
W76-09750 4A

RM WASTES
Data on the Disinfection of Liquid Manure by
Gamma Irradiation at Baja, Hungary,
W76-09528 5D

Effects of Land Use and River Seepage on
Groundwater Quality in Hall County,
Nebraska,
W76-09728 5B

The Hygienic Quality of the Water in a Grow-
ing-Finishing Piggery, (In Romanian),
W76-09883 5B

FE-55
Cycling of Fe55 and Zn65 in Columbia River
Carp Following Reactor Shutdown,
W76-09508 5C

FEASIBILITY STUDIES
Hydroelectric Power Potential at Corps of En-
gineers Projects. Recommendations and Execu-
tive Summary,
W76-09764 6B

Hydroelectric Power Potential at Corps of En-
gineers Projects,
W76-09765 6B

FECAL CONTAMINATION
Steroids in Effluents,
W76-09696 5A

FEDERAL GOVERNMENT
Report to the Congress by the National Com-
mission on Water Quality,
W76-09663 5G

FERNOW FROST GAGE
The Modified Fernow Frost Gage,
W76-09880 7B

FERTILIZATION
The Water Supply System of Soil and Nitrogen
Loss with Runoff Waters in Nonchernozem
Areas, (In Russian),
W76-09794 2G

FERTILIZERS
Requirements and Use of Fertilizer, Lime, and
Mulch for Vegetating Acid Mine Spoils,
W76-09469 4D

Dewatering of Sewage Sludge Viewed as Part
of the Purification Process -- Planning Criteria
(Klaerschlammentwaesserung als Teil der
Gesamten Klaeraufgabe Betrachtet -- Planung-
skriterien),
W76-09681 5D

Effects of Land Use and River Seepage on
Groundwater Quality in Hall County,
Nebraska,
W76-09728 5B

Economic Analysis of Effluent Guidelines:
Fertilizer Industry,
W76-09777 5G

Transformation of Concentrated and Complex
Phosphorus Fertilizers in Modow-Bog Soil with
a High Moisture Content, (In Azerbaijani),
W76-09786 5B

The Leaching Behavior of Different Nitrogen
Sources in Lysimeter Experiments, (In Ger-
man),
W76-09793 2G

FILTER GRATINGS
Inductive Cavitator Keeps Filter Gratings Clear
of Debris,
W76-09677 5D

FILTERS
Apparatus for Treating Industrial and Domestic
Waste Waters,
W76-09429 5D

Development of a Continuous Inclined Sand
Bed Filter,
W76-09668 5D

Inductive Cavitator Keeps Filter Gratings Clear
of Debris,
W76-09677 5D

FILTRATION
Method and Apparatus for Rejuvenating a Bed
of Granular Filter Medium,
W76-09424 5D

Apparatus for Treating Industrial and Domestic
Waste Waters,
W76-09429 5D

Reverse Osmosis -- Can it Replace Distillation,
W76-09667 5D

Development of a Continuous Inclined Sand
Bed Filter,
W76-09668 5D

Inductive Cavitator Keeps Filter Gratings Clear
of Debris,
W76-09677 5D

Monitoring and Automatic Filter Control of the
Dreis-Tiefenback Treatment Plant
(Betriebsueberwachung und Automatische Fil-
tersteuerung der Aufbereitungsanlage Dreis-
Tiefenbach),
W76-09679 5F

Industrial Experience of Sewage Sludge
Processing with Zimpro Installations in the
Netherlands,
W76-09709 5D

Domestic Water Filtration Apparatus,
W76-09862 5F

FINANCING
Financing Pollution Abatement Equipment for
Textiles and Other South Carolina Industries.
W76-09766 5G

Presentation Concerning Pollution Control
Facilities Revenue Bonds,
W76-09767 5G

Role of the Underwriter in Tax Exempt Financ-
ing for Industrial Expansion and Pollution Con-
trol,
W76-09768 5G

The Industrial Revenue Bond for Pollution
Control: One Company's Perspective,
W76-09769 5G

Financing Pollution Control Projects in South
Carolina Using Tax-Exempt Industrial Revenue
Bonds,
W76-09770 5G

The Pollution Control Bond,
W76-09771 5G

FINGER FILL CANALS
Application of Water Quality Models to Finger
Fill Canals,
W76-09981 5B

FINITE ELEMENT ANALYSIS
A Three-Dimensional Galerkin Finite Element
Solution of Flow Through Multiaquifers in
Sutter Basin, California,
W76-09562 2F

FINLAND
Purification of Waste Water By Polymer Exchangers (Jatevesien puhdistaminen polymeerivaihtajilla),
W76-09675 5D

FISH
Re-Evaluation of the Effects of Man-Made Modifications on Gordon Creek Between 1887 and 1973 and Especially as Regards its Fish Fauna,
W76-09407 4C

Experiments on the Culture of the Large Snake-Head Ophicephalus Marulius (Hamilton),
W76-09487 8I

Environmental Quality Research, First Annual Report,
W76-09654 5C

FISH CONTROL AGENTS
Reaction Times of Certain Freshwater Fishes to a Rotenone-Containing Piscicide,
W76-09993 5C

FISH DIETS
Feeding Habits of the Population of Whitefish (Coregonus Lavaretus (L.)) in Haugatjern: A Eutrophic Norwegian Lake,
W76-09882 2H

FISH DISEASES
Pathology of Acute Poisoning with the Insecticide Sevin in the Bent-Nosed Clam, Macoma Nasuta,
W76-09649 5C

FISH FEEDING HABITS
Feeding Habits of the Population of Whitefish (Coregonus Lavaretus (L.)) in Haugatjern: A Eutrophic Norwegian Lake,
W76-09882 2H

FISH FOOD ORGANISMS
Concentration of Cesium-137 in Aquatic Organisms, Water and Bottom Deposits of Water Bodies with a Different Mineral Compositions of the Water, (In Russian),
W76-09410 5C

Feeding Habits of the Population of Whitefish (Coregonus Lavaretus (L.)) in Haugatjern: A Eutrophic Norwegian Lake,
W76-09882 2H

FISH PONDS
An Observation of Water Quality and Red Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

FISH PRODUCTS
The Mercury Content of Industrial Fish Products: Its Relative Variation with the Treatment (Cooking in Salt Water, Pickling and Fish Production), (In Spanish),
W76-09802 5C

FISH REPRODUCTION
Additional Observations on the Effects of Strip Mining on Small-Stream Fishes in East-Central Kentucky,
W76-09468 5C

Engineering Reclamation, A Most Important Means of Increasing Fish Productivity of Waters, (In Russian),
W76-09800 8I

FISHERIES
An Economist's View of the Oceans,
W76-09617 6E

Engineering Reclamation, A Most Important Means of Increasing Fish Productivity of Waters, (In Russian),
W76-09800 8I

FIXED-BED MODELS
Physical Modeling Techniques Used in River Models,
W76-09972 2E

FJORDS
Water Transport in the Sill Area of Balsfjord North Norway, During Vernal Meltwater Discharge,
W76-09999 2L

FLOCCULATION
Cationic Acrylamide-Styrene Copolymers and Flocculation of Sewage Therewith,
W76-09434 5D

Purification of Waste Water By Polymer Exchangers (Jatevesien puhdistaminen polymeerivaihtajilla),
W76-09675 5D

The Relationship Between Dissimilatory Nitrate Reduction and Oxygen Uptake by Cells of an Alcaligenes Strain in Flocs and in Suspension and by Activated Sludge Flocs,
W76-09686 5D

Increasing the Capacity of Sedimentation Tanks by Means of Sloping Plates,
W76-09706 5D

FLOOD CONTROL
Evaluation of Flood Control Under Changing Conditions,
W76-09630 4A

Flood Problems in Uttar Pradesh,
W76-09640 4A

A Flood Management Model for Urbanizing River Basins,
W76-09737 4C

Management of Flood Control and Drainage in the Urbanizing Zone,
W76-09750 4A

A Linear Programming Model for Use in Guiding Urban Floodplain Management,
W76-09849 6F

FLOOD FLOW
Role of Carbonate Rocks in Modifying Flood Flow Behavior,
W76-09784 2A

FLOOD FREQUENCY
Effect of Sequence Length n on the Choice of Assumed Distribution of Floods,
W76-09851 4A

FLOOD PEAK
Remedial Measures for Urban Flood Peak Reduction,
W76-09736 2E

FLOOD PLAIN CHANGES
A Primer on Floodplain Dynamics,
W76-09831 2E

FLOOD PLAIN ZONING
A Floodplain Management Framework with Structural and Non-Structural Measures,
W76-09754 6F

FLOOD PLAINS
A Primer on Floodplain Dynamics,
W76-09831 2E

A Linear Programming Model for Use in Guid ing Urban Floodplain Management,
W76-09849 6I

FLOOD PROTECTION
A Floodplain Management Framework witl Structural and Non-Structural Measures,
W76-09754 6I

FLOODING
Effects of Flooding and of Irrigation Wate Salinity on Eucalyptus Camaldulensis Dehr From Three Seed Sources,
W76-09664 3(

FLOODS
A Primer on Floodplain Dynamics,
W76-09831 2I

Effect of Sequence Length n on the Choice o Assumed Distribution of Floods,
W76-09851 4A

FLORIDA
Application of Water Quality Models to Finge Fill Canals,
W76-09981 5I

FLOTATION REAGENT BB-2
Hygienic Standardization of Flotation Reager BB-2 and its Components as Industrial Cor taminants of Water Bodies, (In Russian),
W76-09886 5I

FLOW
Use of the Computer Program 'STORM' fo Analysis of the Quantity and Quality of Urba Storm Water Runoff,
W76-09740 5I

Numerical Two-Dimensional Flow Model fo River Systems,
W76-09964 2

Two-Dimensional Model of Flow Toward In takes,
W76-09965 2

Mathematical Model of Flow in a Stream Aquifer System,
W76-09966 2I

Modeling of Three-Dimensional Flows i Estuaries,
W76-09977 2I

FLOW CHARACTERISTICS
Effects of Management Practices on Wate Quality and Quantity: Newark, New Jersey Municipal Watersheds,
W76-09465 4I

Watershed Response to Partial Area Applica tions of Simulated Rainfall,
W76-09467 2A

FLOW CONTROL
Sluice Gates Help Regulate Plant's Hydrauli Flows.
W76-09680 8(

FLOW DURATION
Effects of Management Practices on Wate Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4I

FLOW MODELS
Numerical Two-Dimensional Flow Model fo River Systems,
W76-09964 2I

Mathematical Model of Flow in a Stream-Aquifer System,
W76-09966 2E

IODIZED BEDS
Waste Treatment Apparatus,
W76-09432 5D

IODINE
Determination of Fluorine in Drinking Water with a Cerium(III)- or Lanthanum Alizarin Complex, (In Russian),
W76-09796 5A

Experimental Effect of Boron on Anticarious Action of Fluorine in Drinking Water, (In Russian),
W76-09885 5F

ALLUVIAL SEDIMENTS
Cenozoic Deposits of Southeastern New Mexico and an Outline of the History of Evaporite Dissolution,
W76-09837 2J

FOOD PLANTS
Comparative Evaluation of Food Plants of the Ararat Cochineal Scale (Porphyrophora Hamelii) (In Russian),
W76-09406 2I

FOOD PROCESSING INDUSTRY
Economic Analysis of Effluent Guidelines: Grain Processing Segment of the Grain Mills Industry,
W76-09775 5G

Economic Analysis of Effluent Guidelines: Apple, Citrus and Potato Processing Segments of the Canned and Preserved Fruits and Vegetable Industry,
W76-09779 5G

FOODS
Use of Sewage Sludge as Fodder,
W76-09554 5D

Determination of Microquantities of Naphthalene in Environmental Objects, (In Russian),
W76-09620 5A

FORECASTING
Energy Modeling and Forecasting.
W76-09602 6A

Energy Projections--Relationship to Policy Issues,
W76-09603 6A

Energy Models and Forecasts: A User's Point of View,
W76-09612 6A

Energy Models and Forecasts: A User's Point of View,
W76-09613 6A

A Review and Analysis of Selected Hydrologic Modeling Concepts,
W76-09718 2E

Relationship of Heavy Rainfall to Soil Erosion in View of its Forecasting, (In Bulgarian),
W76-09807 2J

Forecasts for the Sacremento River System,
W76-09967 2E

FOREST MANAGEMENT
Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

Distribution of Ponderosa Pine Forest Densities on the Salt-Verde River Basin,
W76-09477 4A

FOREST SOILS
Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

FORESTS
Distribution of Ponderosa Pine Forest Densities on the Salt-Verde River Basin,
W76-09477 4A

FOSSIL FUELS
Offshore Petroleum and New England - A Study of the Regional Economic Consequences of Potential Offshore Oil and Gas Development,
W76-09893 6B

FRANCE (DOMBES)
Changes in the Population of Cladocera and Copepoda in Three Fishponds of the Dombes, (In French),
W76-09995 2I

FROST
The Modified Fernow Frost Gage,
W76-09880 7B

FUELS
Energy Consumption and Fuel Choice by Residential and Commercial Consumers in the United States,
W76-09609 6A

FULVIC ACIDS
The Qualitative Organic Matter Composition of Some Marshy Soils of Nizhnevelikoretsk Plain, (In Russian),
W76-09888 2G

FURROW IRRIGATION
Efficiency of Irrigation Methods for Strawberries,
W76-09897 3F

GAGES
The Modified Fernow Frost Gage,
W76-09880 7B

GAMMA RAYS
Fission Product Gamma-Ray Sources as an Alternative to Cobalt-60 Sources for Sewage Sludge Sterilization,
W76-09541 5D

GAS CHROMATOGRAPHY
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. I. Computerized High Resolution Mass Spectrometry and Gas Chromatography-Low Resolution Mass Spectrometry,
W76-09687 5A

Gas-Liquid Chromatographic Determination of Butyl Acetate, Butanol and Acetone Present Together in Waste Waters, (In Russian),
W76-09929 5A

GASES
Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

Apparatus and Method for Recovering Pure Water from Natural Sources and Industrial Polluted Waste Sources,
W76-09867 5G

GELATINOUS ZOOPLANKTON
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

GENERATORS
Operation of Hydrogenerator as Synchronous Condensor,
W76-09637 8C

GEOCHEMICAL EXPLORATION
Exploration Rock Geochemistry-Detection of Trace Element Halo at Heath Steele Mines (N. B., Canada) by Discriminant Analysis,
W76-09473 2K

GEOCHEMISTRY
Exploration Rock Geochemistry-Detection of Trace Element Halo at Heath Steele Mines (N. B., Canada) by Discriminant Analysis,
W76-09473 2K

Characterization of Nitrogen Sources Contaminating Shallow Ground Water in an Arid Basin. Las Vegas Area, Nevada,
W76-09762 5B

Geochemical and Isotopic Analyses of Waters Associated with the Edwards Limestone Aquifer, Central Texas,
W76-09836 2K

GEOLOGIC FORMATIONS
Research and Investigation of Geology, Mineral, and Water Resources of Maryland.
W76-09565 4A

Observation of Linear Features in the Maryland Piedmont as Shown on ERTS-1 MSS Imagery and Aircraft Support Photography,
W76-09567 4A

Cenozoic Deposits of Southeastern New Mexico and an Outline of the History of Evaporite Dissolution,
W76-09837 2J

GEOMORPHOLOGY
Movable-Bed River-Models,
W76-09969 2E

GEORGIA
Evaluation of Combined Applications of Ultrafiltration and Complexation Capacity Techniques to Natural Waters,
W76-09690 5A

Legal Approaches to Control Runoff and Sedimentation: A Case Study of Georgia,
W76-09747 4D

GERMANY
Types and Treatment of Sewage Sludges Practice in the Federal Republic of Germany,
W76-09513 5D

The Algal Population of Duemmer Lake in the Years 1970/71, (In German),
W76-09812 5C

GLACIAL DEPOSITS
Gravity Geophysics for Groundwater Exploration in Glaciated Areas,
W76-09758 4B

GOLDFISH
Effecto De La Temperatura De Aclimatacion Sobre La Proliferacion De Precursores Eritropoyeticos En Carassius Auratus, (The Effect of Acclimation Temperature on Proliferation of Erythropoietic Precursors in Carrassius Auratus and on the Uptake of Tritiated Thymidine in Haematopoietic and Intestinal Tissue),
W76-09509 5C

GORDON CREEK
Re-Evaluation of the Effects of Man-Made Modifications on Gordon Creek Between 1887 and 1973 and Especially as Regards its Fish Fauna,
W76-09407 4C

GOVERNMENT FINANCE
Secondary Effects of Public Investments in Highways and Sewers.
W76-09778 5G

GRAIN MILLING INDUSTRY
Economic Analysis of Effluent Guidelines: Grain Processing Segment of the Grain Mills Industry,
W76-09775 5G

GRANULAR FILTERS
Method and Apparatus for Rejuvenating a Bed of Granular Filter Medium,
W76-09424 5D

GRASSES
Comparative Evaluation of Food Plants of the Ararat Cochineal Scale (Porphyrophora Hamelii) (In Russian),
W76-09406 2I

Dependence of Pasture Grass Yield on Soil Moisture Level, (In Russian),
W76-09930 4A

GRASSLANDS
On the Ecology of Collembola and Oribatids in a Landsea Transition Zone (Collembola, Insecta-Oribatei, Acari) (In German),
W76-09635 2L

GRAVEL PACK DESIGN
Monitoring Wells,
W76-09558 4B

GRAVIMETRIC ANALYSIS
Laboratory Centrifuge Saves Time and Money,
W76-09704 5D

GRAY-BROWN PODZOLIC SOILS
Investigations on the Erodibility of a Deeply Plowed Gray-Brown Podzolic Soil from Loess on a Slope by Means of Simulated Rain, (In German),
W76-09917 2J

GREAT LAKES
An Underwater Temperature-Depth Data Collection Device,
W76-09727 2H

Verification of Numerical Models of Lake Ontario, III. Longterm Heat Transports,
W76-09783 2H

GREAT PLAINS
Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colorado,
W76-09761 2F

GREECE (ATHENS)
Isolation of Water Vibrios in Greece, (In French),
W76-09601 5A

GROUNDWATER
Monitoring Wells,
W76-09558 4B

Nitrogen in the Subsurface Environment,
W76-09662 5B

Effects of Land Use and River Seepage on Groundwater Quality in Hall County, Nebraska,
W76-09728 5B

Hydrology of the Madison Formation and its Potential use for Water Supply for Energy Development,
W76-09757 2F

Report of Water Levels in Selected Observation Wells in Utah--April 1976,
W76-09832 4B

Geochemical and Isotopic Analyses of Waters Associated with the Edwards Limestone Aquifer, Central Texas,
W76-09836 2K

A Proposed Algorithm for the Solution of the Large-Scale Inverse Problem in Groundwater,
W76-09850 2F

GROUNDWATER MINING
The Over-Exploitation of Groundwater Resources in Dry Regions,
W76-09479 4B

Influence of Hydraulic Trough and Lateral Joints on the Groundwater Potential of the Massive Trap Unit at Tanoria in Shajapur District (MP),
W76-09614 4B

Characterization of Nitrogen Sources Contaminating Shallow Ground Water in an Arid Basin. Las Vegas Area, Nevada,
W76-09762 5B

GROUNDWATER MOVEMENT
Numerical Simulation of Waste Movement in Steady Groundwater Flow Systems,
W76-09564 5B

Upward Water Movement in Field Cores,
W76-09726 3F

Nuclear Techniques in Hydrological Studies,
W76-09996 2F

GROUNDWATER QUALITY AND QUANTITY MODEL
Optimal Ground Water Quality Management: Well Injection of Waste Waters,
W76-09511 5D

GROUNDWATER RECHARGE
Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colorado,
W76-09761 2F

GROUNDWATER RESOURCES
The Over-Exploitation of Groundwater Resources in Dry Regions,
W76-09479 4B

Influence of Hydraulic Trough and Lateral Joints on the Groundwater Potential of the Massive Trap Unit at Tanoria in Shajapur District (MP),
W76-09614 4B

Appraisal of Water Resources of Northwestern El Paso County, Colorado,
W76-09828 2E

GROWING STOCK LEVEL (GSL)
Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

GROWTH RATES
Experiments on the Culture of the Large Snake-Head Ophicephalus Marulius (Hamilton),
W76-09487 8I

The Relationship Between Temperature and Duration of Egg Development in Some Epiphytic Cladocera and Copepoda from the River Thames, Reading, with a Discussion of Temperature Functions,
W76-09659 5C

Phytomass Dynamics of Aboveground and Underground Organs of Meadow Steppe Plants, (In Russian),
W76-09817 2I

The Action of Some Pollutants on the Growth of Daphnia Magna Strauss, (In French),
W76-09937 5C

Insect Growth Regulators for the Control of Aquatic Midges,
W76-09997 5G

GROWTH STAGES
A Description of Atlantic Mackerel, Scomber Scombrus, Eggs and Early Larvae,
W76-09656 2I

Generation Time, Length of Life, Instar Duration and Frequency of Moulting, and their Relationship to Temperature in Eight Species of Cladocera from the River Thames, Reading,
W76-09658 5C

GULF LOOP CURRENT
On Entrainment and Diffusion in a Gulf of Mexico Anticyclonic Ring,
W76-09723 2L

GULF OF MEXICO
On Entrainment and Diffusion in a Gulf of Mexico Anticyclonic Ring,
W76-09723 2L

Estuarine Ecologic Simulations,
W76-09950 2L

GULF OF MEXICO ANTICYCLONIC RING
On Entrainment and Diffusion in a Gulf of Mexico Anticyclonic Ring,
W76-09723 2L

GULF STREAM
On Entrainment and Diffusion in a Gulf of Mexico Anticyclonic Ring,
W76-09723 2L

GULLY EROSION
The Erodibility of Pumice Soils of the North Island, New Zealand,
W76-09787 4D

GYMNOSPERMS
Environmental Quality Research, First Annual Report,
W76-09654 5C

HALOPHYTES
Contribution of Salts to the Water Potential of Woody Plants,
W76-09691 3C

Salinity Tolerance of Inland Halophytic Vegetation of North America,
W76-09988 3C

ARBORS
Specifications for Container Facilities by Simulation,
W76-09943 6A

Wave Motions in an Offshore Harbor,
W76-09947 8B

Application of Physical Tidal Models in Harbor and Marina Design,
W76-09984 5B

AZARDS
Landslide Hazard in the United States: A Research Assessment,
W76-09781 6F

EAT BUDGET
The Role of Vertical Motion in the Heat Budget of the Upper Northeastern Pacific Ocean,
W76-09720 2L

EAT TRANSFER
Verification of Numerical Models of Lake Ontario, III. Longterm Heat Transports,
W76-09783 2H

EAT TREATMENT
Activated Sludge Process with Alum Addition and Heat Treatment,
W76-09456 5D

Treatment of Sewage Sludge with Combinations of Heat and Ionizing Radiation (Thermoradiation),
W76-09523 5D

Sludge Heat Treatment: Operation and Management,
W76-09708 5D

EATED WATER
Effect of Heated Water Discharge of Thermal and Nuclear Power Plants on Invertebrates of Cooling Ponds, (In Russian),
W76-09811 5C

Temperature Predictions for Offshore Power Plants,
W76-09960 5B

EAVY METALS
Concentration of Heavy Metals in Sediments of a Hydroelectric Impoundment,
W76-09755 5A

The Heavy Metal Concentrations in the Waters Along the Coast of Fukuyama, (In Japanese),
W76-09815 5A

EPATICAE
The Aquatic and Subaquatic Bryophytic Vegetation of the Belgian Part of the River Sambre, Related to Ecological Conditions and Water Pollution, (In French),
W76-09986 5C

IERBICIDES
Comparative Effects of Diquat Plus Copper Sulfate on Aquatic Organisms,
W76-09821 5C

IIGHWAY EFFECTS
Secondary Effects of Public Investments in Highways and Sewers.
W76-09778 5G

IISTOPATHOLOGICAL OBSERVATIONS
Substitute Chemical Program - Initial Scientific and Minieconomic Review of Captan.
W76-09651 5C

HISTORY
On Long-Term Stability of Zooplankton Composition,
W76-09600 5C

HOUSTON SHIP CHANNEL (TEXAS)
Nitrification Studies of Ship Channel Waters,
W76-09453 5D

HUDSON RIVER
Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

HUMAN DISEASES
Ecology of Cholera Vibrios, (In Russian),
W76-09409 5C

Study of the Effect of Iron on the Human Body and Living Conditions, (In Russian),
W76-09803 5C

HUMAN POPULATION
The Sahelian Drought and Its Demographic Implications,
W76-09486 6G

HUNGARY
Data on the Disinfection of Liquid Manure by Gamma Irradiation at Baja, Hungary,
W76-09528 5D

HUNGARY (LAKE BALATON)
Primary Production in the Frozen Lake Balaton,
W76-09991 5C

The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

HURRICANES
Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

HYBRID-ELEMENT METHOD
Hybrid-Element Method for Water Waves,
W76-09945 8B

HYDRATABILITY
Hydratability as a Parameter of Plant Water Potential, (In French),
W76-09918 2I

HYDRATION
Hydratability as a Parameter of Plant Water Potential, (In French),
W76-09918 2I

HYDRAULIC BLASTING UNIT
Sioux Falls Restores Four Wells with Collector Pipe,
W76-09510 3B

HYDRAULIC CONDUCTIVITY
Steady-State Method of Measuring Unsaturated Hydraulic Conductivity,
W76-09924 2G

HYDRAULIC GATES
Sluice Gates Help Regulate Plant's Hydraulic Flows.
W76-09680 8C

HYDRAULIC MODELS
Symposium on Modeling Techniques, Volume I.
W76-09941 2A

Large Wave Channel for 'Full Scale-Modeling' of Wave Dynamics in Surf Zones,
W76-09946 8B

Some Hard Lessons in Numerical Hydraulics,
W76-09952 8B

Anisotropic Sand Transport in Tidal Inlets,
W76-09955 2L

Modeling Sediment Movement for Masonboro Inlet,
W76-09956 2L

Masonboro Inlet Fixed-Bed Model Evaluation,
W76-09957 8B

Near-Field Jet Penetration and Reservoir Mixing,
W76-09962 8C

Physical Modeling Techniques Used in River Models,
W76-09972 2E

Experience with a Small Scale, Highly Distorted Fixed Bed Model of the Lago Maracaibo Estuary,
W76-09979 2L

HYDRAULIC STRUCTURES
Modeling Sediment Transport in Hydraulic Structures,
W76-09975 2J

HYDRAULICS
Longitudinal Dispersion Coefficients for Streams,
W76-09589 5B

Influence of Hydraulic Trough and Lateral Joints on the Groundwater Potential of the Massive Trap Unit at Tanoria in Shajapur District (MP),
W76-09614 4B

Systems Modeling of Stratified Fluids,
W76-09976 8B

HYDRO/ENERGY POTENTIAL
Hydroelectric Power Potential at Corps of Engineers Projects. Recommendations and Executive Summary,
W76-09764 6B

Hydroelectric Power Potential at Corps of Engineers Projects,
W76-09765 6B

HYDROBIOLOGY
Anthropogenic Effect on Continental, Marine, and Oceanic Biohydrocoenoses, (In Russian),
W76-09819 5C

HYDROCARBON GASES
Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

HYDROELECTRIC PLANTS
Power Generation in Arizona and Its Environmental Implications,
W76-09485 6D

Construction Planning of a Hydro Power Station,
W76-09616 8C

Operation of Hydrogenerator as Synchronous Condensor,
W76-09637 8C

Hydroelectric Power Potential at Corps of Engineers Projects. Recommendations and Executive Summary,
W76-09764 6B

HYDROELECTRIC PLANTS

Hydroelectric Power Potential at Corps of Engineers Projects,
W76-09765 6B

HYDROGEN ION CONCENTRATION
Chemistry of Dissolved Inorganic Carbon in Estuarine and Coastal Brackish Waters,
W76-09597 2L

HYDROGEOLOGY
Hydrology of the Madison Formation and its Potential use for Water Supply for Energy Development,
W76-09757 2F

HYDROGRAPH ANALYSIS
Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

Watershed Response to Partial Area Applications of Simulated Rainfall,
W76-09467 2A

Identification of Linear Systems Response by Parametric Programing,
W76-09575 2E

HYDROGRAPHS
Hydrologic Systems Analysis Model for Generating Runoff Time Series (Hidrologiai) Rendszervizsgalati Modell Vizhozamidoser Eloallitasara (II. RESZ),
W76-09557 2A

Accuracy of Reservoir Inflow Forecasts Based on Radar Rainfall Measurements,
W76-09574 2B

Runoff Frequency Procedure for Synthetic Hydrograph Development,
W76-09733 2A

HYDROLOGIC ASPECTS
Maximum Information Obtainable from Inadequate Design Data: from Multivariate to Bayesian Methods,
W76-09625 4A

Hydrology for Engineers, Second Edition,
W76-09661 8B

HYDROLOGIC BOUNDARIES
Hydrologic Unit Map--1974, State of Alaska,
W76-09826 7C

Hydrologic Unit Map--1974, State of Oregon,
W76-09827 7C

HYDROLOGIC DATA
Sensitivity of Linear and Nonlinear Surface Runoff Models to Input Errors,
W76-09578 2A

The Cost-Effectiveness of Water Resources Systems Considering Inadequate Hydrological Data,
W76-09626 6A

Hydrology for Engineers, Second Edition,
W76-09661 8B

Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1974,
W76-09829 7C

HYDROLOGIC MODELS
Ecosystem Modeling,
W76-09645 5C

HYDROLOGIC SYSTEMS
Conceptual Hydrological Model for an Averaged-Sized Catchment Area, I. Concepts and Relationships,
W76-09579 2A

Conceptual Hydrological Model for an Average-Sized Catchment Area, II. Estimate of Parameters, Validity of Model, Application,
W76-09580 2A

Hydrologic Unit Map--1974, State of Alaska,
W76-09826 7C

HYDROLOGIC UNIT MAPS (ALASKA)
Hydrologic Unit Map--1974, State of Alaska,
W76-09826 7C

HYDROLOGIC UNIT MAPS (OREG)
Hydrologic Unit Map--1974, State of Oregon,
W76-09827 7C

HYDROLOGY
Design of Water Resources Project with Inadequate Data in India - General and Particular Case Studies,
W76-09621 4A

Hydrologic Unit Map--1974, State of Oregon,
W76-09827 7C

ICE
Visual Observation of the Suspended Sediments and Nearshore Ice Signatures in Chesapeake Bay,
W76-09571 2L

St. Lawrence Seaway: A New Goal of Year-Round Navigation,
W76-09942 2C

ICE THICKNESS
A Model for the Thermodynamic Growth of Sea Ice in Numerical Investigations of Climate,
W76-09722 2C

ILLINOIS
A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

IMBIBITION
Upward Water Movement in Field Cores,
W76-09726 3F

INADEQUATE DATA
Design of Water Resources Project with Inadequate Data in India - General and Particular Case Studies,
W76-09621 4A

The Design of Water Quality Management Projects with Inadequate Data,
W76-09623 5G

Improved Techniques for Water Resource Systems Design,
W76-09624 4A

Maximum Information Obtainable from Inadequate Design Data: from Multivariate to Bayesian Methods,
W76-09625 4A

The Cost-Effectiveness of Water Resources Systems Considering Inadequate Hydrological Data,
W76-09626 6A

INCINERATION
Waste Treatment Plants,
W76-09427 5E

Process and Apparatus for the Incineration of Aqueous Sewage Sludge,
W76-09428 5E

INCINERATION ODOR
Sewage Treatment System,
W76-09854 5D

INDIA
Scope for Utilizing Gamma Radiation for Microbiological Control of Sewage Waste-Water in India,
W76-09526 5D

Design of Water Resources Project with Inadequate Data in India - General and Particular Case Studies,
W76-09621 4A

Operation of Hydrogenerator as Synchronous Condensor,
W76-09637 8C

Scope of Tidal Power from Indian Estuaries,
W76-09639 2L

Sediment Deposition Model for Tarbela Reservoir,
W76-09970 2J

Nuclear Techniques in Hydrological Studies,
W76-09996 2F

INDUCED INFILTRATION
Water Conservation in Arid-Zone Soils,
W76-09478 3B

INDUCTIVE CAVITATORS
Inductive Cavitator Keeps Filter Gratings Clear of Debris,
W76-09677 5D

INDUS RIVER (INDIA)
Sediment Deposition Model for Tarbela Reservoir,
W76-09970 2J

INDUSTRIAL WASTES
Environmental Pollution by Cadmium and Zinc Discharged from a Braun Tube Factory, (In Japanese)
W76-09405 5B

Fluidized Bed to Handle Combined Waste Sludges,
W76-09671 5D

Acid-Iron Waste as a Factor Affecting the Distribution and Abundance of Zooplankton in the New York Bight: I. Laboratory Studies on the Effects of Acid Waste on Copepods,
W76-09700 5C

Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

Method of Biological Purification of Industrial Effluents from Chromates and Bichromates,
W76-09856 5D

Method and Composition for Preventing Water Contaminated with Industrial Waste from Seeping Through Soil Containing Said Water,
W76-09858 5G

Open-Loop Water-Washable Inspection Penetrant Process,
W76-09859 5D

Apparatus for Purification of Industrial Waste Water,
W76-09861 5D

pparatus and Method for Recovering Pure Vater from Natural Sources and Industrial Pol-uted Waste Sources,
V76-09867 5G

urnace for Thermal Treatment of Liquid In-ustrial Waste Waters Containing Toxic Or-anic Impurities (Pech' Dlya Termicheskogo bezvrezhivaniya Zhidkikh Promyshlennykh tokov S Toksicheskimi Organicheskimi rimesyami),
V76-09875 5D

lygienic Standardization of Flotation Reagent B-2 and its Components as Industrial Con-aminants of Water Bodies, (In Russian),
V76-09886 5B

DUSTRIES
inancing Pollution Abatement Equipment for extiles and Other South Carolina Industries.
V76-09766 5G

resentation Concerning Pollution Control acilities Revenue Bonds,
V76-09767 5G

ole of the Underwriter in Tax Exempt Financ-ng for Industrial Expansion and Pollution Con-rol,
V76-09768 5G

he Industrial Revenue Bond for Pollution ontrol: One Company's Perspective,
V76-09769 5G

inancing Pollution Control Projects in South arolina Using Tax-Exempt Industrial Revenue onds,
V76-09770 5G

conomic Analysis of Effluent Guidelines: ertilizer Industry,
V76-09777 5G

conomic Analysis of Effluent Guidelines: In-ulation Fiberglass Industry.
V76-09780 5G

FECTION
Methods for Reducing the Infection Hazard of Waste-Water Sludge,
W76-09514 5D

FILTRATION
How Many Sewer Leaks Can You Afford.
W76-09404 8G

Stability Analysis of Infiltration,
W76-09588 2G

FLOW
How Many Sewer Leaks Can You Afford.
W76-09404 8G

FORMATION SYSTEMS
The Contribution of a Water Information System for Environmental Planning in Min-nesota,
W76-09753 6G

FRARED SPECTROPHOTOMETRY
Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume II,
W76-09900 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume III,
W76-09901 5A

INHIBITORS
Environmental Quality Research, First Annual Report,
W76-09654 5C

INJECTION WELLS
Optimal Ground Water Quality Management: Well Injection of Waste Waters,
W76-09511 5D

INLETS (WATERWAYS)
Simulation of Tidal Hydrodynamics - Masonboro Inlet,
W76-09953 8B

Anisotropic Sand Transport in Tidal Inlets,
W76-09955 2L

Modeling Sediment Movement for Masonboro Inlet,
W76-09956 2L

Masonboro Inlet Fixed-Bed Model Evaluation,
W76-09957 8B

Principle of Management of Degenerated Inlets and Estuaries,
W76-09958 8B

INPUT ERRORS
Sensitivity of Linear and Nonlinear Surface Runoff Models to Input Errors,
W76-09578 2A

INPUT-OUTPUT ANALYSIS
Identification of Linear Systems Response by Parametric Programing,
W76-09575 2E

INSECT CONTROL
Insect Growth Regulators for the Control of Aquatic Midges,
W76-09997 5G

INSECTICIDES
Pathology of Acute Poisoning with the Insecticide Sevin in the Bent-Nosed Clam, Macoma Nasuta,
W76-09649 5C

INSECTS
Planting Pattern, Plant Population, Irrigation, and Insect Interactions in Cotton.
W76-09998 3F

INSPECTION
Polyethylene Pipe Insertion Rehabilitates Old Sewers,
W76-09459 8G

INSTRUMENTATION
Dissolved Oxygen Analyzer T-01 Analyzer. A Simple Apparatus for Electrochemical Determination of Dissolved Oxygen in Water (Tlenomierz T-01 uproszczony przyrzad elektrochemicznego oznaczania tleunu roxpuszczomego w roztworach wodnych),
W76-09688 5A

An Underwater Temperature-Depth Data Collection Device,
W76-09727 2H

Operation and Maintenance of a Deep-Well Water-Level Measurement Device, 'The Iron Horse',
W76-09835 4B

The Modified Fernow Frost Gage,
W76-09880 7B

Airborne Detection and Mapping of Oil Spills, Grand Bahamas,
W76-09891 5A

Development of a Boat and Helicopter Deployable Oil Slick Sampler,
W76-09892 5A

INTAKES
Two-Dimensional Model of Flow Toward Intakes,
W76-09965 2E

Undistorted Movable-Bed Model Study for a River and Power Plant Intake System,
W76-09971 8B

Riverbank Recessions for Power Plant Facilities,
W76-09973 8B

INTERFLOW
Watershed Response to Partial Area Applications of Simulated Rainfall,
W76-09467 2A

INTERIM LAW MODIFICATION
Report to the Congress by the National Commission on Water Quality,
W76-09663 5G

INVERTEBRATES
Effect of Heated Water Discharge of Thermal and Nuclear Power Plants on Invertebrates of Cooling Ponds, (In Russian),
W76-09811 5C

INVESTMENT
Investment Sequencing, Allocation, and Learning in the Design of Water Resources Systems: An Empirical Application,
W76-09846 6A

IODINE-129
Radiation Hazard of Iodine-129, (In Russian),
W76-09788 5B

IONIZING RADIATION
Viruses and Ionizing Radiation in Respect to Waste-Water Treatment,
W76-09520 5D

IONS
Viruses and Ionizing Radiation in Respect to Waste-Water Treatment,
W76-09520 5D

IOWA
Physical and Economic Aspects Associated with Runoff from Urban Growth: A Methodological Approach,
W76-09749 4C

Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

Calculation of Water Temperatures in Clear Lake, Iowa,
W76-09879 5B

IOWA CITY (IOWA)
Physical and Economic Aspects Associated with Runoff from Urban Growth: A Methodological Approach,
W76-09749 4C

IRON
Study of the Effect of Iron on the Human Body and Living Conditions, (In Russian),
W76-09803 5C

IRON-59
Influence De La Temperature Sur La Contamination D'Especes Marines Par Le Fer-59,

(Influence of Temperature on the Contamination of Marine Species by Iron-59),
W76-09494 5C

IRON-MANGANESE MICROORGANISMS
Iron-Manganese Microorganisms Studied by Overgrowing Technique, (In Russian),
W76-09813 5A

IRRADIATION
Current Technology and Advances in True Re-Use of Effluents,
W76-09515 5D

The Need for the Use of High-Level Radiation in Water Treatment and in Waste-Water (Sewage) Treatment,
W76-09518 5D

Disinfection of Sludge and Waste-Water by Irradiation with Electrons of Low Accelerating Voltage,
W76-09521 5D

Biological Effects of High-Energy Electron Irradiation of Municipal Sludge,
W76-09522 5C

Treatment of Sewage Sludge with Combinations of Heat and Ionizing Radiation (Thermoradiation),
W76-09523 5D

Synergistic Effects of Irradiation of Waste-Water.
W76-09524 5D

Gamma Irradiation for Sewage Treatment at US Army Facilities,
W76-09525 5D

Scope for Utilizing Gamma Radiation for Microbiological Control of Sewage Waste-Water in India,
W76-09526 5D

Data on the Disinfection of Liquid Manure by Gamma Irradiation at Baja, Hungary,
W76-09528 5D

Effects of Gamma Irradiation on the Degradation of Dyes,
W76-09532 5D

Possible use of High-Level Radiation for the Degradation of Some Substances Present in Urban and Industrial Waters,
W76-09533 5D

Comparison of the Chemical Effects of Oxone and of Irradiation on Organic Impurities in Water,
W76-09535 5D

An Electron Accelerator with Electrons of Low-Accelerating Voltage for Irradiating Sewage Sludge and Waste Water,
W76-09539 5D

Practical Aspects of the Pasteurization of Sewage Sludge by Electron Irradiation,
W76-09540 5D

Fission Product Gamma-Ray Sources as an Alternative to Cobalt-60 Sources for Sewage Sludge Sterilization,
W76-09541 5D

Considerations in the Public Acceptance of Sewage Sludge Irradiation Systems,
W76-09543 5D

The Waste-Water and Sludge Re-Use Project by Gamma Irradiation at Kecskemet, Hungary, Some Approaches and Investigations,
W76-09544 5D

Pilot Plant Experience in the Treatment of Industrial and Municipal Waste-Water by Means of Radiation-Induced Oxidation,
W76-09545 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

Dosimetry at a High-Activity Co60 Waste Treatment Facility,
W76-09547 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Bacterial and Parasitological Studies AfterIrradiation.
W76-09548 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Experiments on the Inactivation of Viruses in Sewage Sludge after Radiation Treatment,
W76-09549 5D

Effects of Gamma Radiation at Pilot Plant Level Compared with the Effects of Pasteurization on the Dewatering of Sewage Sludge,
W76-09550 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Results on the Effect of Differently Treated Sewage Sludge on Plants and Soil,
W76-09551 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Analytical Studies on Sewage Sludge and Plant Material,
W76-09552 5D

Potential of Radiation Sterilization in Solid Waste Treatment, A Status Report,
W76-09555 5D

IRRIDATION
Radiation Treatment of Wastes, A Review,
W76-09517 5D

IRRIGATED LAND
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

IRRIGATION
Howell Bunger Valves as Irrigation Outlets,
W76-09615 3F

Aqueduct Optimization with Intermediate Storage,
W76-09636 4A

Irrigation System Pivot Swivel,
W76-09866 3F

Liquid Distribution System for Irrigation and the Like,
W76-09868 3F

Irrigation Vehicle,
W76-09869 3F

Drip Level Irrigation,
W76-09870 3F

Crop Response to Chiseling and Irrigation in Soils with a Compact A2 Horizon,
W76-09985 3F

Planting Pattern, Plant Population, Irrigation, and Insect Interactions in Cotton.
W76-09998 3F

IRRIGATION EFFECTS
Redox Potential in Irrigated Desert Soils as an Indicator of Aeration Status,
W76-09488 2G

Effects of Flooding and of Irrigation Water Salinity on Eucalyptus Camaldulensis Dehn. From Three Seed Sources,
W76-09664 3C

Crop Response to Chiseling and Irrigation in Soils with a Compact A2 Horizon,
W76-09985 3F

IRRIGATION EFFICIENCY
Irrigation Systems in Taiwan: Management of a Decentralized Public Enterprise,
W76-09848 3F

Irrigation System Pivot Swivel,
W76-09866 3F

Liquid Distribution System for Irrigation and the Like,
W76-09868 3F

Irrigation Vehicle,
W76-09869 3F

Drip Level Irrigation,
W76-09870 3F

Efficiency of Irrigation Methods for Strawberries,
W76-09897 3F

IRRIGATION PRACTICES
Liquid Distribution System for Irrigation and the Like,
W76-09868 3F

Drip Level Irrigation,
W76-09870 3F

IRRIGATION SYSTEMS
A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

Irrigation Systems in Taiwan: Management of a Decentralized Public Enterprise,
W76-09848 3F

Irrigation System Pivot Swivel,
W76-09866 3F

Liquid Distribution System for Irrigation and the Like,
W76-09868 3F

Irrigation Vehicle,
W76-09869 3F

Drip Level Irrigation,
W76-09870 3F

IRRIGATIONS
Objectives and Costs of Advanced Treatment Techniques for Sewage,
W76-09449 5D

ISLANDS
Island Barrier Effects on Sea State as Revealed by a Numerical Wave Model and DMSP Satellite Data,
W76-09559 2L

SOLATION
Isolation of Salmonella from Sewage and Surface Waters, (In Russian),
W76-09411 5A

SRAEL
The Over-Exploitation of Groundwater Resources in Dry Regions,
W76-09479 4B

TALY (LAGO MAGGIORE)
Hydrologic and Chemical Analysis of the Principal Piedmontese Tributaries of Lago Maggiore in Relation to its Trophic Modifications, (In Italian),
W76-09576 5C

AMES RIVER (VA)
Environmental Responses to Thermal Discharges from the Chesterfield Station, James River, Virginia,
W76-09652 5C

ANES ISLAND (MD)
Linear Distribution of the High Marsh Vegetation Communities of the Lower Eastern Shore and its Geological Significance,
W76-09570 2L

APAN
Environmental Pollution by Cadmium and Zinc Discharged from a Braun Tube Factory, (In Japanese)
W76-09405 5B

Joint USA/Japan Project on Global Systems Analysis and Simulation (GLOSAS) of Energy, Resources, and Environmental (ERE) Systems,
W76-09610 6A

Operation of Ozone Treatment Apparatus (Ozone shori sochi no unten),
W76-09713 5F

The Distribution of Coliforms in Fresh Water, (In Japanese),
W76-09934 5C

APAN (FUKUYAMA)
The Heavy Metal Concentrations in the Waters Along the Coast of Fukuyama, (In Japanese),
W76-09815 5A

APAN (KANTO VOLCANIC ASH SOIL)
The Softening of the Kanto Volcanic Ash Soil, (In Japanese),
W76-09925 2G

ET PENETRATION
Near-Field Jet Penetration and Reservoir Mixing,
W76-09962 8C

ETS
Particle-Laden Jets with Application to Ocean Dumping,
W76-09959 5B

Near-Field Jet Penetration and Reservoir Mixing,
W76-09962 8C

Physical Model of Discharge in a Two-Layer Stratified Ambient,
W76-09963 8B

UTE
Meteorological Factors and Disease Expressions in Jute,
W76-09931 3F

KANSAS
Variation and Causative Factors of Sediment Yields in the Arkansas River Basin, Kansas,
W76-09839 2J

KARST
Role of Carbonate Rocks in Modifying Flood Flow Behavior,
W76-09784 2A

KENTUCKY RIVER (KENT)
Additional Observations on the Effects of Strip Mining on Small-Stream Fishes in East-Central Kentucky,
W76-09468 5C

KENTUCKY WATERSHED MODEL
Estimating Selected Parameters for the Kentucky Watershed Model from Watershed Characteristics,
W76-09852 2A

KINEMATIC WAVE APPROXIMATION
A Review and Analysis of Selected Hydrologic Modeling Concepts,
W76-09718 2E

KINETICS
The Chemistry of Ozone in the Treatment of Water,
W76-09684 5F

KOREA
An Observation of Water Quality and Red Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

KRYPTON-85
Cost Effectiveness of Release Prevention Controls for Tritium and Krypton-85,
W76-09506 5G

LABORATORY TESTS
The Role of Bioassays in Environmental Research,
W76-09644 5A

Laboratory Evaluation of the Coulter On-Line Particle Monitor,
W76-09699 5A

How to Build a Better Bench Sheet,
W76-09701 5D

LAGO MARACAIBO ESTUARY (VENEZUELA)
Experience with a Small Scale, Highly Distorted Fixed Bed Model of the Lago Maracaibo Estuary,
W76-09979 2L

LAGOONS
Objectives and Costs of Advanced Treatment Techniques for Sewage,
W76-09449 5D

The Effluent Lagoons Greifswald-Ladebow (Das Abwasserteichsystem Greifswald-Ladebow),
W76-09682 5D

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

LAKE BAIKAL (USSR)
Rotifer Production in Lake Baikal, (In Russian),
W76-09791 5C

LAKE BASINS
Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

LAKE BEDS
Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

LAKE CHAD (CHAD)
Phytoplankton of the Saline Waters of Kanem (Chad): X. Conclusions, (In French),
W76-09596 2H

LAKE CHAMPLAIN
Materials Budgets of Lake Champlain,
W76-09756 5A

Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

Sediment Properties, Lake Champlain: 1971-1975,
W76-09763 5B

LAKE CONSTANCE (GERMANY)
Myxobacteria of the Myxococcus Group as Indirect Indicators of Fecal Matter in Surface Water: 1. Communication, (In German),
W76-09591 5A

LAKE LUCERNE (SWITZERLAND)
Sedimentation and Phosphorus Balance in Lake Lucerne (Horw Bay) and in the Rotsee, (In German),
W76-09790 5C

LAKE MICHIGAN
An Underwater Temperature-Depth Data Collection Device,
W76-09727 2H

LAKE ONTARIO
Characteristics of Coastal Circulation Affecting the Transport and Dispersion of Material Released from the Nuclear Industry,
W76-09504 5C

Phosphorus and Nitrogen Cycle on a Transect in Lake Ontario During the International Field Year 1972-1973 (IFYGL),
W76-09594 5C

Verification of Numerical Models of Lake Ontario, III. Longterm Heat Transports,
W76-09783 2H

LAKE SEDIMENTS
Concentration of Heavy Metals in Sediments of a Hydroelectric Impoundment,
W76-09755 5A

Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

Sediment Properties, Lake Champlain: 1971-1975,
W76-09763 5B

Sedimentation and Phosphorus Balance in Lake Lucerne (Horw Bay) and in the Rotsee, (In German),
W76-09790 5C

LAKES
On Long-Term Stability of Zooplankton Composition,
W76-09600 5C

Characteristics of Thionic Bacteria from the Lakes of the Mari ASSR, (In Russian),
W76-09814 5C

LAND APPLICATION
Costs of Wastewater Treatment by Land Application,
W76-09774 5D

LAND MANAGEMENT
Summary of Municipal Watershed Management Surveys in Eastern United States,
W76-09466 4D

Municipal Watershed Management: What are the Opportunities,
W76-09472 4D

LAND USE
Differentiation of Serpentinitic from Non-Serpentinitic Ultramafic Rocks in ERTS-1 MSS Imagery,
W76-09566 4A

Dewatering of Sewage Sludge Viewed as Part of the Purification Process -- Planning Criteria (Klaerschlammentwaesserung als Teil der Gesamten Klaeraufgabe Betrachtet -- Planungskriterien),
W76-09681 5D

Effects of Land Use and River Seepage on Groundwater Quality in Hall County, Nebraska,
W76-09728 5B

A Flood Management Model for Urbanizing River Basins,
W76-09737 4C

Costs of Wastewater Treatment by Land Application,
W76-09774 5D

Secondary Effects of Public Investments in Highways and Sewers.
W76-09778 5G

A Water-Land Use Management Model for the Sevier River Basin Phases I and II,
W76-09844 4A

Land Use Changes and Reservoir Development: An Application of Land Use Information Systems,
W76-09905 4A

LANDSLIDES
Landslide Hazard in the United States: A Research Assessment,
W76-09781 6F

LANTHANUM-ALIZARIN
Determination of Fluorine in Drinking Water with a Cerium(III)- or Lanthanum Alizarin Complex, (In Russian),
W76-09796 5A

LAS VEGAS VALLEY (NEV)
Characterization of Nitrogen Sources Contaminating Shallow Ground Water in an Arid Basin. Las Vegas Area, Nevada,
W76-09762 5B

LEACHATE
Anaerobic Treatment of Leachate with High Sodium Concentrations,
W76-09641 5D

LEACHING
Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

The Leaching Behavior of Different Nitrogen Sources in Lysimeter Experiments, (In German),
W76-09793 2G

The Critical Depth of the Level of Soil-Salinizing Ground Waters, (In Russian),
W76-09808 2G

LEAD
Lead Orthophosphates: III. Stabilities of Fluorophyromorphite and Bromopyromorphite at 25 C,
W76-09820 2K

LEAKAGE
A Three-Dimensional Galerkin Finite Element Solution of Flow Through Multiaquifers in Sutter Basin, California,
W76-09562 2F

Theory of Multiple Leaky Aquifers 1. The Integrodifferential and Differential Equations for Small and Large Values of Time,
W76-09563 2F

LEAKY AQUIFERS
Theory of Multiple Leaky Aquifers 1. The Integrodifferential and Differential Equations for Small and Large Values of Time,
W76-09563 2F

LEGAL ASPECTS
Legal Approaches to Control Runoff and Sedimentation: A Case Study of Georgia,
W76-09747 4D

Municipal Storm Water Management Programs,
W76-09751 4A

LENGTH
Effect of Sequence Length n on the Choice of Assumed Distribution of Floods,
W76-09851 4A

LETHAL LIMIT
On the Extermination of Polyclads: Calcium Hypochlorite (CaOC12) Treatment in the Period of High Water Temperature, (In Korean),
W76-09801 5C

LICHENS
Dependence of the Level of Nitrogenase Activity on the Water Content of the Thallus in Peltigera Canina, P. Evansiana, P. Polydactyla, and P. Praetextata,
W76-09916 5A

LIFE CYCLES
Studies of Phytoplankton Ecology in the Bay of Valparaiso: II. Phytoplankton 1970-1971, (In Spanish),
W76-09408 5A

LIGHT
Primary Production in the Frozen Lake Balaton,
W76-09991 5C

LIMANS
Bottom Deposits of the Kuban Deltaic Limans, (In Russian),
W76-09935 2L

LIME
Requirements and Use of Fertilizer, Lime, and Mulch for Vegetating Acid Mine Spoils,
W76-09469 4D

LINEAR ALKYLATE SULFONATES
Effects of Gamma Radiation from Co60 on Dilute Aqueous Solutions of Linear Alkyl Sulfonate Surfactants and other Organic Pollutants,
W76-09531 5D

LINEAR MODELS
Sensitivity of Linear and Nonlinear Surface Runoff Models to Input Errors,
W76-09578 2A

LINEAR PROGRAMMING
Identification of Linear Systems Response by Parametric Programing,
W76-09575 2E

A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

A Linear Programming Model for Use in Guiding Urban Floodplain Management,
W76-09849 6F

LOESS
Total Porosity and Pore Size Distribution in Untilled and Tilled Loess Soils, (In German),
W76-09939 2G

LONGSHORE TRANSPORT
River Delta Computer Simulation Model (Simudelt),
W76-09954 2L

LOUISIANA
Interstitial Protozoa and Algae of Louisiana Salt Marshes,
W76-09593 5C

LOW FLOW
Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

LYSIMETERS
The Leaching Behavior of Different Nitrogen Sources in Lysimeter Experiments, (In German),
W76-09793 2G

MADTOM
Re-Evaluation of the Effects of Man-Made Modifications on Gordon Creek Between 1887 and 1973 and Especially as Regards its Fish Fauna,
W76-09407 4C

MAINTENANCE
Sewer Inspection: Checking it Out,
W76-09460 8G

Sioux Falls Restores Four Wells with Collector Pipe,
W76-09510 3B

MANAGEMENT
An Economist's View of the Oceans,
W76-09617 6E

The Design of Water Quality Management Projects with Inadequate Data,
W76-09623 5G

NEPA and a State's Role in Water Resources Management,
W76-09627 6E

A Water-Land Use Management Model for the Sevier River Basin Phases I and II,
W76-09844 4A

Irrigation Systems in Taiwan: Management of a Decentralized Public Enterprise,
W76-09848 3F

A Linear Programming Model for Use in Guiding Urban Floodplain Management,
W76-09849 6F

Principle of Management of Degenerated Inlets and Estuaries,
W76-09958 8B

ANIFOLD WELL POINT SYSTEM
Field Drainage with Manifold Well Points,
W76-09586 5G

APPING
Research and Investigation of Geology, Mineral, and Water Resources of Maryland.
W76-09565 4A

Airborne Detection and Mapping of Oil Spills, Grand Bahamas,
W76-09891 5A

APS
Reconnaissance Map Showing Relative Amounts of Soil and Bedrock in the Mountainous Part of the Morrison-Evergreen Quadrangles and Adjoining Areas to the West in Jefferson County, Colorado,
W76-09825 7C

Hydrologic Unit Map--1974, State of Alaska,
W76-09826 7C

Hydrologic Unit Map--1974, State of Oregon,
W76-09827 7C

ARINAS
Application of Physical Tidal Models in Harbor and Marina Design,
W76-09984 5B

ARINE ALGAE
An Assessment of Possible Pollution Effects Over a Century of the Benthic Marine Algae of Co. Durham, England,
W76-09595 5C

ARINE ANIMALS
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

ARINE BACTERIA
Microbial Degradation of Model Petroleum at Low Temperatures,
W76-09648 5C

ARSHES
Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

ARYLAND
Research and Investigation of Geology, Mineral, and Water Resources of Maryland.
W76-09565 4A

Differentiation of Serpentinitic from Non-Serpentinitic Ultramafic Rocks in ERTS-1 MSS Imagery,
W76-09566 4A

Observation of Linear Features in the Maryland Piedmont as Shown on ERTS-1 MSS Imagery and Aircraft Support Photography,
W76-09567 4A

Maryland Chesapeake Bay Beaches - General Distribution and Classification,
W76-09568 2L

The Relationship of the Nearshore Longshore Bar and Sand Waves at Ocean City, Maryland,
W76-09569 2L

Linear Distribution of the High Marsh Vegetation Communities of the Lower Eastern Shore and its Geological Significance,
W76-09570 2L

Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

Watershed Management and Sediment Control in Montgomery County,
W76-09748 4D

Storm-Period Variables Affecting Sediment Transport from Urban Construction Areas,
W76-09840 2J

Urban-Area Sediment Yield--Effects of Construction-Site Conditions and Sediment-Control Methods,
W76-09841 4D

MASONBORO INLET (NC)
Simulation of Tidal Hydrodynamics - Masonboro Inlet,
W76-09953 8B

Modeling Sediment Movement for Masonboro Inlet,
W76-09956 2L

Masonboro Inlet Fixed-Bed Model Evaluation,
W76-09957 8B

MASS SPECTROSCOPY
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. I. Computerized High Resolution Mass Spectrometry and Gas Chromatography-Low Resolution Mass Spectrometry,
W76-09687 5A

MASSACHUSETTS BAY
Sampling Network Design for Dispersion Verification,
W76-09961 5B

MATHEMATICAL MODELS
Advantages of Numerical Atmospheric Dispersion Calculations for Estimating Dispersal and Combination Effects of Stack Releases from the Nuclear Industry,
W76-09501 5A

Optimal Ground Water Quality Management: Well Injection of Waste Waters,
W76-09511 5D

Theory of Multiple Leaky Aquifers 1. The Integrodifferential and Differential Equations for Small and Large Values of Time,
W76-09563 2F

Conceptual Hydrological Model for an Averaged-Sized Catchment Area, I. Concepts and Relationships,
W76-09579 2A

Conceptual Hydrological Model for an Average-Sized Catchment Area, II. Estimate of Parameters, Validity of Model, Application,
W76-09580 2A

The Use of Econometrics to Project Energy Demands,
W76-09611 6A

Energy Models and Forecasts: A User's Point of View,
W76-09612 6A

Energy Models and Forecasts: A User's Point of View,
W76-09613 6A

Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colorado,
W76-09761 2F

A Proposed Algorithm for the Solution of the Large-Scale Inverse Problem in Groundwater,
W76-09850 2F

Estimating Selected Parameters for the Kentucky Watershed Model from Watershed Characteristics,
W76-09852 2A

Parameter Optimization for Watershed Models,
W76-09853 2A

Symposium on Modeling Techniques, Volume I.
W76-09941 2A

Some Hard Lessons in Numerical Hydraulics,
W76-09952 8B

Simulation of Tidal Hydrodynamics - Masonboro Inlet,
W76-09953 8B

Systems Modeling of Stratified Fluids,
W76-09976 8B

Hydrodynamic Transport Phenomena in Estuaries and Coastal Waters: Scope of Mathematical Models,
W76-09980 5B

Application of Water Quality Models to Finger Fill Canals,
W76-09981 5B

River and Estuary Modeling with the Siva System,
W76-09982 2A

Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

MATHEMATICAL STUDIES
The Concentration of Dissolved Solids and River Flow,
W76-09577 5B

MAURITANIA (BAY DU LEVRIER)
Quantitative Aspect of the Phytoplankton of the Bay Du Levrier (Mauritania), (In French),
W76-09987 5C

MEADOWS
Phytomass Dynamics of Aboveground and Underground Organs of Meadow Steppe Plants, (In Russian),
W76-09817 2I

MEAN ANNUAL FOOD
Role of Carbonate Rocks in Modifying Flood Flow Behavior,
W76-09784 2A

MEANDERS
Modeling of Meandering and Braiding in Rivers,
W76-09974 2J

MEASUREMENT
Methods for Measurement of Biodegradability of Chemical Compounds,
W76-09599 5C

MEASUREMENT

Biodegradability and Process for Biological Purification of Waste Water (La Biodegradabilite et Les Procedes D'Epuration Biologique Des Effluents),
W76-09693 5D

Development of a Measurement Method for the Total Activity Rate of Activated Sludge (Contribution a La Mise Au Point D'une Methode De Mesure Du Taux D'Activite Totale Des Boues Activees),
W76-09695 5D

Laboratory Evaluation of the Coulter On-Line Particle Monitor,
W76-09699 5A

Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

MELT WATER

Water Transport in the Sill Area of Balsfjord North Norway, During Vernal Meltwater Discharge,
W76-09999 2L

MELTING

Water Transport in the Sill Area of Balsfjord North Norway, During Vernal Meltwater Discharge,
W76-09999 2L

MEMBRANE-FILTER METHOD

Myxobacteria of the Myxococcus Group as Indirect Indicators of Fecal Matter in Surface Water: 1. Communication, (In German),
W76-09591 5A

MEMBRANE PROCESSES

Evaluation of Combined Applications of Ultrafiltration and Complexation Capacity Techniques to Natural Waters,
W76-09690 5A

Membrane Support-Plates and Fluid Separating Apparatus in which They are Present,
W76-09857 5D

MEMBRANES

Supported Semi-Permeable Membranes,
W76-09863 3A

Semipermeable Membrane and Process for the Preparation Thereof,
W76-09864 3A

Reverse Osmosis Process Using Crosslinked Aromatic Polyamide Membranes,
W76-09877 3A

MERCURY

The Mercury Content of Industrial Fish Products: Its Relative Variation with the Treatment (Cooking in Salt Water, Pickling and Fish Production), (In Spanish),
W76-09802 5C

Metabolic Cycles for Toxic Elements in Aqueous Systems,
W76-09933 5C

MESOTROPHY

The Role of Microflora in the Productivity of a Salmon Breeding Lake, (In Russian),
W76-09818 5C

METABOLISM

Studies on the Metabolism of a Sulfur-Oxidizing Bacterium. VII. Purification and Characterization of Soluble Components Indispensables for Sulfur Oxidation by Thiobacillus Thiooxidans,
W76-09592 5C

Environmental Quality Research, First Annual Report,
W76-09654 5C

Metabolic Cycles for Toxic Elements in Aqueous Systems,
W76-09933 5C

METAGAME THEORY

Metagame Theory and its Applications to Water Resources,
W76-09847 6A

METALS

Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

METHANE

Microbial Reactions in Facultative Oxidation Ponds -- I. The Anaerobic Nature of Oxidation Pond Sediments,
W76-09435 5D

Sludge Heat Treatment: Operation and Management,
W76-09708 5D

METHODOLOGY

Energy Modeling and Forecasting.
W76-09602 6A

Methdological Issues in the Econometric Estimation of Energy Demand Elasticities,
W76-09607 6A

Aqueduct Optimization with Intermediate Storage,
W76-09636 4A

A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

Ten Years of Experience with Automatic Pumping-Sediment Samplers,
W76-09843 7B

The Coanda Effect Oil/Water Separator: A Development Study,
W76-09890 5G

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume II,
W76-09900 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume III,
W76-09901 5A

MICROBIAL DEGRADATION

Microbial Degradation of Model Petroleum at Low Temperatures,
W76-09648 5C

The Role of Microflora in the Productivity of a Salmon Breeding Lake, (In Russian),
W76-09818 5C

Effects of Petroleum Pollutants on Arctic Microbial Populations,
W76-09909 5C

MICROBIAL REACTIONS

Microbial Reactions in Facultative Oxidation Ponds -- I. The Anaerobic Nature of Oxidation Pond Sediments,
W76-09435 5D

MICROCLIMATOLOGY

Micro-Climate Effects on Water Use Efficiency by Plants in an Arid Climate,
W76-09480 3B

MICROCYSTIS-AERUGINOSA

Induced Change of Nitrate Reductase Activity in Microcystis Aeruginosa Kutz. Emend. Elenk, (In Russian),
W76-09816 5C

MICROORGANISMS

Comparative Evaluation of Food Plants of the Ararat Cochineal Scale (Porphyrophora Hamelii) (In Russian),
W76-09406 2I

Microbial Aspects of Carbonisation Effluent Treatment,
W76-09712 5D

Pollution Influence on the Infusorial Fauna (Protozoa, Ciliata) of Bulgarian Rivers II. The Ogosta River and its Effluents,
W76-09714 5A

Marine Soil Pollution and Self-Purification, (In Russian),
W76-09789 5A

Iron-Manganese Microorganisms Studied by Overgrowing Technique, (In Russian),
W76-09813 5A

The Hygienic Quality of the Water in a Growing-Finishing Piggery, (In Romanian),
W76-09883 5B

MICROSCOPY

Iron-Manganese Microorganisms Studied by Overgrowing Technique, (In Russian),
W76-09813 5A

MIDDLE EAST

The Desert War on Pollution,
W76-09711 5D

MIDGES

Insect Growth Regulators for the Control of Aquatic Midges,
W76-09997 5G

MINE WASTES

Changes in Water Chemistry Resulting from Surface-Mining of Coal on Four West Virginia Watersheds,
W76-09470 4C

Concentration of Heavy Metals in Sediments of a Hydroelectric Impoundment,
W76-09755 5A

MINERAL ANALYSIS

Water Chemistry of the St. Lawrence Estuary,
W76-09581 5A

MINERAL WATER

Hygienic Assessment of Changes in Mineral Water Properties During its Treatment for Use in Internal Balneotherapeutic Procedures, (In Russian),
W76-09795 5C

MINERALOGY

Concentration of Cesium-137 in Aquatic Organisms, Water and Bottom Deposits of Water Bodies with a Different Mineral Compositions of the Water, (In Russian),
W76-09410 5C

MINEROLOGY
Exploration Rock Geochemistry-Detection of Trace Element Halo at Heath Steele Mines (N. B., Canada) by Discriminant Analysis,
W76-09473 2K

MINING
Environmental Impact Study of Offshore Sand and Gravel Mining,
W76-09910 6G

MINNESOTA
The Contribution of a Water Information System for Environmental Planning in Minnesota,
W76-09753 6G

MINNOWS
Substitute Chemical Program - Initial Scientific and Minieconomic Review of Captan.
W76-09651 5C

MISSISSIPPI RIVER
Mathematical Modeling of Alluvial Channels,
W76-09968 8B

MISSOURI RIVER
Longitudinal Dispersion Coefficients for Streams,
W76-09589 5B

Undistorted Movable-Bed Model Study for a River and Power Plant Intake System,
W76-09971 8B

MIXED-LAYER DEPTHS
Diagnostic Model Study of Mixed-Layer Depths in the Summer North Pacific,
W76-09719 2L

MOBILE BAY (ALA)
Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

MODEL STUDIES
Advantages of Numerical Atmospheric Dispersion Calculations for Estimating Dispersal and Combination Effects of Stack Releases from the Nuclear Industry,
W76-09501 5A

Discussion of Possible Effects Due to Mixing of Radioactive and Thermal Releases to the Atmosphere from Nuclear Power Plants,
W76-09502 5A

A Site Study of the Multiple Effects of Thermal Releases on the Aquatic Life in an Estuarine Area,
W76-09505 5C

Hydrologic Systems Analysis Model for Generating Runoff Time Series (Hidrologiai) Rendszervizsgalati Modell Vizhozamidoser Eloallitasara (II. RESZ),
W76-09557 2A

Island Barrier Effects on Sea State as Revealed by a Numerical Wave Model and DMSP Satellite Data,
W76-09559 2L

Finite-Amplitude Baroclinic Disturbances in Downstream Varying Currents,
W76-09560 2L

Numerical Simulation of Waste Movement in Steady Groundwater Flow Systems,
W76-09564 5B

Disaggregation Models in Hydrology Revisited,
W76-09573 2A

Sensitivity of Linear and Nonlinear Surface Runoff Models to Input Errors,
W76-09578 2A

Conceptual Hydrological Model for an Averaged-Sized Catchment Area, I. Concepts and Relationships,
W76-09579 2A

Conceptual Hydrological Model for an Average-Sized Catchment Area, II. Estimate of Parameters, Validity of Model, Application,
W76-09580 2A

Modeling the Chesapeake Bay and Tributaries: a Synopsis,
W76-09587 2L

Energy Modeling and Forecasting.
W76-09602 6A

A Probabilistic Model of the Oil and Gas Discovery Process,
W76-09604 6A

Coupled Energy System-Economic Models,
W76-09605 6A

Energy Policy and Economic Growth,
W76-09606 6A

Methdological Issues in the Econometric Estimation of Energy Demand Elasticities,
W76-09607 6A

Energy Systems: Modeling and Policy Planning,
W76-09608 6A

Energy Consumption and Fuel Choice by Residential and Commercial Consumers in the United States,
W76-09609 6A

The Design of Water Quality Management Projects with Inadequate Data,
W76-09623 5G

Ecosystem Modeling,
W76-09645 5C

A Review and Analysis of Selected Hydrologic Modeling Concepts,
W76-09718 2E

Diagnostic Model Study of Mixed-Layer Depths in the Summer North Pacific,
W76-09719 2L

Probability Distributions of Breaking Wave Heights Emphasizing the Utilization of the Jonswap Spectrum,
W76-09721 2L

A Model for the Thermodynamic Growth of Sea Ice in Numerical Investigations of Climate,
W76-09722 2C

On Entrainment and Diffusion in a Gulf of Mexico Anticyclonic Ring,
W76-09723 2L

The Wind Drift and Wave Breaking,
W76-09724 2L

Upward Water Movement in Field Cores,
W76-09726 3F

ILLUDAS - The Illinois Urban Drainage Area Simulator,
W76-09735 2E

Remedial Measures for Urban Flood Peak Reduction,
W76-09736 2E

A Flood Management Model for Urbanizing River Basins,
W76-09737 4C

An Application of the Storm Water Management Model,
W76-09738 5D

Use of the Computer Program 'STORM' for Analysis of the Quantity and Quality of Urban Storm Water Runoff,
W76-09740 5B

Physical and Economic Aspects Associated with Runoff from Urban Growth: A Methodological Approach,
W76-09749 4C

Verification of Numerical Models of Lake Ontario, III. Longterm Heat Transports,
W76-09783 2H

Regression Analysis and Parameter Identification,
W76-09824 7A

A Proposed Algorithm for the Solution of the Large-Scale Inverse Problem in Groundwater,
W76-09850 2F

Symposium on Modeling Techniques, Volume I.
W76-09941 2A

St. Lawrence Seaway: A New Goal of Year-Round Navigation,
W76-09942 2C

Specifications for Container Facilities by Simulation,
W76-09943 6A

Hybrid-Element Method for Water Waves,
W76-09945 8B

Large Wave Channel for 'Full Scale-Modeling' of Wave Dynamics in Surf Zones,
W76-09946 8B

Wave Motions in an Offshore Harbor,
W76-09947 8B

Modeling of Wind-Waves with Jonswap Spectra,
W76-09948 8B

Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

Estuarine Ecologic Simulations,
W76-09950 2L

Organic Sediment Model for Wastewater Outfall,
W76-09951 5B

Some Hard Lessons in Numerical Hydraulics,
W76-09952 8B

Simulation of Tidal Hydrodynamics - Masonboro Inlet,
W76-09953 8B

Modeling Sediment Movement for Masonboro Inlet,
W76-09956 2L

Principle of Management of Degenerated Inlets and Estuaries,
W76-09958 8B

Particle-Laden Jets with Application to Ocean Dumping,
W76-09959 5B

Temperature Predictions for Offshore Power Plants,
W76-09960 5B

Sampling Network Design for Dispersion Verification,
W76-09961 5B

Near-Field Jet Penetration and Reservoir Mixing,
W76-09962 8C

Physical Model of Discharge in a Two-Layer Stratified Ambient,
W76-09963 8B

Numerical Two-Dimensional Flow Model for River Systems,
W76-09964 2E

Two-Dimensional Model of Flow Toward Intakes,
W76-09965 2E

Mathematical Model of Flow in a Stream-Aquifer System,
W76-09966 2E

Forecasts for the Sacremento River System,
W76-09967 2E

Mathematical Modeling of Alluvial Channels,
W76-09968 8B

Movable-Bed River-Models,
W76-09969 2E

Sediment Deposition Model for Tarbela Reservoir,
W76-09970 2J

Undistorted Movable-Bed Model Study for a River and Power Plant Intake System,
W76-09971 8B

Physical Modeling Techniques Used in River Models,
W76-09972 2E

Riverbank Recessions for Power Plant Facilities,
W76-09973 8B

Modeling of Meandering and Braiding in Rivers,
W76-09974 2J

Modeling Sediment Transport in Hydraulic Structures,
W76-09975 2J

Modeling of Three-Dimensional Flows in Estuaries,
W76-09977 2L

Results of Salinity Tests on the San Francisco Bay-Delta Hydraulic Model,
W76-09978 2L

Experience with a Small Scale, Highly Distorted Fixed Bed Model of the Lago Maracaibo Estuary,
W76-09979 2L

Hydrodynamic Transport Phenomena in Estuaries and Coastal Waters: Scope of Mathematical Models,
W76-09980 5B

Application of Water Quality Models to Finger Fill Canals,
W76-09981 5B

River and Estuary Modeling with the Siva System,
W76-09982 2A

Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

Application of Physical Tidal Models in Harbor and Marina Design,
W76-09984 5B

MODEL TECHNIQUES
Hydrodynamic Transport Phenomena in Estuaries and Coastal Waters: Scope of Mathematical Models,
W76-09980 5B

MOISTURE CONTENT
Transformation of Concentrated and Complex Phosphorus Fertilizers in Modow-Bog Soil with a High Moisture Content, (In Azerbaijani),
W76-09786 5B

MOISTURE TENSION
Effect of Different Spring Soil Moisture Levels on Moisture Stress,
W76-09412 3F

Comparative Study in Measuring Fluid Surface Tension and Fluid Content with the Aid of Electrical Resistance Elements 'In Situ' and in the Laboratory, (In Flemish),
W76-09923 2G

MOLLUSKS
Influence De La Temperature Sur La Contamination D'Especes Marines Par Le Fer-59, (Influence of Temperature on the Contamination of Marine Species by Iron-59),
W76-09494 5C

MONITORING
Monitoring Wells,
W76-09558 4B

Monitoring and Automatic Filter Control of the Dreis-Tiefenback Treatment Plant (Betriebsueberwachung und Automatische Filtersteuerung der Aufbereitungsanlage Dreis-Tiefenbach),
W76-09679 5F

Laboratory Evaluation of the Coulter On-Line Particle Monitor,
W76-09699 5A

Representative Dirty Water Sampling,
W76-09702 5A

Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

MONTANA
Concentration of Heavy Metals in Sediments of a Hydroelectric Impoundment,
W76-09755 5A

MONTGOMERY COUNTY (MD)
Watershed Management and Sediment Control in Montgomery County,
W76-09748 4D

Urban-Area Sediment Yield--Effects of Construction-Site Conditions and Sediment-Control Methods,
W76-09841 4D

MONTMORILLONITE
Volume Changes in Swelling Clays,
W76-09881 2G

MOUNTAIN CREEK (TEX)
Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1974,
W76-09829 7C

MOVABLE-BED MODELS
Physical Modeling Techniques Used in River Models,
W76-09972 2E

MULCHING
Requirements and Use of Fertilizer, Lime, and Mulch for Vegetating Acid Mine Spoils,
W76-09469 4D

MULTIPLE AQUIFERS
Theory of Multiple Leaky Aquifers 1. The Integrodifferential and Differential Equations for Small and Large Values of Time,
W76-09563 2F

MULTIPURPOSE RESERVOIRS
Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W76-09622 4A

MULTIVARIATE ANALYSIS
Role of Carbonate Rocks in Modifying Flood Flow Behavior,
W76-09784 2A

MUNICIPAL WASTES
Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W76-09413 5D

MUNICIPAL WATER
Water Authority Rate Making,
W76-09717 6C

MUNICIPAL WATERSHED SURVEYS
Summary of Municipal Watershed Management Surveys in Eastern United States,
W76-09466 4D

MUNICIPAL WATERSHEDS
Effects of Management Practices on Water Quality and Quantity: Baltimore, Maryland, Municipal Watersheds,
W76-09464 4D

Effects of Management Practices on Water Quality and Quantity: Newark, New Jersey, Municipal Watersheds,
W76-09465 4D

Municipal Watershed Management: What are the Opportunities,
W76-09472 4D

MUSKINGUM RIVER (OHIO)
The Concentration of Dissolved Solids and River Flow,
W76-09577 5B

MYXOCOCCUS
Myxobacteria of the Myxococcus Group as Indirect Indicators of Fecal Matter in Surface Water: 1. Communication, (In German),
W76-09591 5A

NAPERVILLE (ILL)
Municipal Storm Water Management Programs,
W76-09751 4A

APHTHALENE
Determination of Microquantities of Naphthalene in Environmental Objects, (In Russian),
W76-09620 5A

ARRAGANSETT BAY (RI)
Velocity Observations in the West Passage of Narragansett Bay: A Partially Mixed Estuary,
W76-09561 2L

ATIONAL ENERGY POLICY
Energy Systems: Modeling and Policy Planning,
W76-09608 6A

ATIONAL ENVIRONMENTAL POLICY ACT
NEPA and a State's Role in Water Resources Management,
W76-09627 6E

ATURAL RECHARGE
Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colorado,
W76-09761 2F

ATURAL RESOURCES
Distribution of Ponderosa Pine Forest Densities on the Salt-Verde River Basin,
W76-09477 4A

AVIGABLE WATERS
Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

EBRASKA
Effects of Land Use and River Seepage on Groundwater Quality in Hall County, Nebraska,
W76-09728 5B

EPAL (INDIA)
On The Rainfall and Water Potential of Nepal,
W76-09642 2B

ETHERLANDS
Industrial Experience of Sewage Sludge Processing with Zimpro Installations in the Netherlands,
W76-09709 5D

ETWORK DESIGN
Regression Analysis and Parameter Identification,
W76-09824 7A

Sampling Network Design for Dispersion Verification,
W76-09961 5B

ETWORKS
Evaluation of Mean Square Error Involved in Approximating the Areal Average of a Rainfall Event by a Discrete Summation,
W76-09572 2B

Sampling Network Design for Dispersion Verification,
W76-09961 5B

EVADA
Characterization of Nitrogen Sources Contaminating Shallow Ground Water in an Arid Basin. Las Vegas Area, Nevada,
W76-09762 5B

EW JERSEY
Effects of Management Practices on Water Quality and Quantity: Newark, New Jersey, Municipal Watersheds,
W76-09465 4D

Combined Sewage Overflows - Frequency, Environmental Effects, and a Corrective Program,
W76-09741 5D

NEW MEXICO
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

Cenozoic Deposits of Southeastern New Mexico and an Outline of the History of Evaporite Dissolution,
W76-09837 2J

NEW YORK BIGHT
Species Composition and Diversity of Polychaetes in the New York Bight,
W76-09650 5C

NEW YORK CITY JAMAICA TREATMENT PLANT
New York Takes Another Giant Step,
W76-09710 5D

NEW ZEALAND
Wastewater Treatment in New Zealand,
W76-09670 5D

NEW ZEALAND (NORTH ISLAND)
The Erodibility of Pumice Soils of the North Island, New Zealand,
W76-09787 4D

NITRATE REDUCTASE ACTIVITY
Induced Change of Nitrate Reductase Activity in Microcystis Aeruginosa Kutz. Emend. Elenk, (In Russian),
W76-09816 5C

NITRATES
Phosphate Removal--Tackling Eutrophication from the Other Side,
W76-09436 5D

Nitrates: What's Happening in Britain,
W76-09451 5D

Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

Characterization of Nitrogen Sources Contaminating Shallow Ground Water in an Arid Basin. Las Vegas Area, Nevada,
W76-09762 5B

Induced Change of Nitrate Reductase Activity in Microcystis Aeruginosa Kutz. Emend. Elenk, (In Russian),
W76-09816 5C

The Hygienic Quality of the Water in a Growing-Finishing Piggery, (In Romanian),
W76-09883 5B

NITRIFICATION
Nitrification Studies of Ship Channel Waters,
W76-09453 5D

Possibilities and Limits of Extended Waste Water Purification (Moeglichkeiten und Grenzen der Weitergehanded Abwasserreinigung),
W76-09683 5D

NITRITES
The Hygienic Quality of the Water in a Growing-Finishing Piggery, (In Romanian),
W76-09883 5B

NITROGEN
Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W76-09413 5D

Phosphorus and Nitrogen Cycle on a Transect in Lake Ontario During the International Field Year 1972-1973 (IFYGL),
W76-09594 5C

Nitrogen in the Subsurface Environment,
W76-09662 5B

The Leaching Behavior of Different Nitrogen Sources in Lysimeter Experiments, (In German),
W76-09793 2G

The Water Supply System of Soil and Nitrogen Loss with Runoff Waters in Nonchernozem Areas, (In Russian),
W76-09794 2G

NITROGEN COMPOUNDS
Sewage Treatment Process,
W76-09422 5D

Nitrates: What's Happening in Britain,
W76-09451 5D

Nitrogen in the Subsurface Environment,
W76-09662 5B

Sanitary Inspection of Surface Waters Polluted with Aromatic Amino and Nitro-Compounds, (In Russian),
W76-09798 5A

NITROGEN CONTAMINATION
Nitrogen in the Subsurface Environment,
W76-09662 5B

NITROGEN FIXATION
Dependence of the Level of Nitrogenase Activity on the Water Content of the Thallus in Peltigera Canina, P. Evansiana, P. Polydactyla, and P. Praetextata,
W76-09916 5A

NON-LINEAR MODELS
Sensitivity of Linear and Nonlinear Surface Runoff Models to Input Errors,
W76-09578 2A

NON-STRUCTURAL ALTERNATIVES
A Floodplain Management Framework with Structural and Non-Structural Measures,
W76-09754 6F

NONSWELLING SOILS
Stability Analysis of Infiltration,
W76-09588 2G

NORTH AMERICA
Salinity Tolerance of Inland Halophytic Vegetation of North America,
W76-09988 3C

NORTH CAROLINA
Simulation of Tidal Hydrodynamics - Masonboro Inlet,
W76-09953 8B

NORTH SEA
Modeling of Wind-Waves with Jonswap Spectra,
W76-09948 8B

NORWAY (BALSFJORD)
Water Transport in the Sill Area of Balsfjord North Norway, During Vernal Meltwater Discharge,
W76-09999 2L

NORWAY (HAUGATJERN LAKE)
Feeding Habits of the Population of Whitefish (Coregonus Lavaretus (L.)) in Haugatjern: A Eutrophic Norwegian Lake,
W76-09882 2H

NUCLEAR POWERPLANTS
Power Generation in Arizona and Its Environmental Implications,
W76-09485 6D

Wave Motions in an Offshore Harbor,
W76-09947 8B

NUCLEAR TECHNIQUES (HYDROLOGY)
Nuclear Techniques in Hydrological Studies,
W76-09996 2F

NUCLEAR WASTES
Assessing Potential Ocean Pollutants,
W76-09889 5G

NUCLEATION
Synergistic Effects of Atmospheric Releases of Radioactive Gases and SO2 in Inducing Nucleation in the Atmosphere,
W76-09500 5A

NUISANCE ALGAE
Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

NUMERICAL ANALYSIS
Hybrid-Element Method for Water Waves,
W76-09945 8B

Some Hard Lessons in Numerical Hydraulics,
W76-09952 8B

NUTRIENT
Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

NUTRIENT REMOVAL
Phosphate Removal--Tackling Eutrophication from the Other Side,
W76-09436 5D

NUTRIENT REQUIREMENTS
Sedimentation and Phosphorus Balance in Lake Lucerne (Horw Bay) and in the Rotsee, (In German),
W76-09790 5C

NUTRIENT UPTAKE
A Quantitative Analysis of the Factors Affecting Plant Nutrient Uptake from Some Soils,
W76-09489 2G

NUTRIENTS
Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

A Quantitative Analysis of the Factors Affecting Plant Nutrient Uptake from Some Soils
W76-09489 2G

Materials Budgets of Lake Champlain,
W76-09756 5A

Organic Productivity of Inshore and Offshore Waters of Barbados: A Study of the Island Mass Effect,
W76-09938 5C

Quantitative Aspect of the Phytoplankton of the Bay Du Levrier (Mauritania), (In French),
W76-09987 5C

OBSERVATION WELLS
Monitoring Wells,
W76-09558 4B

Report of Water Levels in Selected Observation Wells in Utah--April 1976,
W76-09832 4B

OCEAN CIRCULATION
Temperature Predictions for Offshore Power Plants,
W76-09960 5B

OCEAN CITY (MD)
The Relationship of the Nearshore Longshore Bar and Sand Waves at Ocean City, Maryland,
W76-09569 2L

OCEAN CURRENTS
Finite-Amplitude Baroclinic Disturbances in Downstream Varying Currents,
W76-09560 2L

Observations of the California Undercurrent Off Washington and Vancouver Island,
W76-09584 2L

OCEAN DUMPING
Assessing Potential Ocean Pollutants,
W76-09889 5G

OCEAN WAVES
Island Barrier Effects on Sea State as Revealed by a Numerical Wave Model and DMSP Satellite Data,
W76-09559 2L

Energy Dissipation on a Rough Slope,
W76-09582 8B

Transverse Forces on Vertical Cylinders in Waves,
W76-09583 8B

Probability Distributions of Breaking Wave Heights Emphasizing the Utilization of the Jonswap Spectrum,
W76-09721 2L

Wave Breaking in the Presence of Wind Drift and Swell,
W76-09874 2L

Modeling of Wind-Waves with Jonswap Spectra,
W76-09948 8B

OCEANS
Observations of the California Undercurrent Off Washington and Vancouver Island,
W76-09584 2L

Upwelling Near Samalga Pass,
W76-09585 2L

An Economist's View of the Oceans,
W76-09617 6E

Diagnostic Model Study of Mixed Layer Depths in the Summer North Pacific,
W76-09719 2L

The Role of Vertical Motion in the Heat Budget of the Upper Northeastern Pacific Ocean,
W76-09720 2L

ODOR
Operation of Ozone Treatment Apparatus (Ozone shori sochi no unten),
W76-09713 5F

OFFSHORE PLATFORMS
Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

An Environmental Research Program for Drilling in the Canadian Beaufort Sea,
W76-09912 5G

OFFSHORE POWERPLANTS
Wave Motions in an Offshore Harbor,
W76-09947 8B

Temperature Predictions for Offshore Power Plants,
W76-09960 5B

OFFSHORE TECHNOLOGY
Environmental Impact Study of Offshore Sand and Gravel Mining,
W76-09910 6G

Academic Data-Needs for Environmental Assessments of Offshore Technological Operations,
W76-09914 6G

Coast Guard's Response to Spilled Oil,
W76-09915 5A

OGALLALA FORMATION (NEB)
Effects of Land Use and River Seepage on Groundwater Quality in Hall County, Nebraska,
W76-09728 5B

OHIO
Re-Evaluation of the Effects of Man-Made Modifications on Gordon Creek Between 1887 and 1973 and Especially as Regards its Fish Fauna,
W76-09407 4C

The Concentration of Dissolved Solids and River Flow,
W76-09577 5B

OHIO RIVER
Hydrologic Forecasting for the Ohio River Waterway,
W76-09944 2E

OIL
A Probabilistic Model of the Oil and Gas Discovery Process,
W76-09604 6A

OIL INDUSTRY
Water-Resources Investigations of the U.S. Geological Survey in the Major Coal and Oil Shale Areas of Wyoming, 1975-76,
W76-09833 4A

Combination Providing Safety Berthing, Unloading of Oil, and Conduit Carriage to Refineries on Land, of Large Deep-Sea-Requiring Tankers,
W76-09865 5G

Offshore Petroleum and New England - A Study of the Regional Economic Consequences of Potential Offshore Oil and Gas Development,
W76-09893 6B

Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

OIL POLLUTION
The Coanda Effect Oil/Water Separator: A Development Study,
W76-09890 5G

Airborne Detection and Mapping of Oil Spills, Grand Bahamas,
W76-09891 5A

Development of a Boat and Helicopter Deployable Oil Slick Sampler,
W76-09892 5A

Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume II,
W76-09900 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume III,
W76-09901 5A

Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

OIL SAMPLERS
Development of a Boat and Helicopter Deployable Oil Slick Sampler,
W76-09892 5A

OIL SPILLS
Microbial Degradation of Model Petroleum at Low Temperatures,
W76-09648 5C

Airborne Detection and Mapping of Oil Spills, Grand Bahamas,
W76-09891 5A

Development of a Boat and Helicopter Deployable Oil Slick Sampler,
W76-09892 5A

Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

Oil in the Arctic,
W76-09902 5C

Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

Effects of Petroleum Pollutants on Arctic Microbial Populations,
W76-09909 5C

An Environmental Research Program for Drilling in the Canadian Beaufort Sea,
W76-09912 5G

Coast Guard's Response to Spilled Oil,
W76-09915 5A

OIL WASTES
A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

OIL-WATER SEPARATORS
The Coanda Effect Oil/Water Separator: A Development Study,
W76-09890 5G

OILY WATER
Microbial Degradation of Model Petroleum at Low Temperatures,
W76-09648 5C

The Coanda Effect Oil/Water Separator: A Development Study,
W76-09890 5G

Development of a Batchwise In-situ Regeneration Type Separator to Remove Oil from Oil-Water Suspensions,
W76-09895 5G

ON-SITE INVESTIGATIONS
Species Composition and Diversity of Polychaetes in the New York Bight,
W76-09650 5C

OPEN CHANNELS
Proposed Revision to the Modified Einstein Method of Computing Total Sediment Discharge,
W76-09842 2J

OPERATING COSTS
Objectives and Costs of Advanced Treatment Techniques for Sewage,
W76-09449 5D

OPERATING RULES
Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W76-09622 4A

OPERATIONS
Solution of the Operating Problems of a Modern Sewage Treatment Plant,
W76-09455 5D

Optimal Operation of the Pumping Stations in the Kinnereth-Eshkol Section of the National Water Carrier,
W76-09629 4A

OPERATIONS RESEARCH
A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

Metagame Theory and its Applications to Water Resources,
W76-09847 6A

OPTIMIZATION
On the Capacity-Expansion of Desalination Plants and Storage Tanks,
W76-09618 3A

Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W76-09622 4A

Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

Least Cost Design of Activated Sludge Systems,
W76-09638 5D

Parameter Optimization for Watershed Models,
W76-09853 2A

OREGON
Monitoring Wells,
W76-09558 4B

Hydrologic Unit Map--1974, State of Oregon,
W76-09827 7C

Specifications for Container Facilities by Simulation,
W76-09943 6A

ORGANIC CARBON
Using a CHN Analyzer to Reduce Carbonate Interference in Particulate Organic Carbon Analyses,
W76-09940 5A

ORGANIC COMPOUNDS
Determination of Tetramethylthiuram Disulfide (TMTD) in Water and Air by Colimetry, (In Russian),
W76-09590 5A

The Chemistry of Ozone in the Treatment of Water,
W76-09684 5F

Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. I. Computerized High Resolution Mass Spectrometry and Gas Chromatography-Low Resolution Mass Spectrometry,
W76-09687 5A

Organic Contaminants of Water,
W76-09689 5A

Evaluation of Combined Applications of Ultrafiltration and Complexation Capacity Techniques to Natural Waters,
W76-09690 5A

Problems Concerning the Character of Oxidizability of Certain Organic Substances in Water Treated with Ozone (Problemes lies A L'Evolution Du Caractere D'Oxydabilite De Certain Corps Organiques Presents Dans L'Eau Tratee Par L'Ozone),
W76-09692 5D

Sanitary Inspection of Surface Waters Polluted with Aromatic Amino and Nitro-Compounds, (In Russian),
W76-09798 5A

Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

ORGANIC MATTER
The Qualitative Organic Matter Composition of Some Marshy Soils of Nizhnevelikoretsk Plain, (In Russian),
W76-09888 2G

ORGANIC SEDIMENTS
Organic Sediment Model for Wastewater Outfall,
W76-09951 5B

ORGANIC WASTES
Organic Sediment Model for Wastewater Outfall,
W76-09951 5B

OROGRAPHY
On The Rainfall and Water Potential of Nepal,
W76-09642 2B

OSCILLOPOLAROGRAPHIC TECHNIQUE
Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

OUTER CONTINENTAL SHELF
Combination Providing Safety Berthing, Unloading of Oil, and Conduit Carriage to Refineries on Land, of Large Deep-Sea-Requiring Tankers,
W76-09865 5G

Assessing Potential Ocean Pollutants,
W76-09889 5G

Airborne Detection and Mapping of Oil Spills, Grand Bahamas,
W76-09891 5A

Offshore Petroleum and New England - A Study of the Regional Economic Consequences of Potential Offshore Oil and Gas Development,
W76-09893 6B

Development of a Batchwise In-situ Regeneration Type Separator to Remove Oil from Oil-Water Suspensions,
W76-09895 5G

Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

Oil in the Arctic,
W76-09902 5C

Environmental Impact Study of Offshore Sand and Gravel Mining,
W76-09910 6G

An Environmental Research Program for Drilling in the Canadian Beaufort Sea,
W76-09912 5G

Academic Data-Needs for Environmental Assessments of Offshore Technological Operations,
W76-09914 6G

OUTFALL SEWERS
A Comparison Between the Efficacy of Submarine Outfall Disposal of Advanced Primary Effluent and Conventional Treatment,
W76-09448 5E

Organic Sediment Model for Wastewater Outfall,
W76-09951 5B

OUTFALLS
Development of Edinburgh's Sewage Disposal Scheme,
W76-09707 5D

OVERDRAFT
The Over-Exploitation of Groundwater Resources in Dry Regions,
W76-09479 4B

OVERFLOW
Give Stormwater Pollutants the Spin,
W76-09461 5D

Combined Sewage Overflows - Frequency, Environmental Effects, and a Corrective Program,
W76-09741 5D

OXIDATION
Stabilization of Waste Material,
W76-09425 5D

Pilot Plant Experience in the Treatment of Industrial and Municipal Waste-Water by Means of Radiation-Induced Oxidation,
W76-09545 5D

Studies on the Metabolism of a Sulfur-Oxidizing Bacterium. VII. Purification and Characterization of Soluble Components Indispensables for Sulfur Oxidation by Thiobacillus Thiooxidans,
W76-09592 5C

Problems Concerning the Character of Oxidizability of Certain Organic Substances in Water Treated with Ozone (Problemes lies A L'Evolution Du Caractere D'Oxydabilite De Certain Corps Organiques Presents Dans L'Eau Tratee Par L'Ozone),
W76-09692 5D

Apparatus for Purification of Industrial Waste Water,
W76-09861 5D

OXIDATION LAGOONS
Microbial Reactions in Facultative Oxidation Ponds -- I. The Anaerobic Nature of Oxidation Pond Sediments,
W76-09435 5D

OXIDATION-REDUCTION POTENTIAL
Redox Potential in Irrigated Desert Soils as an Indicator of Aeration Status,
W76-09488 2G

OXYGEN
The Relationship Between Dissimilatory Nitrate Reduction and Oxygen Uptake by Cells of an Alcaligenes Strain in Flocs and in Suspension and by Activated Sludge Flocs,
W76-09686 5D

OXYGEN ACTIVATED SLUDGE
The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

OXYGENATION
Wastewater Treatment System with Controlled Mixing,
W76-09433 5D

Radiation Chemical Destruction of Phenol in Oxygenated Aqueous Solutions,
W76-09530 5D

OYSTERS
On the Extermination of Polyclads: Calcium Hypochlorite (CaOCl2) Treatment in the Period of High Water Temperature, (In Korean),
W76-09801 5C

OZONE
Ozone Provides Alternative for Secondary Effluent Disinfection. Part 1,
W76-09445 5D

Radiation Treatment of Wastes, A Review,
W76-09517 5D

Comparison of the Chemical Effects of Oxone and of Irradiation on Organic Impurities in Water,
W76-09535 5D

The Chemistry of Ozone in the Treatment of Water,
W76-09684 5F

Problems Concerning the Character of Oxidizability of Certain Organic Substances in Water Treated with Ozone (Problemes lies A L'Evolution Du Caractere D'Oxydabilite De Certain Corps Organiques Presents Dans L'Eau Tratee Par L'Ozone),
W76-09692 5D

Operation of Ozone Treatment Apparatus (Ozone shori sochi no unten),
W76-09713 5F

Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

PACIFIC OCEAN
Observations of the California Undercurrent Off Washington and Vancouver Island,
W76-09584 2L

Upwelling Near Samalga Pass,
W76-09585 2L

Diagnostic Model Study of Mixed-Layer Depths in the Summer North Pacific,
W76-09719 2L

The Role of Vertical Motion in the Heat Budget of the Upper Northeastern Pacific Ocean,
W76-09720 2L

Probability Distributions of Breaking Wave Heights Emphasizing the Utilization of the Jonswap Spectrum,
W76-09721 2L

PACKAGE PLANTS
Technique Alternatives for a Package Stabilization Plant,
W76-09705 5D

PALO ALTO (CALIF)
Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

PARAMETRIC HYDROLOGY
Estimating Selected Parameters for the Kentucky Watershed Model from Watershed Characteristics,
W76-09852 2A

Parameter Optimization for Watershed Models,
W76-09853 2A

PARAMETRIC PROGRAMMING
Identification of Linear Systems Response by Parametric Programing,
W76-09575 2E

PARASITISM
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Bacterial and Parasitological Studies AfterIrradiation.
W76-09548 5D

PARTICLE-LADEN JETS
Particle-Laden Jets with Application to Ocean Dumping,
W76-09959 5B

PASTEURIZATION
Practical Aspects of the Pasteurization of Sewage Sludge by Electron Irradiation,
W76-09540 5D

Costs and Hygienic Necessity of Sewage Sludge Pasteurization in Switzerland,
W76-09542 5D

Effects of Gamma Radiation at Pilot Plant Level Compared with the Effects of Pasteurization on the Dewatering of Sewage Sludge,
W76-09550 5D

PATENTS
Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W76-09413 5D

Sanitary Waste Treatment Plant,
W76-09414 5D

Aerated Sewerage Disposal,
W76-09415 5D

Sludge Removal System,
W76-09416 5D

Sewage Treatment Tank and Tube Settler,
W76-09417 5D

Marine Sewage Disposal Device,
W76-09418 5D

Sludge Control and Decant System,
W76-09419 5D

Apparatus for Sewage Treatment and Wastewater Reclamation,
W76-09420 5D

Separation of Sludge,
W76-09421 5D

Sewage Treatment Process,
W76-09422 5D

Sewage Treatment Aeration Systems,
W76-09423 5D

Method and Apparatus for Rejuvenating a Bed of Granular Filter Medium,
W76-09424 5D

Stabilization of Waste Material,
W76-09425 5D

Septic Tank System,
W76-09426 5D

Waste Treatment Plants,
W76-09427 5E

Process and Apparatus for the Incineration of Aqueous Sewage Sludge,
W76-09428 5E

Apparatus for Treating Industrial and Domestic Waste Waters,
W76-09429 5D

Sewage Septic System for a Plurality of Drain Fields,
W76-09430 5D

Waste Purification System,
W76-09431 5D

Waste Treatment Apparatus,
W76-09432 5D

Wastewater Treatment System with Controlled Mixing,
W76-09433 5D

Cationic Acrylamide-Styrene Copolymers and Flocculation of Sewage Therewith,
W76-09434 5D

Removal of Phosphate from Waste Water,
W76-09458 5D

Sewage Treatment System,
W76-09854 5D

Water Treatment Process and Apparatus,
W76-09855 5D

Method of Biological Purification of Industrial Effluents from Chromates and Bichromates,
W76-09856 5D

Membrane Support-Plates and Fluid Separating Apparatus in which They are Present,
W76-09857 5D

Method and Composition for Preventing Water Contaminated with Industrial Waste from Seeping Through Soil Containing Said Water,
W76-09858 5G

Open-Loop Water-Washable Inspection Penetrant Process,
W76-09859 5D

Apparatus for Purification of Industrial Waste Water,
W76-09861 5D

Domestic Water Filtration Apparatus,
W76-09862 5F

Supported Semi-Permeable Membranes,
W76-09863 3A

Semipermeable Membrane and Process for the Preparation Thereof,
W76-09864 3A

Combination Providing Safety Berthing, Unloading of Oil, and Conduit Carriage to Refineries on Land, of Large Deep-Sea-Requiring Tankers,
W76-09865 5G

Irrigation System Pivot Swivel,
W76-09866 3F

Apparatus and Method for Recovering Pure Water from Natural Sources and Industrial Polluted Waste Sources,
W76-09867 5G

Liquid Distribution System for Irrigation and the Like,
W76-09868 3F

Irrigation Vehicle,
W76-09869 3F

Drip Level Irrigation,
W76-09870 3F

Method and Apparatus for Converting Saline Water to Fresh Water,
W76-09871 3A

Method and Apparatus for the Conversion of an Aqueous Scale-Formed Liquid,
W76-09872 3A

Method of Operating a Purifying Plant and Tank for Practicing Said Method,
W76-09873 5D

Furnace for Thermal Treatment of Liquid Industrial Waste Waters Containing Toxic Organic Impurities (Pech' Dlya Termicheskogo Obezvrezhivaniya Zhidkikh Promyshlennykh Stokov S Toksicheskimi Organicheskimi Primesyami),
W76-09875 5D

Preparation of Reverse Osmosis Membranes by Complete Evaporation of the Solvent System,
W76-09876 3A

Reverse Osmosis Process Using Crosslinked Aromatic Polyamide Membranes,
W76-09877 3A

PATH OF POLLUTANTS
Discussion of Possible Effects Due to Mixing of Radioactive and Thermal Releases to the Atmosphere from Nuclear Power Plants,
W76-09502 5A

Numerical Simulation of Waste Movement in Steady Groundwater Flow Systems,
W76-09564 5B

The Concentration of Dissolved Solids and River Flow,
W76-09577 5B

Longitudinal Dispersion Coefficients for Streams,
W76-09589 5B

Nitrogen in the Subsurface Environment,
W76-09662 5B

Distribution of Bdellovibrio Bacteriovorus in Sewage Works, River Water, and Sediments,
W76-09698 5A

Sediment Properties, Lake Champlain: 1971-1975,
W76-09763 5B

Radiation Hazard of Iodine-129, (In Russian),
W76-09788 5B

PATHOGENIC BACTERIA
Ecology of Cholera Vibrios, (In Russian),
W76-09409 5C

Sanitary Effect of Gamma Irradiation on Sewage Sludge,
W76-09527 5D

PATHOLOGY
Substitute Chemical Program - Initial Scientific and Minieconomic Review of Captan.
W76-09651 5C

PELTIGERA SP
Dependence of the Level of Nitrogenase Activity on the Water Content of the Thallus in Peltigera Canina, P. Evansiana, P. Polydactyla, and P. Praetextata,
W76-09916 5A

PENNSYLVANIA
Erosion Control During Pipeline Construction,
W76-09743 5G

Hydrology and Sedimentation of Bixler Run Basin, Central Pennsylvania,
W76-09830 2J

PEQUANNOCK WATERSHED (NJ)
Effects of Management Practices on Water Quality and Quantity: Newark, New Jersey, Municipal Watersheds,
W76-09465 4D

PERCOLATION
The Leaching Behavior of Different Nitrogen Sources in Lysimeter Experiments, (In German),
W76-09793 2G

PERIPHYTON
Effect of Entrainment in Power Station Cooling Systems Studied Using Periphytic Communities,
W76-09498 5C

Environmental Quality Research, First Annual Report,
W76-09654 5C

PERMEABILITY
Effect of an Electric Current on Water Stability of the Structure of Salinized Solonetz, (In Russian),
W76-09804 2G

PERMSELECTIVE MEMBRANES
Membrane Support-Plates and Fluid Separating Apparatus in which They are Present,
W76-09857 5D

PESTICIDE REMOVAL
Development of Laboratory Model Ecosystems as Early Warning Elements of Environmental Pollution,
W76-09643 5C

PESTICIDE RESIDUES
Development of Laboratory Model Ecosystems as Early Warning Elements of Environmental Pollution,
W76-09643 5C

Results of Hygienic and Toxicological Studies of Pesticides in Countries of the Council of Mutual Economic Assistance in 1962-1972, (In Russian),
W76-09884 5G

Pesticide and PCB Residue in Organs of Wild Animals as Indicators of Environmental Contamination, (In German),
W76-09922 5A

PESTICIDES
Substitute Chemical Program - Initial Scientific and Minieconomic Review of Captan.
W76-09651 5C

PETROLEUM
Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

PHENOLS
Radiation Chemical Destruction of Phenol in Oxygenated Aqueous Solutions,
W76-09530 5D

PHOSPHATES
Phosphate Removal--Tackling Eutrophication from the Other Side,
W76-09436 5D

Removal of Phosphate from Waste Water,
W76-09458 5D

Transformation of Concentrated and Complex Phosphorus Fertilizers in Modow-Bog Soil with a High Moisture Content, (In Azerbaijani),
W76-09786 5B

PHOSPHORUS
Phosphorus and Nitrogen Cycle on a Transect in Lake Ontario During the International Field Year 1972-1973 (IFYGL),
W76-09594 5C

Transformation of Concentrated and Complex Phosphorus Fertilizers in Modow-Bog Soil with a High Moisture Content, (In Azerbaijani),
W76-09786 5B

Sedimentation and Phosphorus Balance in Lake Lucerne (Horw Bay) and in the Rotsee, (In German),
W76-09790 5C

Effect of Excess Soil Moisture on the Content of Phosphorus Compounds in Barley, (In Russian),
W76-09913 3F

PHOTOMETRY
Turbidimeter Lights the Way to Accurate Process Control,
W76-09694 5A

Determination of Fluorine in Drinking Water with a Cerium(III)- or Lanthanum Alizarin Complex, (In Russian),
W76-09796 5A

PHOTOSYNTHESIS
Sugar Beet Photosynthesis and Productivity Cultivated by Irrigated Farming in the Kirgiz SSR, (In Russian),
W76-09810 3F

Primary Production in the Frozen Lake Balaton,
W76-09991 5C

PHYSICOCHEMICAL PROPERTIES
A Simple Physicochemical Method of Detecting Traces of Surfactants in Water,
W76-09927 5A

PHYTOPLANKTON
Studies of Phytoplankton Ecology in the Bay of Valparaiso: II. Phytoplankton 1970-1971, (In Spanish),
W76-09408 5A

Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

Environmental Responses to Thermal Discharges from the Chesterfield Station, James River, Virginia,
W76-09652 5C

An Observation of Water Quality and Red Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

Organic Productivity of Inshore and Offshore Waters of Barbados: A Study of the Island Mass Effect,
W76-09938 5C

Quantitative Aspect of the Phytoplankton of the Bay Du Levrier (Mauritania), (In French),
W76-09987 5C

The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

PIGGERY WASTES
The Hygienic Quality of the Water in a Growing-Finishing Piggery, (In Romanian),
W76-09883 5B

PILES (FOUNDATIONS)
Transverse Forces on Vertical Cylinders in Waves,
W76-09583 8B

PILOT PLANTS
Sludge/Activated Carbon Cycle Treats Sewage.
W76-09443 5D

Carbon Made from Sewage Solids Treats Wastewater.
W76-09450 5D

Pilot Plant Experience in the Treatment of Industrial and Municipal Waste-Water by Means of Radiation-Induced Oxidation,
W76-09545 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Bacterial and Parasitological Studies AfterIrradiation.
W76-09548 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Experiments on the Inactivation of Viruses in Sewage Sludge after Radiation Treatment,
W76-09549 5D

Effects of Gamma Radiation at Pilot Plant Level Compared with the Effects of Pasteurization on the Dewatering of Sewage Sludge,
W76-09550 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Analytical Studies on Sewage Sludge and Plant Material,
W76-09552 5D

The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

PIPE FLOW
Hydrodynamic Separation of Solids from Solid-Liquid Mixtures,
W76-09716 5D

PIPE RELINING
Polyethylene Pipe Tackles Difficult Sewer Repair Job,
W76-09403 8G

Polyethylene Pipe Insertion Rehabilitates Old Sewers,
W76-09459 8G

PIPELINES
How Many Sewer Leaks Can You Afford.
W76-09404 8G

Polyethylene Pipe Insertion Rehabilitates Old Sewers,
W76-09459 8G

Erosion Control During Pipeline Construction,
W76-09743 5G

PISCICIDES
Reaction Times of Certain Freshwater Fishes to a Rotenone-Containing Piscicide,
W76-09993 5C

PLANKTON
Plankton Analysis Training Manual.
W76-09782 5C

Rotifer Production in Lake Baikal, (In Russian),
W76-09791 5C

The Algal Population of Duemmer Lake in the Years 1970/71, (In German),
W76-09812 5C

PLANNING
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

Energy Systems: Modeling and Policy Planning,
W76-09608 6A

Construction Planning of a Hydro Power Station,
W76-09616 8C

A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

The Contribution of a Water Information System for Environmental Planning in Minnesota,
W76-09753 6G

PLANT DISEASES
Meteorological Factors and Disease Expressions in Jute,
W76-09931 3F

PLANT GROWTH
A Quantitative Analysis of the Factors Affecting Plant Nutrient Uptake from Some Soils,
W76-09489 2G

Effects of Flooding and of Irrigation Water Salinity on Eucalyptus Camaldulensis Dehn. From Three Seed Sources,
W76-09664 3C

Phytomass Dynamics of Aboveground and Underground Organs of Meadow Steppe Plants, (In Russian),
W76-09817 2I

PLANT PHYSIOLOGY
Effectiveness of Water Utilization by Plants, (In Ukranian),
W76-09809 2D

Phytomass Dynamics of Aboveground and Underground Organs of Meadow Steppe Plants, (In Russian),
W76-09817 2I

PLANT POPULATIONS
Planting Pattern, Plant Population, Irrigation, and Insect Interactions in Cotton.
W76-09998 3F

PLANT WATER CONTENT
Hydratability as a Parameter of Plant Water Potential, (In French),
W76-09918 2I

PLANTING MANAGEMENT
Planting Pattern, Plant Population, Irrigation, and Insect Interactions in Cotton.
W76-09998 3F

PLASTIC PIPES
Polyethylene Pipe Tackles Difficult Sewer Repair Job,
W76-09403 8G

Polyethylene Pipe Insertion Rehabilitates Old Sewers,
W76-09459 8G

PLASTICS
GRP Launders at Sewage Treatment Plant.
W76-09462 8G

Radiation Recycling Process of Waste Poly(Tetrafluorethylene) Scrap,
W76-09556 5D

PLATTE RIVER SEEPAGE (NEB)
Effects of Land Use and River Seepage on Groundwater Quality in Hall County, Nebraska,
W76-09728 5B

PO RIVER DELTA (ITALY)
A Site Study of the Multiple Effects of Thermal Releases on the Aquatic Life in an Estuarine Area,
W76-09505 5C

PODZOLS
Investigations on the Erodibility of a Deeply Plowed Gray-Brown Podzolic Soil from Loess on a Slope by Means of Simulated Rain, (In German),
W76-09917 2J

Total Porosity and Pore Size Distribution in Untilled and Tilled Loess Soils, (In German),
W76-09939 2G

POISIONS
'Toxic' or 'Poisonous' Water, (In Russian),
W76-09932 5C

POISONS
Pathology of Acute Poisoning with the Insecticide Sevin in the Bent-Nosed Clam, Macoma Nasuta,
W76-09649 5C

POLAND (LUKNIANY LAKE)
The Vegetation of the 'Lukniany Lake' Nature Reserve in the Mazurian Lake District,(In Polish),
W76-09990 5C

POLAROGRAPHIC ANALYSIS
Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

POLICY ISSUES
Energy Projections--Relationship to Policy Issues,
W76-09603 6A

POLITICAL ASPECTS
Metagame Theory and its Applications to Water Resources,
W76-09847 6A

POLLUTANT IDENTIFICATION
Isolation of Salmonella from Sewage and Surface Waters, (In Russian),
W76-09411 5A

Exploration Rock Geochemistry-Detection of Trace Element Halo at Heath Steele Mines (N. B., Canada) by Discriminant Analysis,
W76-09473 2K

Surveys on Radiation-Resistant Asporogenic Bacteria in Natural Environments,
W76-09519 5C

Hydrologic and Chemical Analysis of the Principal Piedmontese Tributaries of Lago Maggiore in Relation to its Trophic Modifications, (In Italian),
W76-09576 5C

Determination of Tetramethylthiuram Disulfide (TMTD) in Water and Air by Colimetry, (In Russian),
W76-09590 5A

Myxobacteria of the Myxococcus Group as Indirect Indicators of Fecal Matter in Surface Water: 1. Communication, (In German),
W76-09591 5A

Isolation of Water Vibrios in Greece, (In French),
W76-09601 5A

Determination of Microquantities of Naphthalene in Environmental Objects, (In Russian),
W76-09620 5A

The Role of Bioassays in Environmental Research,
W76-09644 5A

A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. I. Computerized High Resolution Mass Spectrometry and Gas Chromatography-Low Resolution Mass Spectrometry,
W76-09687 5A

Dissolved Oxygen Analyzer T-01 Analyzer. A Simple Apparatus for Electrochemical Determination of Dissolved Oxygen in Water (Tlenomierz T-01 uproszczony przyrzad elektrochemicznego oznaczania tleunu roxpuszczomego w roztworach wodnych),
W76-09688 5A

Organic Contaminants of Water,
W76-09689 5A

Evaluation of Combined Applications of Ultrafiltration and Complexation Capacity Techniques to Natural Waters,
W76-09690 5A

Problems Concerning the Character of Oxidizability of Certain Organic Substances in Water Treated with Ozone (Problemes lies A L'Evolution Du Caractere D'Oxydabilite De Certain Corps Organiques Presents Dans L'Eau Tratee Par L'Ozone),
W76-09692 5D

Turbidimeter Lights the Way to Accurate Process Control,
W76-09694 5A

Steroids in Effluents,
W76-09696 5A

Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

Distribution of Bdellovibrio Bacteriovorus in Sewage Works, River Water, and Sediments,
W76-09698 5A

Laboratory Evaluation of the Coulter On-Line Particle Monitor,
W76-09699 5A

How to Build a Better Bench Sheet,
W76-09701 5D

Representative Dirty Water Sampling,
W76-09702 5A

Pollution Influence on the Infusorial Fauna (Protozoa, Ciliata) of Bulgarian Rivers II. The Ogosta River and its Effluents,
W76-09714 5A

Concentration of Heavy Metals in Sediments of a Hydroelectric Impoundment,
W76-09755 5A

Materials Budgets of Lake Champlain,
W76-09756 5A

Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

Sediment Properties, Lake Champlain: 1971-1975,
W76-09763 5B

Marine Soil Pollution and Self-Purification, (In Russian),
W76-09789 5A

Presence and Some Properties of Bacteria of the Family Pseudomonadaceae in the River Danube, (In German),
W76-09792 5A

Determination of Fluorine in Drinking Water with a Cerium(III)- or Lanthanum Alizarin Complex, (In Russian),
W76-09796 5A

Hygienic Standardization of Tin Dibutyl Diisooctylthioglycolate in Water Bodies, (In Russian),
W76-09797 5C

Sanitary Inspection of Surface Waters Polluted with Aromatic Amino and Nitro-Compounds, (In Russian),
W76-09798 5A

Iron-Manganese Microorganisms Studied by Overgrowing Technique, (In Russian),
W76-09813 5A

The Heavy Metal Concentrations in the Waters Along the Coast of Fukuyama, (In Japanese),
W76-09815 5A

Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

Balanidae as Pollution Indicators in the Bay of Guanabara, (In Portuguese),
W76-09823 5A

Airborne Detection and Mapping of Oil Spills, Grand Bahamas,
W76-09891 5A

Development of a Boat and Helicopter Deployable Oil Slick Sampler,
W76-09892 5A

Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume II,
W76-09900 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume III,
W76-09901 5A

Dependence of the Level of Nitrogenase Activity on the Water Content of the Thallus in Peltigera Canina, P. Evansiana, P. Polydactyla, and P. Praetextata,
W76-09916 5A

Pesticide and PCB Residue in Organs of Wild Animals as Indicators of Environmental Contamination, (In German),
W76-09922 5A

A Simple Physicochemical Method of Detecting Traces of Surfactants in Water,
W76-09927 5A

Technique of Water Sampling in Sanitary Investigations of Large Bodies of Water, (In Russian),
W76-09928 5A

Gas-Liquid Chromatographic Determination of Butyl Acetate, Butanol and Acetone Present Together in Waste Waters, (In Russian),
W76-09929 5A

Using a CHN Analyzer to Reduce Carbonate Interference in Particulate Organic Carbon Analyses,
W76-09940 5A

POLLUTANTS

Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

POLLUTION ABATEMENT

Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries,
W76-09766 5G

Presentation Concerning Pollution Control Facilities Revenue Bonds,
W76-09767 5G

Role of the Underwriter in Tax Exempt Financing for Industrial Expansion and Pollution Control,
W76-09768 5G

The Industrial Revenue Bond for Pollution Control: One Company's Perspective,
W76-09769 5G

Financing Pollution Control Projects in South Carolina Using Tax-Exempt Industrial Revenue Bonds,
W76-09770 5G

The Pollution Control Bond,
W76-09771 5G

Economic Analysis of Effluent Guidelines: Apple, Citrus and Potato Processing Segments of the Canned and Preserved Fruits and Vegetable Industry,
W76-09779 5G

POLLUTION CONTROL BONDS

The Pollution Control Bond,
W76-09771 5G

POLLUTION IDENTIFICATION

Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

Coast Guard's Response to Spilled Oil,
W76-09915 5A

POLYCHAETES

Species Composition and Diversity of Polychaetes in the New York Bight,
W76-09650 5C

POLYCHLORINATED BIPHENYLS

Pesticide and PCB Residue in Organs of Wild Animals as Indicators of Environmental Contamination, (In German),
W76-09922 5A

POLYCLADS

On the Extermination of Polyclads: Calcium Hypochlorite (CaOC12) Treatment in the Period of High Water Temperature, (In Korean),
W76-09801 5C

POLYELECTROLYTES

Purification of Waste Water By Polymer Exchangers (Jatevesien puhdistaminen polymeerivaihtajilla),
W76-09675 5D

POLYMERS

Cationic Acrylamide-Styrene Copolymers and Flocculation of Sewage Therewith,
W76-09434 5D

Van Clarifies Sludge Options,
W76-09438 5F

Purification of Waste Water By Polymer Exchangers (Jatevesien puhdistaminen polymeerivaihtajilla),
W76-09675 5D

POLYSACCHARIDES

Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

PONDEROSA PINE TREES

Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

Distribution of Ponderosa Pine Forest Densities on the Salt-Verde River Basin,
W76-09477 4A

POROSITY

Total Porosity and Pore Size Distribution in Untilled and Tilled Loess Soils, (In German),
W76-09939 2G

PORTS

Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

Recommended Procedure for Developing Deepwater Ports Design Criteria,
W76-09907 5G

POTABLE WATER

Operation of Ozone Treatment Apparatus (Ozone shori sochi no unten),
W76-09713 5F

POTENTIOMETERS

Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

POWER GENERATION

Scope of Tidal Power from Indian Estuaries,
W76-09639 2L

POWERPLANTS

Temperature Predictions for Offshore Power Plants,
W76-09960 5B

Undistorted Movable-Bed Model Study for a River and Power Plant Intake System,
W76-09971 8B

PRE-TREATMENT (WATER)

A Comparison Between the Efficacy of Submarine Outfall Disposal of Advanced Primary Effluent and Conventional Treatment,
W76-09448 5E

PRECIPITATION (ATMOSPHERIC)
Overview of Rainfall-Runoff Process in Urban Areas,
W76-09730 2A

PRECIPITATION EXCESS
Sensitivity of Linear and Nonlinear Surface Runoff Models to Input Errors,
W76-09578 2A

PRESERVATION
The Mercury Content of Industrial Fish Products: Its Relative Variation with the Treatment (Cooking in Salt Water, Pickling and Fish Production), (In Spanish),
W76-09802 5C

PRESSURE MEASURING INSTRUMENTS
An Underwater Temperature-Depth Data Collection Device,
W76-09727 2H

PRIMARY PRODUCTIVITY
Environmental Responses to Thermal Discharges from the Chesterfield Station, James River, Virginia,
W76-09652 5C

Biological Production Processes in the Ural River, (In Russian),
W76-09919 5C

Organic Productivity of Inshore and Offshore Waters of Barbados: A Study of the Island Mass Effect,
W76-09938 5C

Quantitative Aspect of the Phytoplankton of the Bay Du Levrier (Mauritania), (In French),
W76-09987 5C

Primary Production in the Frozen Lake Balaton,
W76-09991 5C

The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

PRIVATE WATER FIRMS
Water Authority Rate Making,
W76-09717 6C

PROBABILITY
A Probabilistic Model of the Oil and Gas Discovery Process,
W76-09604 6A

PROCESS CONTROL
Turbidimeter Lights the Way to Accurate Process Control,
W76-09694 5A

PRODUCTION
Rotifer Production in Lake Baikal, (In Russian),
W76-09791 5C

PRODUCTION DECLINE
Sioux Falls Restores Four Wells with Collector Pipe,
W76-09510 3B

PRODUCTIVITY
Engineering Reclamation, A Most Important Means of Increasing Fish Productivity of Waters, (In Russian),
W76-09800 8I

Sugar Beet Photosynthesis and Productivity Cultivated by Irrigated Farming in the Kirgiz SSR, (In Russian),
W76-09810 3F

The Role of Microflora in the Productivity of a Salmon Breeding Lake, (In Russian),
W76-09818 5C

Organic Productivity of Inshore and Offshore Waters of Barbados: A Study of the Island Mass Effect,
W76-09938 5C

PROJECT PLANNING
National Conference of District Chiefs, Albuquerque, New Mexico, September 28-October 3, 1975--Proceedings,
W76-09838 2A

PROJECT POST-EVALUATION
National Conference of District Chiefs, Albuquerque, New Mexico, September 28-October 3, 1975--Proceedings,
W76-09838 2A

PROJECT PURPOSES
National Conference of District Chiefs, Albuquerque, New Mexico, September 28-October 3, 1975--Proceedings,
W76-09838 2A

PROJECTIONS
Energy Projections--Relationship to Policy Issues,
W76-09603 6A

The Use of Econometrics to Project Energy Demands,
W76-09611 6A

PROJECTS
Joint USA/Japan Project on Global Systems Analysis and Simulation (GLOSAS) of Energy, Resources, and Environmental (ERE) Systems,
W76-09610 6A

Howell Bunger Valves as Irrigation Outlets,
W76-09615 3F

Design of Water Resources Project with Inadequate Data in India - General and Particular Case Studies,
W76-09621 4A

Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W76-09622 4A

PROTEUS
Hygienic Assessment of Changes in Mineral Water Properties During its Treatment for Use in Internal Balneotherapeutic Procedures, (In Russian),
W76-09795 5C

PROTOTYPES
Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

PROTOZOA
Interstitial Protozoa and Algae of Louisiana Salt Marshes,
W76-09593 5C

Pollution Influence on the Infusorial Fauna (Protozoa, Ciliata) of Bulgarian Rivers II. The Ogosta River and its Effluents,
W76-09714 5A

PROVENANCE
Effects of Flooding and of Irrigation Water Salinity on Eucalyptus Camaldulensis Dehn. From Three Seed Sources,
W76-09664 3C

PSEUDOMONAS
Presence and Some Properties of Bacteria of the Family Pseudomonadaceae in the River Danube, (In German),
W76-09792 5A

PUBLIC HEALTH
Public Health Aspects of Waste-Water Treatment,
W76-09516 5D

PUBLIC LAW 92-500
Report to the Congress by the National Commission on Water Quality,
W76-09663 5G

PUERTO RICO
A Flood Management Model for Urbanizing River Basins,
W76-09737 4C

PUGET SOUND (WASH)
Application of Physical Tidal Models in Harbor and Marina Design,
W76-09984 5B

PUMICE SOILS
The Erodibility of Pumice Soils of the North Island, New Zealand,
W76-09787 4D

PUMPING PLANTS
Optimal Operation of the Pumping Stations in the Kinnereth-Eshkol Section of the National Water Carrier,
W76-09629 4A

PVC
Field Drainage with Manifold Well Points,
W76-09586 5G

PYROLYSIS
Sludge/Activated Carbon Cycle Treats Sewage.
W76-09443 5D

Carbon Made from Sewage Solids Treats Wastewater.
W76-09450 5D

RACINE (WIS)
An Application of the Storm Water Management Model,
W76-09738 5D

RADAR
Accuracy of Reservoir Inflow Forecasts Based on Radar Rainfall Measurements,
W76-09574 2B

RADIATION
Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment,
W76-09490 5C

Radiation for a Clean Environment.
W76-09512 5D

Surveys on Radiation-Resistant Asporogenic Bacteria in Natural Environments,
W76-09519 5C

Viruses and Ionizing Radiation in Respect to Waste-Water Treatment,
W76-09520 5D

Aqueous Radiation Chemistry in Relation to Waste Treatment, An Introductory Review,
W76-09529 5D

Effects of Gamma Radiation from Co60 on Dilute Aqueous Solutions of Linear Alkyl Sulfonate Surfactants and other Organic Pollutants,
W76-09531 5D

RADIATION

Degradation of Persistent Organochlorine Pollutants by Gamma Radiation and its Possible use for Waste-Water Treatment,
W76-09534 5D

Alternative High-Level Radiation Sources for Sewage and Waste-Water Treatment,
W76-09536 5D

Use of High-Power Electron Beam Radiation for the Treatment of Municipal and Industrial Wastes,
W76-09537 5D

Prospects for High-Energy Electron Irradiation of Waste-Water Liquid Residuals,
W76-09538 5D

Radiation Recycling Process of Waste Poly(Tetrafluorethylene) Scrap,
W76-09556 5D

RADIATION CHEMISTRY

Aqueous Radiation Chemistry in Relation to Waste Treatment, An Introductory Review,
W76-09529 5D

RADIOACTIVITY

Impact of Thermal and Radioactive Effluents on a Tropical Nearshore Ecosystem,
W76-09492 5C

RADIOACTIVITY EFFECTS

Interaction Mechanisms of Radioactive, Chemical and Thermal Releases from the Nuclear Industry, Methodology for Considering Co-Operative Effects,
W76-09491 5C

Discussion of Possible Effects Due to Mixing of Radioactive and Thermal Releases to the Atmosphere from Nuclear Power Plants,
W76-09502 5A

Cycling of Fe55 and Zn65 in Columbia River Carp Following Reactor Shutdown,
W76-09508 5C

RADIOECOLOGY

Possible Future Effects on the Population of the Federal Republic of Germany of Gaseous Radioactive Effluents from Nuclear Facilities,
W76-09499 5A

Surveys on Radiation-Resistant Asporogenic Bacteria in Natural Environments,
W76-09519 5C

Use of the Principles and Methods of Radio-Ecology in Solving Some Urgent Problems of Man's Effect on the Environment, (In Russian),
W76-09936 6G

RADIOISOTOPES

The Effect of Temperature on the Uptake and Retention of Co 60 and Zn 65 by the Common Shrimp Crangon Crangon (L),
W76-09493 5C

Influence De La Temperature Sur La Contamination D'Especes Marines Par Le Fer-59, (Influence of Temperature on the Contamination of Marine Species by Iron-59),
W76-09494 5C

Radiation Hazard of Iodine-129, (In Russian),
W76-09788 5B

RAINFALL

Evaluation of Mean Square Error Involved in Approximating the Areal Average of a Rainfall Event by a Discrete Summation,
W76-09572 2B

Accuracy of Reservoir Inflow Forecasts Based on Radar Rainfall Measurements,
W76-09574 2B

On The Rainfall and Water Potential of Nepal,
W76-09642 2B

National Symposium on Urban Rainfall and Runoff and Sediment Control,
W76-09729 4C

The Distribution of Heavy Rainfall in a Major Urban Area,
W76-09734 2B

RAINFALL DISPOSITION

The Distribution of Heavy Rainfall in a Major Urban Area,
W76-09734 2B

RAINFALL INTENSITY

Relationship of Heavy Rainfall to Soil Erosion in View of its Forecasting, (In Bulgarian),
W76-09807 2J

RAINFALL-RUNOFF RELATIONSHIPS

Effects of Management Practices on Water Quality and Quantity: Baltimore, Maryland, Municipal Watersheds,
W76-09464 4D

Watershed Response to Partial Area Applications of Simulated Rainfall,
W76-09467 2A

Design of Water Resources Project with Inadequate Data in India - General and Particular Case Studies,
W76-09621 4A

Overview of Rainfall-Runoff Process in Urban Areas,
W76-09730 2A

Runoff Frequency Procedure for Synthetic Hydrograph Development,
W76-09733 2A

RANNEY HORIZONTAL COLLECTOR WELL

Sioux Falls Restores Four Wells with Collector Pipe,
W76-09510 3B

RATES

Water Authority Rate Making,
W76-09717 6C

RECHARGE

Hydrology of the Madison Formation and its Potential use for Water Supply for Energy Development,
W76-09757 2F

RECLAIMED WATER

Apparatus and Method for Recovering Pure Water from Natural Sources and Industrial Polluted Waste Sources,
W76-09867 5G

RECREATION DEMAND

Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-09633 6D

RECYCLING

Carbon Wastewater Treatment Process,
W76-09441 5D

Recent Advances in the Treatment of Solid Wastes,
W76-09553 5D

Radiation Recycling Process of Waste Poly(Tetrafluorethylene) Scrap,
W76-09556 5D

Anaerobic Treatment of Dilute Waste Waters,
W76-09673 5D

The Desert War on Pollution,
W76-09711 5D

Materials Budgets of Lake Champlain,
W76-09756 5A

Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

Development of a Batchwise In-situ Regeneration Type Separator to Remove Oil from Oil-Water Suspensions,
W76-09895 5G

RED WATER

An Observation of Water Quality and Red Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

REEDS

Comparative Evaluation of Food Plants of the Ararat Cochineal Scale (Porphyrophora Hamelii) (In Russian),
W76-09406 2I

REFINERIES

Offshore Petroleum and New England - A Study of the Regional Economic Consequences of Potential Offshore Oil and Gas Development,
W76-09893 6B

REFRACTION MEASUREMENTS

Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

REGIONAL ANALYSIS

Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-09633 6D

REGRESSION ANALYSIS

Regression Analysis and Parameter Identification,
W76-09824 7A

Calculation of Water Temperatures in Clear Lake, Iowa,
W76-09879 5B

REHABILITATION

Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

REINFORCED PLASTICS

GRP Launders at Sewage Treatment Plant.
W76-09462 8G

REJUVENATING TECHNIQUES

Sioux Falls Restores Four Wells with Collector Pipe,
W76-09510 3B

RELIABILITY

Improved Techniques for Water Resource Systems Design,
W76-09624 4A

EMOTE CONTROL
Liquid Distribution System for Irrigation and the Like,
W76-09868 3F

EMOTE SENSING
Island Barrier Effects on Sea State as Revealed by a Numerical Wave Model and DMSP Satellite Data,
W76-09559 2L

Research and Investigation of Geology, Mineral, and Water Resources of Maryland.
W76-09565 4A

Differentiation of Serpentinitic from Non-Serpentinitic Ultramafic Rocks in ERTS-1 MSS Imagery,
W76-09566 4A

Observation of Linear Features in the Maryland Piedmont as Shown on ERTS-1 MSS Imagery and Aircraft Support Photography,
W76-09567 4A

Maryland Chesapeake Bay Beaches - General Distribution and Classification,
W76-09568 2L

The Relationship of the Nearshore Longshore Bar and Sand Waves at Ocean City, Maryland,
W76-09569 2L

Linear Distribution of the High Marsh Vegetation Communities of the Lower Eastern Shore and its Geological Significance,
W76-09570 2L

Visual Observation of the Suspended Sediments and Nearshore Ice Signatures in Chesapeake Bay,
W76-09571 2L

Airborne Detection and Mapping of Oil Spills, Grand Bahamas,
W76-09891 5A

Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

Coast Guard's Response to Spilled Oil,
W76-09915 5A

EPAIRING
Polyethylene Pipe Tackles Difficult Sewer Repair Job,
W76-09403 8G

How Many Sewer Leaks Can You Afford.
W76-09404 8G

ESEARCH PRIORITIES
Landslide Hazard in the United States: A Research Assessment,
W76-09781 6F

ESERVOIR DESIGN
Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W76-09622 4A

ESERVOIR OPERATION
Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W76-09622 4A

RESERVOIRS
A Probabilistic Model of the Oil and Gas Discovery Process,
W76-09604 6A

A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

Aqueduct Optimization with Intermediate Storage,
W76-09636 4A

Changes in the Sedimentation Characteristics of an Urbanizing Watershed, Dallas and Collin Counties, Texas,
W76-09745 4C

Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1974,
W76-09829 7C

Near-Field Jet Penetration and Reservoir Mixing,
W76-09962 8C

Physical Model of Discharge in a Two-Layer Stratified Ambient,
W76-09963 8B

Sediment Deposition Model for Tarbela Reservoir,
W76-09970 2J

RESOURCES DEVELOPMENT
Offshore Petroleum and New England - A Study of the Regional Economic Consequences of Potential Offshore Oil and Gas Development,
W76-09893 6B

Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

Oil in the Arctic,
W76-09902 5C

Engineering and Ecological Evaluation of Artificial-Island Design, Rincon Island, Punta Gorda, California,
W76-09903 2L

Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

A Post Construction Survey of Several Manmade Islands Off the Coast of California,
W76-09911 2L

RETENTION
Relationship of Rational and Unit Graph Methods in Retention Basin Design,
W76-09732 4C

REVERSE OSMOSIS
Reverse Osmosis -- Can it Replace Distillation,
W76-09667 5D

Supported Semi-Permeable Membranes,
W76-09863 3A

Semipermeable Membrane and Process for the Preparation Thereof,
W76-09864 3A

Reverse Osmosis Process Using Crosslinked Aromatic Polyamide Membranes,
W76-09877 3A

REVIEWS
Radiation Treatment of Wastes, A Review,
W76-09517 5D

Recent Advances in the Treatment of Solid Wastes,
W76-09553 5D

Anthropogenic Effect on Continental, Marine, and Oceanic Biohydrocoenoses, (In Russian),
W76-09819 5C

RHODE ISLAND
Velocity Observations in the West Passage of Narragansett Bay: A Partially Mixed Estuary,
W76-09561 2L

RICHARDS EQUATION
Upward Water Movement in Field Cores,
W76-09726 3F

RIO GRANDE RIVER
Field Drainage with Manifold Well Points,
W76-09586 5G

RISKS
Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

RIVER BASIN DEVELOPMENT
Water System Behavior: Determinants in an Arid Region,
W76-09483 4A

RIVER BASINS
Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1974,
W76-09829 7C

Variation and Causative Factors of Sediment Yields in the Arkansas River Basin, Kansas,
W76-09839 2J

A Water-Land Use Management Model for the Sevier River Basin Phases I and II,
W76-09844 4A

RIVER DANUBE
Presence and Some Properties of Bacteria of the Family Pseudomonadaceae in the River Danube, (In German),
W76-09792 5A

RIVER FLOW
The Concentration of Dissolved Solids and River Flow,
W76-09577 5B

River Delta Computer Simulation Model (Simudelt),
W76-09954 2L

RIVER FORECASTING
Hydrologic Forecasting for the Ohio River Waterway,
W76-09944 2E

RIVER MODELS
Modeling of Meandering and Braiding in Rivers,
W76-09974 2J

RIVER SYSTEMS
Water System Behavior: Determinants in an Arid Region,
W76-09483 4A

RIVER SYSTEMS

Numerical Two-Dimensional Flow Model for River Systems,
W76-09964 2E

RIVER THAMES (ENGLAND)

Generation Time, Length of Life, Instar Duration and Frequency of Moulting, and their Relationship to Temperature in Eight Species of Cladocera from the River Thames, Reading,
W76-09658 5C

The Relationship Between Temperature and Duration of Egg Development in Some Epiphytic Cladocera and Copepoda from the River Thames, Reading, with a Discussion of Temperature Functions,
W76-09659 5C

RIVER TONE (JAPAN)

Evaluation of Flood Control Under Changing Conditions,
W76-09630 4A

RIVERBANK RECESSIONS

Riverbank Recessions for Power Plant Facilities,
W76-09973 8B

RIVERS

Howell Bunger Valves as Irrigation Outlets,
W76-09615 3F

Pollution Influence on the Infusorial Fauna (Protozoa, Ciliata) of Bulgarian Rivers II. The Ogosta River and its Effluents,
W76-09714 5A

A Primer on Floodplain Dynamics,
W76-09831 2E

Two-Dimensional Model of Flow Toward Intakes,
W76-09965 2E

Forecasts for the Sacremento River System,
W76-09967 2E

Movable-Bed River-Models,
W76-09969 2E

Sediment Deposition Model for Tarbela Reservoir,
W76-09970 2J

Undistorted Movable-Bed Model Study for a River and Power Plant Intake System,
W76-09971 8B

Physical Modeling Techniques Used in River Models,
W76-09972 2E

Riverbank Recessions for Power Plant Facilities,
W76-09973 8B

Modeling of Meandering and Braiding in Rivers,
W76-09974 2J

River and Estuary Modeling with the Siva System,
W76-09982 2A

ROCKS

Differentiation of Serpentinitic from Non-Serpentinitic Ultramafic Rocks in ERTS-1 MSS Imagery,
W76-09566 4A

ROMANIA (TIS PLAIN)

Studies on the Relationships Between Moisture and Suction in Some Soils of the Tisa Plain, (In Rumanian),
W76-10000 2G

ROOT SYSTEMS

A Quantitative Analysis of the Factors Affecting Plant Nutrient Uptake from Some Soils,
W76-09489 2G

ROTATING DISCS TREATMENT

A Study of Rotating-Disc Treatment Units Operating at Different Temperatures,
W76-09674 5D

ROTENONE

Reaction Times of Certain Freshwater Fishes to a Rotenone-Containing Piscicide,
W76-09993 5C

Laboratory and Field Tests in the Revival of Fish Affected by Rotenone,
W76-09994 5C

ROTIFERS

Rotifer Production in Lake Baikal, (In Russian),
W76-09791 5C

ROTSEE (SWITZERLAND)

Sedimentation and Phosphorus Balance in Lake Lucerne (Horw Bay) and in the Rotsee, (In German),
W76-09790 5C

RUNOFF

Hydrologic Systems Analysis Model for Generating Runoff Time Series (Hidrologiai) Rendszervizsgalati Modell Vizhozamidoser Eloallitasara (II. RESZ),
W76-09557 2A

A Review and Analysis of Selected Hydrologic Modeling Concepts,
W76-09718 2E

Relationship of Rational and Unit Graph Methods in Retention Basin Design,
W76-09732 4C

Physical and Economic Aspects Associated with Runoff from Urban Growth: A Methodological Approach,
W76-09749 4C

RUNOFF FORECASTING

Identification of Linear Systems Response by Parametric Programing,
W76-09575 2E

RURAL AREAS

Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-09633 6D

SACRAMENTO RIVER (CALIF)

Forecasts for the Sacremento River System,
W76-09967 2E

SACRAMENTO-SAN JOAQUIN DELTA (CALIF)

Results of Salinity Tests on the San Francisco Bay-Delta Hydraulic Model,
W76-09978 2L

SAHEL

The Sahelian Drought and Its Demographic Implications,
W76-09486 6G

SALINE SOILS

Water Utilization and Soil Salinity: Control in Arid Zone Agriculture,
W76-09482 3C

Effect of an Electric Current on Water Stability of the Structure of Salinized Solonetz, (In Russian),
W76-09804 2G

The Critical Depth of the Level of Soil-Salinizing Ground Waters, (In Russian),
W76-09808 2G

Evaporation from Highly Saline Soils in an Experimental Plot in the Turkmen SSR, (In Russian),
W76-09887 2D

SALINE WATER

Water Utilization and Soil Salinity: Control in Arid Zone Agriculture,
W76-09482 3C

Method and Apparatus for Converting Saline Water to Fresh Water,
W76-09871 3A

SALINITY

Chemistry of Dissolved Inorganic Carbon in Estuarine and Coastal Brackish Waters,
W76-09597 2L

Bottom Deposits of the Kuban Deltaic Limans, (In Russian),
W76-09935 2L

SALMONELLA

Isolation of Salmonella from Sewage and Surface Waters, (In Russian),
W76-09411 5A

Sanitary Effect of Gamma Irradiation on Sewage Sludge,
W76-09527 5D

SALMONIDS

Substitute Chemical Program - Initial Scientific and Minieconomic Review of Captan.
W76-09651 5C

SALONETZ SOILS

Effect of an Electric Current on Water Stability of the Structure of Salinized Solonetz, (In Russian),
W76-09804 2G

SALT MARSHES

Interstitial Protozoa and Algae of Louisiana Salt Marshes,
W76-09593 5C

SALT TOLERANCE

Effects of Flooding and of Irrigation Water Salinity on Eucalyptus Camaldulensis Dehn From Three Seed Sources,
W76-09664 3C

Contribution of Salts to the Water Potential of Woody Plants,
W76-09691 3C

Effect of Water Quality and Management Practices on Some Chemical Properties of Soils,
W76-09926 3C

Salinity Tolerance of Inland Halophytic Vegetation of North America,
W76-09988 3C

SALT-VERDE RIVER BASIN (ARIZ)

Distribution of Ponderosa Pine Forest Densities on the Salt-Verde River Basin,
W76-09477 4A

SALTS
Contribution of Salts to the Water Potential of Woody Plants,
W76-09691 3C

The Critical Depth of the Level of Soil-Salinizing Ground Waters, (In Russian),
W76-09808 2G

SAMALGA PASS (ALAS)
Upwelling Near Samalga Pass,
W76-09585 2L

SAMPLING
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

Representative Dirty Water Sampling,
W76-09702 5A

Ten Years of Experience with Automatic Pumping-Sediment Samplers,
W76-09843 7B

Development of a Boat and Helicopter Deployable Oil Slick Sampler,
W76-09892 5A

Technique of Water Sampling in Sanitary Investigations of Large Bodies of Water, (In Russian),
W76-09928 5A

Sampling Network Design for Dispersion Verification,
W76-09961 5B

SAN FRANCISCO BAY
Modeling of Three-Dimensional Flows in Estuaries,
W76-09977 2L

Results of Salinity Tests on the San Francisco Bay-Delta Hydraulic Model,
W76-09978 2L

SAND BED FILTERS
Development of a Continuous Inclined Sand Bed Filter,
W76-09668 5D

SAND WAVES
The Relationship of the Nearshore Longshore Bar and Sand Waves at Ocean City, Maryland,
W76-09569 2L

SANITARY ENGINEERING
Considerations in the Public Acceptance of Sewage Sludge Irradiation Systems,
W76-09543 5D

The Waste-Water and Sludge Re-Use Project by Gamma Irradiation at Kecskemet, Hungary, Some Approaches and Investigations,
W76-09544 5D

SARGASSUM-MUTICUM
The Eradication of the Seaweed Sargassum Muticum from Britain,
W76-09989 5G

SCALE
Comparative Evaluation of Food Plants of the Ararat Cochineal Scale (Porphyrophora Hamelii) (In Russian),
W76-09406 2I

SCALING
Method and Apparatus for the Conversion of an Aqueous Scale-Formed Liquid,
W76-09872 3A

SCLEROPHYLLS
Drought Adaptations in Two Californian Evergreen Sclerophylls,
W76-09476 2I

SEA ICE
A Model for the Thermodynamic Growth of Sea Ice in Numerical Investigations of Climate,
W76-09722 2C

Oil in the Arctic,
W76-09902 5C

SEA STATE
Island Barrier Effects on Sea State as Revealed by a Numerical Wave Model and DMSP Satellite Data,
W76-09559 2L

SEA WATER
Method and Apparatus for Converting Saline Water to Fresh Water,
W76-09871 3A

Method and Apparatus for the Conversion of an Aqueous Scale-Formed Liquid,
W76-09872 3A

SEAWEED ERADICATION
The Eradication of the Seaweed Sargassum Muticum from Britain,
W76-09989 5G

SECONDARY EFFLUENTS
Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

SEDIMENT CONTROL
National Symposium on Urban Rainfall and Runoff and Sediment Control,
W76-09729 4C

Legal Approaches to Control Runoff and Sedimentation: A Case Study of Georgia,
W76-09747 4D

Watershed Management and Sediment Control in Montgomery County,
W76-09748 4D

Urban-Area Sediment Yield--Effects of Construction-Site Conditions and Sediment-Control Methods,
W76-09841 4D

SEDIMENT DISCHARGE
Proposed Revision to the Modified Einstein Method of Computing Total Sediment Discharge,
W76-09842 2J

Bottom Deposits of the Kuban Deltaic Limans, (In Russian),
W76-09935 2L

SEDIMENT SAMPLER
Ten Years of Experience with Automatic Pumping-Sediment Samplers,
W76-09843 7B

SEDIMENT TRANSPORT
Hydrology and Sedimentation of Bixler Run Basin, Central Pennsylvania,
W76-09830 2J

A Primer on Floodplain Dynamics,
W76-09831 2E

Cenozoic Deposits of Southeastern New Mexico and an Outline of the History of Evaporite Dissolution,
W76-09837 2J

Variation and Causative Factors of Sediment Yields in the Arkansas River Basin, Kansas,
W76-09839 2J

Storm-Period Variables Affecting Sediment Transport from Urban Construction Areas,
W76-09840 2J

Ten Years of Experience with Automatic Pumping-Sediment Samplers,
W76-09843 7B

Origin, Effect and Suppression of Secondary Waves,
W76-09878 2J

Anisotropic Sand Transport in Tidal Inlets,
W76-09955 2L

Modeling Sediment Transport in Hydraulic Structures,
W76-09975 2J

SEDIMENT YIELD
Predicting Sediment Yield in Urban Areas,
W76-09746 4D

Variation and Causative Factors of Sediment Yields in the Arkansas River Basin, Kansas,
W76-09839 2J

Urban-Area Sediment Yield--Effects of Construction-Site Conditions and Sediment-Control Methods,
W76-09841 4D

SEDIMENTATION
Additional Observations on the Effects of Strip Mining on Small-Stream Fishes in East-Central Kentucky,
W76-09468 5C

Overview of the Urban Erosion and Sedimentation Processes,
W76-09731 4C

Changes in the Sedimentation Characteristics of an Urbanizing Watershed, Dallas and Collin Counties, Texas,
W76-09745 4C

River Delta Computer Simulation Model (Simudelt),
W76-09954 2L

Modeling Sediment Movement for Masonboro Inlet,
W76-09956 2L

Sediment Deposition Model for Tarbela Reservoir,
W76-09970 2J

SEDIMENTATION RATES
Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

SEDIMENTOLOGY
Cenozoic Deposits of Southeastern New Mexico and an Outline of the History of Evaporite Dissolution,
W76-09837 2J

SEDIMENTS
A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

Concentration of Heavy Metals in Sediments of a Hydroelectric Impoundment,
W76-09755 5A

SEDIMENTS

Organic Sediment Model for Wastewater Outfall,
W76-09951 5B

SEEPAGE
Stability Analysis of Infiltration,
W76-09588 2G

SEEPAGE CONTROL
Method and Composition for Preventing Water Contaminated with Industrial Waste from Seeping Through Soil Containing Said Water,
W76-09858 5G

SEISMIC REFLECTION
Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

SEISMIC STUDIES
Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

SELF-PURIFICATION
Marine Soil Pollution and Self-Purification, (In Russian),
W76-09789 5A

SEMIPERMEABLE MEMBRANES
Supported Semi-Permeable Membranes,
W76-09863 3A

Semipermeable Membrane and Process for the Preparation Thereof,
W76-09864 3A

SEPARATED SEWERS
Is the Separation of Sewers Desirable,
W76-09739 5D

SEPARATION TECHNIQUES
Separation of Sludge,
W76-09421 5D

Cationic Acrylamide-Styrene Copolymers and Flocculation of Sewage Therewith,
W76-09434 5D

Hydrodynamic Separation of Solids from Solid-Liquid Mixtures,
W76-09716 5D

Membrane Support-Plates and Fluid Separating Apparatus in which They are Present,
W76-09857 5D

Open-Loop Water-Washable Inspection Penetrant Process,
W76-09859 5D

Preparation of Reverse Osmosis Membranes by Complete Evaporation of the Solvent System,
W76-09876 3A

The Coanda Effect Oil/Water Separator: A Development Study,
W76-09890 5G

Development of a Batchwise In-situ Regeneration Type Separator to Remove Oil from Oil-Water Suspensions,
W76-09895 5G

SEPTIC TANKS
Aerated Sewerage Disposal,
W76-09415 5D

Septic Tank System,
W76-09426 5D

Sewage Septic System for a Plurality of Drain Fields,
W76-09430 5D

SETTLING BASINS
Sewage Treatment Tank and Tube Settler,
W76-09417 5D

Increasing the Capacity of Sedimentation Tanks by Means of Sloping Plates,
W76-09706 5D

Method and Composition for Preventing Water Contaminated with Industrial Waste from Seeping Through Soil Containing Said Water,
W76-09858 5G

SEVIN
Pathology of Acute Poisoning with the Insecticide Sevin in the Bent-Nosed Clam, Macoma Nasuta,
W76-09649 5C

SEWAGE
Distribution of Bdellovibrio Bacteriovorus in Sewage Works, River Water, and Sediments,
W76-09698 5A

SEWAGE DISPOSAL
Aerated Sewerage Disposal,
W76-09415 5D

Marine Sewage Disposal Device,
W76-09418 5D

Types and Treatment of Sewage Sludges Practice in the Federal Republic of Germany,
W76-09513 5D

Development of Edinburgh's Sewage Disposal Scheme,
W76-09707 5D

SEWAGE EFFLUENTS
Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

Effects of Land Use and River Seepage on Groundwater Quality in Hall County, Nebraska,
W76-09728 5B

SEWAGE SLUDGE
Carbon Wastewater Treatment Process,
W76-09441 5D

Types and Treatment of Sewage Sludges Practice in the Federal Republic of Germany,
W76-09513 5D

Use of Sewage Sludge as Fodder,
W76-09554 5D

Dewatering of Sewage Sludge Viewed as Part of the Purification Process -- Planning Criteria (Klaerschlammentwaesserung als Teil der Gesamten Klaeraufgabe Betrachtet -- Planungskriterien),
W76-09681 5D

Wastewater Sludge Utilization and Disposal Costs,
W76-09773 5D

SEWAGE TREATMENT
Aerated Sewerage Disposal,
W76-09415 5D

Sewage Treatment Tank and Tube Settler,
W76-09417 5D

Marine Sewage Disposal Device,
W76-09418 5D

Sludge Control and Decant System,
W76-09419 5D

Apparatus for Sewage Treatment and Wastewater Reclamation,
W76-09420 5D

Sewage Treatment Process,
W76-09422 5D

Sewage Treatment Aeration Systems,
W76-09423 5D

Septic Tank System,
W76-09426 5D

Waste Treatment Plants,
W76-09427 5E

Sewage Septic System for a Plurality of Drain Fields,
W76-09430 5D

Waste Purification System,
W76-09431 5D

Phosphate Removal--Tackling Eutrophication from the Other Side,
W76-09436 5D

Who Says Sewage Treatment Plants Have to be Ugly,
W76-09437 5D

Sewage Treatment Facility to be Updated and Expanded at Kitchener Ontario,
W76-09439 5D

Weed Holds Promise for Pollution Cleanup,
W76-09440 5D

Cottonvalley -- Britain's Latest Sewage Works.
W76-09442 5D

Crawley Sewage Treatment Works.
W76-09444 5D

Ozone Provides Alternative for Secondary Effluent Disinfection. Part 1,
W76-09445 5D

Working Towards Tougher Odour Control Standards.
W76-09446 5G

Objectives and Costs of Advanced Treatment Techniques for Sewage,
W76-09449 5D

Carbon Made from Sewage Solids Treats Wastewater.
W76-09450 5D

The Water Industry: A Review Relating to Waste Water Treatment,
W76-09454 5D

Solution of the Operating Problems of a Modern Sewage Treatment Plant,
W76-09455 5D

Some Critical Views of Selected Processes for the Biological Treatment of Sewage,
W76-09457 5D

GRP Launders at Sewage Treatment Plant.
W76-09462 8G

Types and Treatment of Sewage Sludges Practice in the Federal Republic of Germany,
W76-09513 5D

Biological Effects of High-Energy Electron Irradiation of Municipal Sludge,
W76-09522 5C

Treatment of Sewage Sludge with Combinations of Heat and Ionizing Radiation (Thermoradiation),
W76-09523 5D

Gamma Irradiation for Sewage Treatment at US Army Facilities,
W76-09525 5D

Alternative High-Level Radiation Sources for Sewage and Waste-Water Treatment,
W76-09536 5D

Practical Aspects of the Pasteurization of Sewage Sludge by Electron Irradiation,
W76-09540 5D

Fission Product Gamma-Ray Sources as an Alternative to Cobalt-60 Sources for Sewage Sludge Sterilization,
W76-09541 5D

Costs and Hygienic Necessity of Sewage Sludge Pasteurization in Switzerland,
W76-09542 5D

Considerations in the Public Acceptance of Sewage Sludge Irradiation Systems,
W76-09543 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Bacterial and Parasitological Studies AfterIrradiation.
W76-09548 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Experiments on the Inactivation of Viruses in Sewage Sludge after Radiation Treatment,
W76-09549 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Analytical Studies on Sewage Sludge and Plant Material,
W76-09552 5D

Development of a Continuous Inclined Sand Bed Filter,
W76-09668 5D

Value Engineered Sewage Plant Moves Fast,
W76-09672 5D

Sluice Gates Help Regulate Plant's Hydraulic Flows.
W76-09680 8C

Technique Alternatives for a Package Stabilization Plant,
W76-09705 5D

Increasing the Capacity of Sedimentation Tanks by Means of Sloping Plates,
W76-09706 5D

Industrial Experience of Sewage Sludge Processing with Zimpro Installations in the Netherlands,
W76-09709 5D

New York Takes Another Giant Step,
W76-09710 5D

Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

Wastewater Sludge Utilization and Disposal Costs,
W76-09773 5D

Sewage Treatment System,
W76-09854 5D

SEWERAGE

How Many Sewer Leaks Can You Afford.
W76-09404 8G

Septic Tank System,
W76-09426 5D

Give Stormwater Pollutants the Spin,
W76-09461 5D

Secondary Effects of Public Investments in Highways and Sewers.
W76-09778 5G

SEWERS

Polyethylene Pipe Tackles Difficult Sewer Repair Job,
W76-09403 8G

How Many Sewer Leaks Can You Afford.
W76-09404 8G

Polyethylene Pipe Insertion Rehabilitates Old Sewers,
W76-09459 8G

Sewer Inspection: Checking it Out,
W76-09460 8G

SHIGELLA

Hygienic Assessment of Changes in Mineral Water Properties During its Treatment for Use in Internal Balneotherapeutic Procedures, (In Russian),
W76-09795 5C

SHIPBOARD WASTES

Waste Treatment Plants,
W76-09427 5E

SHRIMP

The Effect of Temperature on the Uptake and Retention of Co 60 and Zn 65 by the Common Shrimp Crangon Crangon (L),
W76-09493 5C

SIEROZEMS

Redox Potential in Irrigated Desert Soils as an Indicator of Aeration Status,
W76-09488 2G

SILICON

Removal of Dissolved Boron and Silicon During Estuarine Mixing of Sea and River Waters,
W76-09725 2K

SILICON OILS

The Effect of Silicon Oils on the Water Loss of Hordeum Vulgare L, (In German),
W76-09806 3B

SIMULATED RAINFALL

Watershed Response to Partial Area Applications of Simulated Rainfall,
W76-09467 2A

SIMULATION ANALYSIS

Energy Consumption and Fuel Choice by Residential and Commercial Consumers in the United States,
W76-09609 6A

Joint USA/Japan Project on Global Systems Analysis and Simulation (GLOSAS) of Energy, Resources, and Environmental (ERE) Systems,
W76-09610 6A

Improved Techniques for Water Resource Systems Design,
W76-09624 4A

Optimal Operation of the Pumping Stations in the Kinnereth-Eshkol Section of the National Water Carrier,
W76-09629 4A

A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

A Water-Land Use Management Model for the Sevier River Basin Phases I and II,
W76-09844 4A

SIZE

A Probabilistic Model of the Oil and Gas Discovery Process,
W76-09604 6A

On the Capacity-Expansion of Desalination Plants and Storage Tanks,
W76-09618 3A

SLUDGE DISPOSAL

Wastewater Sludge Utilization and Disposal Costs,
W76-09773 5D

SLUDGE TREATMENT

Sludge Removal System,
W76-09416 5D

Sludge Control and Decant System,
W76-09419 5D

Separation of Sludge,
W76-09421 5D

Process and Apparatus for the Incineration of Aqueous Sewage Sludge,
W76-09428 5E

Van Clarifies Sludge Options,
W76-09438 5F

Methods for Reducing the Infection Hazard of Waste-Water Sludge,
W76-09514 5D

Disinfection of Sludge and Waste-Water by Irradiation with Electrons of Low Accelerating Voltage,
W76-09521 5D

Biological Effects of High-Energy Electron Irradiation of Municipal Sludge,
W76-09522 5C

Treatment of Sewage Sludge with Combinations of Heat and Ionizing Radiation (Thermoradiation),
W76-09523 5D

The Waste-Water and Sludge Re-Use Project by Gamma Irradiation at Kecskemet, Hungary, Some Approaches and Investigations,
W76-09544 5D

The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

Fluidized Bed to Handle Combined Waste Sludges,
W76-09671 5D

SLUDGE TREATMENT

Anaerobic Treatment of Dilute Waste Waters,
W76-09673 5D

Sludge Heat Treatment: Operation and Management,
W76-09708 5D

Industrial Experience of Sewage Sludge Processing with Zimpro Installations in the Netherlands,
W76-09709 5D

SLUICE GATES

Sluice Gates Help Regulate Plant's Hydraulic Flows.
W76-09680 8C

SMALL WATERSHEDS

Storm-Period Variables Affecting Sediment Transport from Urban Construction Areas,
W76-09840 2J

SOIL AGGREGATES

Effect of an Electric Current on Water Stability of the Structure of Salinized Solonetz, (In Russian),
W76-09804 2G

SOIL CHEMICAL PROPERTIES

Effect of Water Quality and Management Practices on Some Chemical Properties of Soils,
W76-09926 3C

SOIL DESALINATION

Water Utilization and Soil Salinity: Control in Arid Zone Agriculture,
W76-09482 3C

SOIL DISPOSAL FIELDS

Costs of Wastewater Treatment by Land Application,
W76-09774 5D

SOIL EROSION

Overview of the Urban Erosion and Sedimentation Processes,
W76-09731 4C

Evaluation and Control of Soil Erosion in Urbanizing Watersheds,
W76-09742 4D

The Erodibility of Pumice Soils of the North Island, New Zealand,
W76-09787 4D

Method of Evaluating the Effectiveness of Techniques for Increasing the Resistance of Soils to Erosion, (In Russian),
W76-09805 4D

Relationship of Heavy Rainfall to Soil Erosion in View of its Forecasting, (In Bulgarian),
W76-09807 2J

SOIL HORIZONS

The Critical Depth of the Level of Soil-Salinizing Ground Waters, (In Russian),
W76-09808 2G

SOIL MEASUREMENTS

The Modified Fernow Frost Gage,
W76-09880 7B

SOIL MOISTURE

Effect of Different Spring Soil Moisture Levels on Moisture Stress,
W76-09412 3F

Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

A Quantitative Analysis of the Factors Affecting Plant Nutrient Uptake from Some Soils,
W76-09489 2G

Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colorado,
W76-09761 2F

The Water Supply System of Soil and Nitrogen Loss with Runoff Waters in Nonchernozem Areas, (In Russian),
W76-09794 2G

Effect of Excess Soil Moisture on the Content of Phosphorus Compounds in Barley, (In Russian),
W76-09913 3F

Comparative Study in Measuring Fluid Surface Tension and Fluid Content with the Aid of Electrical Resistance Elements 'In Situ' and in the Laboratory, (In Flemish),
W76-09923 2G

The Softening of the Kanto Volcanic Ash Soil, (In Japanese),
W76-09925 2G

Dependence of Pasture Grass Yield on Soil Moisture Level, (In Russian),
W76-09930 4A

Studies on the Relationships Between Moisture and Suction in Some Soils of the Tisa Plain, (In Rumanian),
W76-10000 2G

SOIL SOFTENING

The Softening of the Kanto Volcanic Ash Soil, (In Japanese),
W76-09925 2G

SOIL STABILITY

Effect of an Electric Current on Water Stability of the Structure of Salinized Solonetz, (In Russian),
W76-09804 2G

SOIL STRUCTURE

Reconnaissance Map Showing Relative Amounts of Soil and Bedrock in the Mountainous Part of the Morrison-Evergreen Quadrangles and Adjoining Areas to the West in Jefferson County, Colorado,
W76-09825 7C

SOIL TREATMENT

Water Conservation in Arid-Zone Soils,
W76-09478 3B

SOIL-WATER-PLANT RELATIONSHIP

Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

SOIL-WATER-PLANT RELATIONSHIPS

Redox Potential in Irrigated Desert Soils as an Indicator of Aeration Status,
W76-09488 2G

A Quantitative Analysis of the Factors Affecting Plant Nutrient Uptake from Some Soils,
W76-09489 2G

On the Ecology of Collembola and Oribatids in a Landsea Transition Zone (Collembola, Insecta-Oribatei, Acari) (In German),
W76-09635 2L

SOILS

Volume Changes in Swelling Clays,
W76-09881 2G

SOLAR ENERGY

Arizona Energy: A Framework for Decision.
W76-09484 6D

SOLID WASTES

Recent Advances in the Treatment of Solid Wastes,
W76-09553 5D

Potential of Radiation Sterilization in Solid Waste Treatment, A Status Report,
W76-09555 5D

Radiation Recycling Process of Waste Poly(Tetrafluorethylene) Scrap,
W76-09556 5D

SOLIDS REMOVAL

Hydrodynamic Separation of Solids from Solid Liquid Mixtures,
W76-09716 5D

SOUTH CAROLINA

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries.
W76-09766 5G

SOUTH DAKOTA

Sioux Falls Restores Four Wells with Collector Pipe,
W76-09510 3B

SPATIAL DISTRIBUTION

Distribution of Ponderosa Pine Forest Densities on the Salt-Verde River Basin,
W76-09477 4A

Phosphorus and Nitrogen Cycle on a Transect in Lake Ontario During the International Field Year 1972-1973 (IFYGL),
W76-09594 5C

SPECTROMETRY

Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. I. Computerized High Resolution Mass Spectrometry and Gas Chromatography-Low Resolution Mass Spectrometry,
W76-09687 5A

SPECTROPHOTOMETRY

Determination of Microquantities of Naphthalene in Environmental Objects, (In Russian),
W76-09620 5A

The Heavy Metal Concentrations in the Waters Along the Coast of Fukuyama, (In Japanese),
W76-09815 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume II,
W76-09900 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume III,
W76-09901 5A

SPECTROSCOPY

Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

SPOIL BANKS

Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

SPRINKLER IRRIGATION
Irrigation Vehicle,
W76-09869 3F

Efficiency of Irrigation Methods for Strawberries,
W76-09897 3F

ST. LAWRENCE RIVER
Water Chemistry of the St. Lawrence Estuary,
W76-09581 5A

St. Lawrence Seaway: A New Goal of Year-Round Navigation,
W76-09942 2C

ST. LAWRENCE SEAWAY
Water Chemistry of the St. Lawrence Estuary,
W76-09581 5A

St. Lawrence Seaway: A New Goal of Year-Round Navigation,
W76-09942 2C

ST. LOUIS (MO)
The Distribution of Heavy Rainfall in a Major Urban Area,
W76-09734 2B

STABILITY
Stability Analysis of Infiltration,
W76-09588 2G

STABILITY ANALYSIS
Stability Analysis of Infiltration,
W76-09588 2G

STATISTICAL MODELS
Disaggregation Models in Hydrology Revisited,
W76-09573 2A

STATISTICS
Effect of Sequence Length n on the Choice of Assumed Distribution of Floods,
W76-09851 4A

STEROIDS
Steroids in Effluents,
W76-09696 5A

STORAGE CAPACITY
Changes in the Sedimentation Characteristics of an Urbanizing Watershed, Dallas and Collin Counties, Texas,
W76-09745 4C

STORAGE TANKS
On the Capacity-Expansion of Desalination Plants and Storage Tanks,
W76-09618 3A

STORM RUNOFF
Effects of Storm Discharges on River Water Quality,
W76-09401 5B

Urban Drainage Studies,
W76-09402 5B

National Symposium on Urban Rainfall and Runoff and Sediment Control,
W76-09729 4C

STORM WATER
Municipal Storm Water Management Programs,
W76-09751 4A

Urban Stormwater Management--Problems, Solutions and Impact: A Summary of Interviews,
W76-09752 4C

STRATIFICATION
Physical Model of Discharge in a Two-Layer Stratified Ambient,
W76-09963 8B

STRATIFIED FLOW
Systems Modeling of Stratified Fluids,
W76-09976 8B

STRATIFIED FLUIDS
Systems Modeling of Stratified Fluids,
W76-09976 8B

STREAMFLOW
The Concentration of Dissolved Solids and River Flow,
W76-09577 5B

Regression Analysis and Parameter Identification,
W76-09824 7A

Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1974,
W76-09829 7C

Hydrology and Sedimentation of Bixler Run Basin, Central Pennsylvania,
W76-09830 2J

STREAMS
Re-Evaluation of the Effects of Man-Made Modifications on Gordon Creek Between 1887 and 1973 and Especially as Regards its Fish Fauna,
W76-09407 4C

The Influence of Urbanization on Stream Channel Behavior,
W76-09744 4C

Mathematical Model of Flow in a Stream-Aquifer System,
W76-09966 2E

STRIP MINES
Additional Observations on the Effects of Strip Mining on Small-Stream Fishes in East-Central Kentucky,
W76-09468 5C

Requirements and Use of Fertilizer, Lime, and Mulch for Vegetating Acid Mine Spoils,
W76-09469 4D

Changes in Water Chemistry Resulting from Surface-Mining of Coal on Four West Virginia Watersheds,
W76-09470 4C

SUBSURFACE IRRIGATION
Upward Water Movement in Field Cores,
W76-09726 3F

SUBSURFACE STORMFLOW
Watershed Response to Partial Area Applications of Simulated Rainfall,
W76-09467 2A

SUGAR BEETS
Sugar Beet Photosynthesis and Productivity Cultivated by Irrigated Farming in the Kirgiz SSR, (In Russian),
W76-09810 3F

SULFIDES
Exploration Rock Geochemistry-Detection of Trace Element Halo at Heath Steele Mines (N. B., Canada) by Discriminant Analysis,
W76-09473 2K

Determination of Tetramethylthiuram Disulfide (TMTD) in Water and Air by Colimetry, (In Russian),
W76-09590 5A

SULFUR BACTERIA
Studies on the Metabolism of a Sulfur-Oxidizing Bacterium. VII. Purification and Characterization of Soluble Components Indispensables for Sulfur Oxidation by Thiobacillus Thiooxidans,
W76-09592 5C

Characteristics of Thionic Bacteria from the Lakes of the Mari ASSR, (In Russian),
W76-09814 5C

SUPERPORTS
Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

Recommended Procedure for Developing Deepwater Ports Design Criteria,
W76-09907 5G

SURFACE-GROUNDWATER RELATIONSHIPS
Hydrology and Sedimentation of Bixler Run Basin, Central Pennsylvania,
W76-09830 2J

Mathematical Model of Flow in a Stream-Aquifer System,
W76-09966 2E

SURFACE TENSION
Comparative Study in Measuring Fluid Surface Tension and Fluid Content with the Aid of Electrical Resistance Elements 'In Situ' and in the Laboratory, (In Flemish),
W76-09923 2G

SURFACE WATERS
Appraisal of Water Resources of Northwestern El Paso County, Colorado,
W76-09828 2E

SURFACTANTS
A Simple Physicochemical Method of Detecting Traces of Surfactants in Water,
W76-09927 5A

SURVEYS
Surveys on Radiation-Resistant Asporogenic Bacteria in Natural Environments,
W76-09519 5C

Urban Stormwater Management--Problems, Solutions and Impact: A Summary of Interviews,
W76-09752 4C

SUSPENDED SOLIDS
Method and Apparatus for Rejuvenating a Bed of Granular Filter Medium,
W76-09424 5D

Visual Observation of the Suspended Sediments and Nearshore Ice Signatures in Chesapeake Bay,
W76-09571 2L

Development of a Continuous Inclined Sand Bed Filter,
W76-09668 5D

Representative Dirty Water Sampling,
W76-09702 5A

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

SUSPENDED SOLIDS

Sampling Network Design for Dispersion Verification,
W76-09961 5B

SUTTER BASIN (CALIF)
A Three-Dimensional Galerkin Finite Element Solution of Flow Through Multiaquifers in Sutter Basin, California,
W76-09562 2F

SWAN RIVER WATERSHED (MINN)
The Contribution of a Water Information System for Environmental Planning in Minnesota,
W76-09753 6G

SWEDEN
On Long-Term Stability of Zooplankton Composition,
W76-09600 5C

SWELLING CLAYS
Volume Changes in Swelling Clays,
W76-09881 2G

SWITZERLAND
Costs and Hygienic Necessity of Sewage Sludge Pasteurization in Switzerland,
W76-09542 5D

SYNERGISM
Synergistic Effects of Airborne Emissions from Nuclear Power Plants,
W76-09503 5A

Gamma Irradiation for Sewage Treatment at US Army Facilities,
W76-09525 5D

SYNTHETIC HYDROLOGY
Disaggregation Models in Hydrology Revisited,
W76-09573 2A

SYSTEMS ANALYSIS
Hydrologic Systems Analysis Model for Generating Runoff Time Series (Hidrologiai) Rendszervizsgalati Modell Vizhozamidoser Eloallitasara (II. RESZ),
W76-09557 2A

Energy Systems: Modeling and Policy Planning,
W76-09608 6A

Joint USA/Japan Project on Global Systems Analysis and Simulation (GLOSAS) of Energy, Resources, and Environmental (ERE) Systems,
W76-09610 6A

TAIWAN
Irrigation Systems in Taiwan: Management of a Decentralized Public Enterprise,
W76-09848 3F

TARBELA RESERVOIR (INDIA)
Sediment Deposition Model for Tarbela Reservoir,
W76-09970 2J

TAUTOG
The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

TELEVISION INSPECTION
Sewer Inspection: Checking it Out,
W76-09460 8G

TEMPERATURE
Influence De La Temperature Sur La Contamination D'Especes Marines Par Le Fer-59, (Influence of Temperature on the Contamination of Marine Species by Iron-59),
W76-09494 5C

Generation Time, Length of Life, Instar Duration and Frequency of Moulting, and their Relationship to Temperature in Eight Species of Cladocera from the River Thames, Reading,
W76-09658 5C

The Relationship Between Temperature and Duration of Egg Development in Some Epiphytic Cladocera and Copepoda from the River Thames, Reading, with a Discussion of Temperature Functions,
W76-09659 5C

A Study of Rotating-Disc Treatment Units Operating at Different Temperatures,
W76-09674 5D

TEMPERATURE-DEPTH PROBE (UNDERWATER)
An Underwater Temperature-Depth Data Collection Device,
W76-09727 2H

TERTIARY TREATMENT
Crawley Sewage Treatment Works.
W76-09444 5D

Objectives and Costs of Advanced Treatment Techniques for Sewage,
W76-09449 5D

The Water Industry: A Review Relating to Waste Water Treatment,
W76-09454 5D

Value Engineered Sewage Plant Moves Fast,
W76-09672 5D

TETRAMETHYLTHIURAM DISULFIDE
Determination of Tetramethylthiuram Disulfide (TMTD) in Water and Air by Colimetry, (In Russian),
W76-09590 5A

TEXAS
Field Drainage with Manifold Well Points,
W76-09586 5G

Changes in the Sedimentation Characteristics of an Urbanizing Watershed, Dallas and Collin Counties, Texas,
W76-09745 4C

Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1974,
W76-09829 7C

Geochemical and Isotopic Analyses of Waters Associated with the Edwards Limestone Aquifer, Central Texas,
W76-09836 2K

Estuarine Ecologic Simulations,
W76-09950 2L

THERMAL EFFECTS
Interaction Mechanisms of Radioactive, Chemical and Thermal Releases from the Nuclear Industry, Methodology for Considering Co-Operative Effects,
W76-09491 5C

THERMAL INSULATION
Economic Analysis of Effluent Guidelines: Insulation Fiberglass Industry.
W76-09780 5G

THERMAL POLLUTION
Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment,
W76-09490 5C

Impact of Thermal and Radioactive Effluents on a Tropical Nearshore Ecosystem,
W76-09492 5C

The Effect of Temperature on the Uptake and Retention of Co 60 and Zn 65 by the Common Shrimp Crangon Crangon (L),
W76-09493 5C

Swedish Studies on Combination Effects of Thermal Discharges in the Aquatic Environment, Some Aspects of Power Plant Siting Policy,
W76-09495 5C

Evaluation of the Thermal Effects of a Nuclear Power Plant,
W76-09496 5C

Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

Effect of Entrainment in Power Station Cooling Systems Studied Using Periphytic Communities,
W76-09498 5C

Discussion of Possible Effects Due to Mixing of Radioactive and Thermal Releases to the Atmosphere from Nuclear Power Plants,
W76-09502 5A

A Site Study of the Multiple Effects of Thermal Releases on the Aquatic Life in an Estuarine Area,
W76-09505 5C

The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

Effecto De La Temperatura De Aclimatacion Sobre La Proliferacion De Precursores Eritropoyeticos En Carassius Auratus, (The Effect of Acclimation Temperature on Proliferation of Erythropoietic Precursors in Carrassius Auratus and on the Uptake of Tritiated Thymidine in Haematopoietic and Intestinal Tissue),
W76-09509 5C

Environmental Responses to Thermal Discharges from the Chesterfield Station, James River, Virginia,
W76-09652 5C

Effects of Shock Temperature on Biological Systems,
W76-09660 5C

Effect of Heated Water Discharge of Thermal and Nuclear Power Plants on Invertebrates of Cooling Ponds, (In Russian),
W76-09811 5C

Temperature Predictions for Offshore Power Plants,
W76-09960 5B

THERMAL POWERPLANTS
Power Generation in Arizona and Its Environmental Implications,
W76-09485 6B

ERMAL STRESS
Effects of Shock Temperature on Biological Systems,
W76-09660 5C

ERMORADIATION
Treatment of Sewage Sludge with Combinations of Heat and Ionizing Radiation (Thermoradiation),
W76-09523 5D

INNING
Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

IOBACILLUS THIOOXIDANS
Studies on the Metabolism of a Sulfur-Oxidizing Bacterium. VII. Purification and Characterization of Soluble Components Indispensables for Sulfur Oxidation by Thiobacillus Thiooxidans,
W76-09592 5C

REE-DIMENSIONAL FLOWS
Modeling of Three-Dimensional Flows in Estuaries,
W76-09977 2L

DAL EFFECTS
Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

Forecasts for the Sacremento River System,
W76-09967 2E

DAL FLUSHING
Application of Physical Tidal Models in Harbor and Marina Design,
W76-09984 5B

DAL INLETS
Anisotropic Sand Transport in Tidal Inlets,
W76-09955 2L

DAL WATERS
Scope of Tidal Power from Indian Estuaries,
W76-09639 2L

Experience with a Small Scale, Highly Distorted Fixed Bed Model of the Lago Maracaibo Estuary,
W76-09979 2L

ES
Velocity Observations in the West Passage of Narragansett Bay: A Partially Mixed Estuary,
W76-09561 2L

iver Delta Computer Simulation Model (Simudelt),
W76-09954 2L

nisotropic Sand Transport in Tidal Inlets,
W76-09955 2L

E SERIES ANALYSIS
Disaggregation Models in Hydrology Revisited,
W76-09573 2A

DIBUTYL DIISOOCTYLTHIOGLYCOLATE
ygienic Standardization of Tin Dibutyl iisooctylthioglycolate in Water Bodies, (In ussian),
76-09797 5C

POGRAPHY
near Distribution of the High Marsh Vegetaon Communities of the Lower Eastern Shore d its Geological Significance,
76-09570 2L

TOXIC IONS
Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

TOXICITY
Development of Laboratory Model Ecosystems as Early Warning Elements of Environmental Pollution,
W76-09643 5C

The Role of Bioassays in Environmental Research,
W76-09644 5A

Pathology of Acute Poisoning with the Insecticide Sevin in the Bent-Nosed Clam, Macoma Nasuta,
W76-09649 5C

Substitute Chemical Program - Initial Scientific and Minieconomic Review of Captan.
W76-09651 5C

A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

Environmental Quality Research, First Annual Report,
W76-09654 5C

Hygienic Standardization of Tin Dibutyl Diisooctylthioglycolate in Water Bodies, (In Russian),
W76-09797 5C

'Toxic' or 'Poisonous' Water, (In Russian),
W76-09932 5C

Metabolic Cycles for Toxic Elements in Aqueous Systems,
W76-09933 5C

TOXICITY TESTS
Pathology of Acute Poisoning with the Insecticide Sevin in the Bent-Nosed Clam, Macoma Nasuta,
W76-09649 5C

TRACE ELEMENT
Exploration Rock Geochemistry-Detection of Trace Element Halo at Heath Steele Mines (N. B., Canada) by Discriminant Analysis,
W76-09473 2K

TRACE ELEMENTS
Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

Sediment Properties, Lake Champlain: 1971-1975,
W76-09763 5B

TRACERS
Steroids in Effluents,
W76-09696 5A

TRAINING
Plankton Analysis Training Manual.
W76-09782 5C

TRAINING MANUALS
Plankton Analysis Training Manual.
W76-09782 5C

TRANSPIRATION
Effectiveness of Water Utilization by Plants, (In Ukranian),
W76-09809 2D

TRANSPIRATION CONTROL
Micro-Climate Effects on Water Use Efficiency by Plants in an Arid Climate,
W76-09480 3B

TREATMENT FACILITIES
Sanitary Waste Treatment Plant,
W76-09414 5D

Who Says Sewage Treatment Plants Have to be Ugly,
W76-09437 5D

Sewage Treatment Facility to be Updated and Expanded at Kitchener Ontario,
W76-09439 5D

Cottonvalley -- Britain's Latest Sewage Works.
W76-09442 5D

Crawley Sewage Treatment Works.
W76-09444 5D

Desert Area Activated Sludge Plant.
W76-09447 5D

PCS Uses Study Approach for Effluent Treatment.
W76-09452 5D

Solution of the Operating Problems of a Modern Sewage Treatment Plant,
W76-09455 5D

Activated Sludge Process with Alum Addition and Heat Treatment,
W76-09456 5D

Wastewater Treatment in New Zealand,
W76-09670 5D

Value Engineered Sewage Plant Moves Fast,
W76-09672 5D

A Study of Rotating-Disc Treatment Units Operating at Different Temperatures,
W76-09674 5D

Monitoring and Automatic Filter Control of the Dreis-Tiefenback Treatment Plant (Betriebsueberwachung und Automatische Filtersteuerung der Aufbereitungsanlage Dreis-Tiefenbach),
W76-09679 5F

The Effluent Lagoons Greifswald-Ladebow (Das Abwasserteichsystem Greifswald-Ladebow),
W76-09682 5D

Technique Alternatives for a Package Stabilization Plant,
W76-09705 5D

New York Takes Another Giant Step,
W76-09710 5D

A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

Development of a Dynamic Programming Model for the Regionalization and Staging of Wastewater Treatment Plants,
W76-09845 5D

Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

TREES
Effects of Flooding and of Irrigation Water Salinity on Eucalyptus Camaldulensis Dehn. From Three Seed Sources,
W76-09664 3C

TRENTON (NJ)
Combined Sewage Overflows - Frequency, Environmental Effects, and a Corrective Program,
W76-09741 5D

TRIBUTARIES
Modeling the Chesapeake Bay and Tributaries: a Synopsis,
W76-09587 2L

TRICKLE IRRIGATION
Water Utilization and Soil Salinity: Control in Arid Zone Agriculture,
W76-09482 3C

Efficiency of Irrigation Methods for Strawberries,
W76-09897 3F

TRITIUM
Cost Effectiveness of Release Prevention Controls for Tritium and Krypton-85,
W76-09506 5G

TROPHIC LEVEL
Concentration of Cesium-137 in Aquatic Organisms, Water and Bottom Deposits of Water Bodies with a Different Mineral Compositions of the Water, (In Russian),
W76-09410 5C

TROPICAL CYCLONES
Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

TURBIDIMETERS
Turbidimeter Lights the Way to Accurate Process Control,
W76-09694 5A

TURBIDITY
Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

Turbidimeter Lights the Way to Accurate Process Control,
W76-09694 5A

Primary Production in the Frozen Lake Balaton,
W76-09991 5C

TURBOVENTILATORS
The Effluent Lagoons Greifswald-Ladebow (Das Abwasserteichsystem Greifswald-Ladebow),
W76-09682 5D

TURBULENT FLOW
Hydrodynamic Separation of Solids from Solid-Liquid Mixtures,
W76-09716 5D

TURGIDITY
Hydratability as a Parameter of Plant Water Potential, (In French),
W76-09918 2I

TWO-DIMENSIONAL FLOW MODELS
Numerical Two-Dimensional Flow Model for River Systems,
W76-09964 2E

Two-Dimensional Model of Flow Toward Intakes,
W76-09965 2E

ULTRAFILTRATION
Evaluation of Combined Applications of Ultrafiltration and Complexation Capacity Techniques to Natural Waters,
W76-09690 5A

ULTRAVIOLET RADIATION
Practical Application of the Germicidal Power of Ultraviolet Irradiation to Drinking-water, (In French),
W76-09646 5F

UNDERGROUND WASTE DISPOSAL
Numerical Simulation of Waste Movement in Steady Groundwater Flow Systems,
W76-09564 5B

UNDERWATER
Transverse Forces on Vertical Cylinders in Waves,
W76-09583 8B

UNITED STATES
Joint USA/Japan Project on Global Systems Analysis and Simulation (GLOSAS) of Energy, Resources, and Environmental (ERE) Systems,
W76-09610 6A

UPWARD WATER MOVEMENT
Upward Water Movement in Field Cores,
W76-09726 3F

UPWELLING
Upwelling Near Samalga Pass,
W76-09585 2L

URAL RIVER
Biological Production Processes in the Ural River, (In Russian),
W76-09919 5C

URBAN DRAINAGE
Urban Drainage Studies,
W76-09402 5B

ILLUDAS - The Illinois Urban Drainage Area Simulator,
W76-09735 2E

URBAN PLANNING
A Linear Programming Model for Use in Guiding Urban Floodplain Management,
W76-09849 6F

URBAN RUNOFF
Overview of Rainfall-Runoff Process in Urban Areas,
W76-09730 2A

Overview of the Urban Erosion and Sedimentation Processes,
W76-09731 4C

Relationship of Rational and Unit Graph Methods in Retention Basin Design,
W76-09732 4C

Remedial Measures for Urban Flood Peak Reduction,
W76-09736 2E

An Application of the Storm Water Management Model,
W76-09738 5D

Is the Separation of Sewers Desirable,
W76-09739 5D

Use of the Computer Program 'STORM' for Analysis of the Quantity and Quality of Urban Storm Water Runoff,
W76-09740 5B

Management of Flood Control and Drainage in the Urbanizing Zone,
W76-09750 4A

Municipal Storm Water Management Programs,
W76-09751 4A

Urban Stormwater Management--Problems, Solutions and Impact: A Summary of Interviews,
W76-09752 4C

URBAN WATERSHEDS
Evaluation and Control of Soil Erosion in Urbanizing Watersheds,
W76-09742 4D

URBANIZATION
National Symposium on Urban Rainfall and Runoff and Sediment Control,
W76-09729 4C

A Flood Management Model for Urbanizing River Basins,
W76-09737 4C

Evaluation and Control of Soil Erosion in Urbanizing Watersheds,
W76-09742 4D

The Influence of Urbanization on Stream Channel Behavior,
W76-09744 4C

Changes in the Sedimentation Characteristics of an Urbanizing Watershed, Dallas and Collin Counties, Texas,
W76-09745 4C

Predicting Sediment Yield in Urban Areas,
W76-09746 4D

Watershed Management and Sediment Control in Montgomery County,
W76-09748 4D

Physical and Economic Aspects Associated with Runoff from Urban Growth: A Methodological Approach,
W76-09749 4C

Management of Flood Control and Drainage in the Urbanizing Zone,
W76-09750 4A

Municipal Storm Water Management Programs,
W76-09751 4A

Urban Stormwater Management--Problems, Solutions and Impact: A Summary of Interviews,
W76-09752 4C

Storm-Period Variables Affecting Sediment Transport from Urban Construction Areas,
W76-09840 2J

Urban-Area Sediment Yield--Effects of Construction-Site Conditions and Sediment-Control Methods,
W76-09841 4D

SSR
Evaporation from Highly Saline Soils in an Experimental Plot in the Turkmen SSR, (In Russian),
W76-09887 2D

SSR (DALNYE LAKE)
The Role of Microflora in the Productivity of a Salmon Breeding Lake, (In Russian),
W76-09818 5C

SSR (GEORGIA)
The Critical Depth of the Level of Soil-Salinizing Ground Waters, (In Russian),
W76-09808 2G

SSR (KUBAN RIVER)
Bottom Deposits of the Kuban Deltaic Limans, (In Russian),
W76-09935 2L

SSR (LAKE KRASNOYE)
Iron-Manganese Microorganisms Studied by Overgrowing Technique, (In Russian),
W76-09813 5A

SSR (MARI ASSR)
Characteristics of Thionic Bacteria from the Lakes of the Mari ASSR, (In Russian),
W76-09814 5C

SSR (NIZHNEVELIKORETSK PLAIN)
The Qualitative Organic Matter Composition of Some Marshy Soils of Nizhnevelikoretsk Plain, (In Russian),
W76-09888 2G

SSR (ORENBURG)
Biological Production Processes in the Ural River, (In Russian),
W76-09919 5C

TAH
Report of Water Levels in Selected Observation Wells in Utah--April 1976,
W76-09832 4B

A Water-Land Use Management Model for the Sevier River Basin Phases I and II,
W76-09844 4A

Development of a Dynamic Programming Model for the Regionalization and Staging of Wastewater Treatment Plants,
W76-09845 5D

TTAR PRADESH (INDIA)
Flood Problems in Uttar Pradesh,
W76-09640 4A

ALIDITY OF MODEL
Conceptual Hydrological Model for an Average-Sized Catchment Area, II. Estimate of Parameters, Validity of Model, Application,
W76-09580 2A

ALUE ENGINEERING
Value Engineered Sewage Plant Moves Fast,
W76-09672 5D

ANCOUVER ISLAND (BC)
Observations of the California Undercurrent Off Washington and Vancouver Island,
W76-09584 2L

EGETATION
Differentiation of Serpentinitic from Non-Serpentinitic Ultramafic Rocks in ERTS-1 MSS Imagery,
W76-09566 4A

Linear Distribution of the High Marsh Vegetation Communities of the Lower Eastern Shore and its Geological Significance,
W76-09570 2L

The Vegetation of the 'Lukniany Lake' Nature Reserve in the Mazurian Lake District,(In Polish),
W76-09990 5C

VELOCITY
Longitudinal Dispersion Coefficients for Streams,
W76-09589 5B

VENEZUELA
Experience with a Small Scale, Highly Distorted Fixed Bed Model of the Lago Maracaibo Estuary,
W76-09979 2L

VENTILATION
The Effluent Lagoons Greifswald-Ladebow (Das Abwasserteichsystem Greifswald-Ladebow),
W76-09682 5D

VERMONT
Materials Budgets of Lake Champlain,
W76-09756 5A

Sediment Properties, Lake Champlain: 1971-1975,
W76-09763 5B

VERTICAL DISTRIBUTION
Studies of Phytoplankton Ecology in the Bay of Valparaiso: II. Phytoplankton 1970-1971, (In Spanish),
W76-09408 5A

VERTICAL MOTION
The Role of Vertical Motion in the Heat Budget of the Upper Northeastern Pacific Ocean,
W76-09720 2L

VIBRIO
Isolation of Water Vibrios in Greece, (In French),
W76-09601 5A

VIBRIO-CHOLERAE
Practical Application of the Germicidal Power of Ultraviolet Irradiation to Drinking-water, (In French),
W76-09646 5F

VIBRIOS
Ecology of Cholera Vibrios, (In Russian),
W76-09409 5C

VIRGINIA
Environmental Responses to Thermal Discharges from the Chesterfield Station, James River, Virginia,
W76-09652 5C

Evaluation and Control of Soil Erosion in Urbanizing Watersheds,
W76-09742 4D

VIRUS REMOVAL
Assessment of Virus Removal by a Multi-Stage Activated Sludge Process,
W76-09676 5D

VIRUSES
Viruses and Ionizing Radiation in Respect to Waste-Water Treatment,
W76-09520 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Experiments on the Inactivation of Viruses in Sewage Sludge after Radiation Treatment,
W76-09549 5D

Assessment of Virus Removal by a Multi-Stage Activated Sludge Process,
W76-09676 5D

WASHINGTON
Observations of the California Undercurrent Off Washington and Vancouver Island,
W76-09584 2L

Application of Physical Tidal Models in Harbor and Marina Design,
W76-09984 5B

WASTE DISPOSAL
Waste Treatment Plants,
W76-09427 5E

Carbon Wastewater Treatment Process,
W76-09441 5D

Species Composition and Diversity of Polychaetes in the New York Bight,
W76-09650 5C

Development of Edinburgh's Sewage Disposal Scheme,
W76-09707 5D

Assessing Potential Ocean Pollutants,
W76-09889 5G

WASTE IDENTIFICATION
Modern Techniques of Waste Detection,
W76-09685 5F

Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

WASTE OILS
Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

WASTE TREATMENT
Radiation Treatment of Wastes, A Review,
W76-09517 5D

Data on the Disinfection of Liquid Manure by Gamma Irradiation at Baja, Hungary,
W76-09528 5D

Dosimetry at a High-Activity Co60 Waste Treatment Facility,
W76-09547 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Bacterial and Parasitological Studies AfterIrradiation.
W76-09548 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Experiments on the Inactivation of Viruses in Sewage Sludge after Radiation Treatment,
W76-09549 5D

Effects of Gamma Radiation at Pilot Plant Level Compared with the Effects of Pasteurization on the Dewatering of Sewage Sludge,
W76-09550 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Results on the Effect of Differently Treated Sewage Sludge on Plants and Soil,
W76-09551 5D

WASTE TREATMENT

Recent Advances in the Treatment of Solid Wastes,
W76-09553 5D

Potential of Radiation Sterilization in Solid Waste Treatment, A Status Report,
W76-09555 5D

Radiation Recycling Process of Waste Poly(Tetrafluorethylene) Scrap,
W76-09556 5D

Fluidized Bed to Handle Combined Waste Sludges,
W76-09671 5D

WASTE WATER DISPOSAL

A Comparison Between the Efficacy of Submarine Outfall Disposal of Advanced Primary Effluent and Conventional Treatment,
W76-09448 5E

WASTE WATER TREATMENT

Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W76-09413 5D

Sanitary Waste Treatment Plant,
W76-09414 5D

Aerated Sewerage Disposal,
W76-09415 5D

Sludge Removal System,
W76-09416 5D

Sewage Treatment Tank and Tube Settler,
W76-09417 5D

Marine Sewage Disposal Device,
W76-09418 5D

Sludge Control and Decant System,
W76-09419 5D

Apparatus for Sewage Treatment and Wastewater Reclamation,
W76-09420 5D

Separation of Sludge,
W76-09421 5D

Sewage Treatment Process,
W76-09422 5D

Sewage Treatment Aeration Systems,
W76-09423 5D

Stabilization of Waste Material,
W76-09425 5D

Septic Tank System,
W76-09426 5D

Waste Treatment Plants,
W76-09427 5E

Process and Apparatus for the Incineration of Aqueous Sewage Sludge,
W76-09428 5E

Apparatus for Treating Industrial and Domestic Waste Waters,
W76-09429 5D

Sewage Septic System for a Plurality of Drain Fields,
W76-09430 5D

Waste Purification System,
W76-09431 5D

Waste Treatment Apparatus,
W76-09432 5D

Wastewater Treatment System with Controlled Mixing,
W76-09433 5D

Cationic Acrylamide-Styrene Copolymers and Flocculation of Sewage Therewith,
W76-09434 5D

Microbial Reactions in Facultative Oxidation Ponds -- I. The Anaerobic Nature of Oxidation Pond Sediments,
W76-09435 5D

Phosphate Removal--Tackling Eutrophication from the Other Side,
W76-09436 5D

Who Says Sewage Treatment Plants Have to be Ugly,
W76-09437 5D

Sewage Treatment Facility to be Updated and Expanded at Kitchener Ontario,
W76-09439 5D

Weed Holds Promise for Pollution Cleanup,
W76-09440 5D

Carbon Wastewater Treatment Process,
W76-09441 5D

Cottonvalley -- Britain's Latest Sewage Works.
W76-09442 5D

Sludge/Activated Carbon Cycle Treats Sewage.
W76-09443 5D

Crawley Sewage Treatment Works.
W76-09444 5D

Ozone Provides Alternative for Secondary Effluent Disinfection. Part 1,
W76-09445 5D

Working Towards Tougher Odour Control Standards.
W76-09446 5G

Desert Area Activated Sludge Plant.
W76-09447 5D

A Comparison Between the Efficacy of Submarine Outfall Disposal of Advanced Primary Effluent and Conventional Treatment,
W76-09448 5E

Objectives and Costs of Advanced Treatment Techniques for Sewage,
W76-09449 5D

Carbon Made from Sewage Solids Treats Wastewater.
W76-09450 5D

Nitrates: What's Happening in Britain,
W76-09451 5D

PCS Uses Study Approach for Effluent Treatment.
W76-09452 5D

The Water Industry: A Review Relating to Waste Water Treatment,
W76-09454 5D

Solution of the Operating Problems of a Modern Sewage Treatment Plant,
W76-09455 5D

Activated Sludge Process with Alum Addition and Heat Treatment,
W76-09456 5D

Some Critical Views of Selected Processes fo the Biological Treatment of Sewage,
W76-09457 5I

Removal of Phosphate from Waste Water,
W76-09458 5I

Give Stormwater Pollutants the Spin,
W76-09461 5I

GRP Launders at Sewage Treatment Plant.
W76-09462 8C

Optimal Ground Water Quality Management Well Injection of Waste Waters,
W76-09511 5I

Radiation for a Clean Environment.
W76-09512 5I

Types and Treatment of Sewage Sludges Practice in the Federal Republic of Germany,
W76-09513 5D

Methods for Reducing the Infection Hazard of Waste-Water Sludge,
W76-09514 5D

Public Health Aspects of Waste-Water Treatment,
W76-09516 5D

The Need for the Use of High-Level Radiation in Water Treatment and in Waste-Water (Sewage) Treatment,
W76-09518 5D

Viruses and Ionizing Radiation in Respect to Waste-Water Treatment,
W76-09520 5D

Disinfection of Sludge and Waste-Water by Irradiation with Electrons of Low Accelerating Voltage,
W76-09521 5D

Synergistic Effects of Irradiation of Waste-Water.
W76-09524 5D

Scope for Utilizing Gamma Radiation for Microbiological Control of Sewage Waste-Water in India,
W76-09526 5D

Possible use of High-Level Radiation for the Degradation of Some Substances Present in Urban and Industrial Waters,
W76-09533 5D

Degradation of Persistent Organochlorine Pollutants by Gamma Radiation and its Possible use for Waste-Water Treatment,
W76-09534 5D

Comparison of the Chemical Effects of Oxone and of Irradiation on Organic Impurities in Water,
W76-09535 5D

Alternative High-Level Radiation Sources for Sewage and Waste-Water Treatment,
W76-09536 5D

Use of High-Power Electron Beam Radiation for the Treatment of Municipal and Industrial Wastes,
W76-09537 5D

Prospects for High-Energy Electron Irradiation of Waste-Water Liquid Residuals,
W76-09538 5D

An Electron Accelerator with Electrons of Low-Accelerating Voltage for Irradiating Sewage Sludge and Waste Water,
W76-09539 5D

Fission Product Gamma-Ray Sources as an Alternative to Cobalt-60 Sources for Sewage Sludge Sterilization,
W76-09541 5D

The Waste-Water and Sludge Re-Use Project by Gamma Irradiation at Kecskemet, Hungary, Some Approaches and Investigations,
W76-09544 5D

Pilot Plant Experience in the Treatment of Industrial and Municipal Waste-Water by Means of Radiation-Induced Oxidation,
W76-09545 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

Least Cost Design of Activated Sludge Systems,
W76-09638 5D

Anaerobic Treatment of Leachate with High Sodium Concentrations,
W76-09641 5D

Reverse Osmosis -- Can it Replace Distillation,
W76-09667 5D

Development of a Continuous Inclined Sand Bed Filter,
W76-09668 5D

The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

Wastewater Treatment in New Zealand,
W76-09670 5D

Anaerobic Treatment of Dilute Waste Waters,
W76-09673 5D

A Study of Rotating-Disc Treatment Units Operating at Different Temperatures,
W76-09674 5D

Purification of Waste Water By Polymer Exchangers (Jatevesien puhdistaminen polymeerivaihtajilla),
W76-09675 5D

Assessment of Virus Removal by a Multi-Stage Activated Sludge Process,
W76-09676 5D

Inductive Cavitator Keeps Filter Gratings Clear of Debris,
W76-09677 5D

Effluent Detention Ponds Dechlorinate Wastewater,
W76-09678 5D

Sluice Gates Help Regulate Plant's Hydraulic Flows.
W76-09680 8C

Dewatering of Sewage Sludge Viewed as Part of the Purification Process -- Planning Criteria (Klaerschlammentwaesserung als Teil der Gesamten Klaeraufgabe Betrachtet -- Planungskriterien),
W76-09681 5D

The Effluent Lagoons Greifswald-Ladebow (Das Abwasserteichsystem Greifswald-Ladebow),
W76-09682 5D

Possibilities and Limits of Extended Waste Water Purification (Moeglichkeiten und Grenzen der Weitergehanded Abwasserreinigung),
W76-09683 5D

The Chemistry of Ozone in the Treatment of Water,
W76-09684 5F

The Relationship Between Dissimilatory Nitrate Reduction and Oxygen Uptake by Cells of an Alcaligenes Strain in Flocs and in Suspension and by Activated Sludge Flocs,
W76-09686 5D

Problems Concerning the Character of Oxidizability of Certain Organic Substances in Water Treated with Ozone (Problemes lies A L'Evolution Du Caractere D'Oxydabilite De Certain Corps Organiques Presents Dans L'Eau Tratee Par L'Ozone),
W76-09692 5D

Biodegradability and Process for Biological Purification of Waste Water (La Biodegradabilite et Les Procedes D'Epuration Biologique Des Effluents),
W76-09693 5D

How to Build a Better Bench Sheet,
W76-09701 5D

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

Laboratory Centrifuge Saves Time and Money,
W76-09704 5D

Technique Alternatives for a Package Stabilization Plant,
W76-09705 5D

Increasing the Capacity of Sedimentation Tanks by Means of Sloping Plates,
W76-09706 5D

Sludge Heat Treatment: Operation and Management,
W76-09708 5D

New York Takes Another Giant Step,
W76-09710 5D

The Desert War on Pollution,
W76-09711 5D

Microbial Aspects of Carbonisation Effluent Treatment,
W76-09712 5D

Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

Hydrodynamic Separation of Solids from Solid-Liquid Mixtures,
W76-09716 5D

A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

Wastewater Sludge Utilization and Disposal Costs,
W76-09773 5D

Costs of Wastewater Treatment by Land Application,
W76-09774 5D

Development of a Dynamic Programming Model for the Regionalization and Staging of Wastewater Treatment Plants,
W76-09845 5D

Sewage Treatment System,
W76-09854 5D

Water Treatment Process and Apparatus,
W76-09855 5D

Method of Biological Purification of Industrial Effluents from Chromates and Bichromates,
W76-09856 5D

Membrane Support-Plates and Fluid Separating Apparatus in which They are Present,
W76-09857 5D

Open-Loop Water-Washable Inspection Penetrant Process,
W76-09859 5D

Apparatus for Purification of Industrial Waste Water,
W76-09861 5D

Supported Semi-Permeable Membranes,
W76-09863 3A

Semipermeable Membrane and Process for the Preparation Thereof,
W76-09864 3A

Method and Apparatus for Converting Saline Water to Fresh Water,
W76-09871 3A

Method and Apparatus for the Conversion of an Aqueous Scale-Formed Liquid,
W76-09872 3A

Method of Operating a Purifying Plant and Tank for Practicing Said Method,
W76-09873 5D

Furnace for Thermal Treatment of Liquid Industrial Waste Waters Containing Toxic Organic Impurities (Pech' Dlya Termicheskogo Obezvrezhivaniya Zhidkikh Promyshlennykh Stokov S Toksicheskimi Organicheskimi Primesyami),
W76-09875 5D

Preparation of Reverse Osmosis Membranes by Complete Evaporation of the Solvent System,
W76-09876 3A

Reverse Osmosis Process Using Crosslinked Aromatic Polyamide Membranes,
W76-09877 3A

Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

Development of a Batchwise In-situ Regeneration Type Separator to Remove Oil from Oil-Water Suspensions,
W76-09895 5G

WATER ALLOCATION (POLICY)
Arizona Energy: A Framework for Decision.
W76-09484 6D

WATER ALLOCATION (POLICY)

Investment Sequencing, Allocation, and Learning in the Design of Water Resources Systems: An Empirical Application,
W76-09846 6A

WATER ANALYSIS

Development of Laboratory Model Ecosystems as Early Warning Elements of Environmental Pollution,
W76-09643 5C

The Role of Bioassays in Environmental Research,
W76-09644 5A

Dissolved Oxygen Analyzer T-01 Analyzer. A Simple Apparatus for Electrochemical Determination of Dissolved Oxygen in Water (Tlenomierz T-01 uproszczony przyrzad elektrochemicznego oznaczania tleunu roxpuszczomego w roztworach wodnych),
W76-09688 5A

Geochemical and Isotopic Analyses of Waters Associated with the Edwards Limestone Aquifer, Central Texas,
W76-09836 2K

Technique of Water Sampling in Sanitary Investigations of Large Bodies of Water, (In Russian),
W76-09928 5A

WATER AUTHORITY

Water Authority Rate Making,
W76-09717 6C

WATER CHEMISTRY

The Concentration of Dissolved Solids and River Flow,
W76-09577 5B

Water Chemistry of the St. Lawrence Estuary,
W76-09581 5A

Geochemical and Isotopic Analyses of Waters Associated with the Edwards Limestone Aquifer, Central Texas,
W76-09836 2K

WATER CIRCULATION

Characteristics of Coastal Circulation Affecting the Transport and Dispersion of Material Released from the Nuclear Industry,
W76-09504 5C

On Entrainment and Diffusion in a Gulf of Mexico Anticyclonic Ring,
W76-09723 2L

WATER CONSERVATION

Water Conservation in Arid-Zone Soils,
W76-09478 3B

Modern Techniques of Waste Detection,
W76-09685 5F

WATER DEMAND

Power Generation in Arizona and Its Environmental Implications,
W76-09485 6D

An Assessment of Estuarine and Nearshore Marine Environments,
W76-09665 6G

WATER HYACINTH

Weed Holds Promise for Pollution Cleanup,
W76-09440 5D

WATER IMMERSION

Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

WATER LEVEL FLUCTUATIONS

Monitoring Wells,
W76-09558 4B

Report of Water Levels in Selected Observation Wells in Utah--April 1976,
W76-09832 4B

WATER LEVEL RECORDERS

Operation and Maintenance of a Deep-Well Water-Level Measurement Device, 'The Iron Horse',
W76-09835 4B

WATER LEVELS

Monitoring Wells,
W76-09558 4B

WATER LOSS

The Effect of Silicon Oils on the Water Loss of Hordeum Vulgare L, (In German),
W76-09806 3B

WATER MANAGEMENT (APPLIED)

The Over-Exploitation of Groundwater Resources in Dry Regions,
W76-09479 4B

Water Utilization and Soil Salinity: Control in Arid Zone Agriculture,
W76-09482 3C

Arizona Energy: A Framework for Decision.
W76-09484 6D

Urban Stormwater Management--Problems, Solutions and Impact: A Summary of Interviews,
W76-09752 4C

WATER POLICY

Water Use Policies and Power Plant Economics,
W76-09776 5G

WATER POLLUTION

Nitrogen in the Subsurface Environment,
W76-09662 5B

Combined Sewage Overflows - Frequency, Environmental Effects, and a Corrective Program,
W76-09741 5D

Assessing Potential Ocean Pollutants,
W76-09889 5G

'Toxic' or 'Poisonous' Water, (In Russian),
W76-09932 5C

Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

The Aquatic and Subaquatic Bryophytic Vegetation of the Belgian Part of the River Sambre, Related to Ecological Conditions and Water Pollution, (In French),
W76-09986 5C

WATER POLLUTION CONTROL

The Design of Water Quality Management Projects with Inadequate Data,
W76-09623 5G

Economic Analysis of Effluent Guidelines: Grain Processing Segment of the Grain Mills Industry,
W76-09775 5G

Economic Analysis of Effluent Guidelines: Fertilizer Industry,
W76-09777 5G

Economic Analysis of Effluent Guidelines: Apple, Citrus and Potato Processing Segments of the Canned and Preserved Fruits and Vegetable Industry,
W76-09779 5G

Economic Analysis of Effluent Guidelines: Insulation Fiberglass Industry.
W76-09780 5G

Method and Composition for Preventing Water Contaminated with Industrial Waste from Seeping Through Soil Containing Said Water,
W76-09858 5G

Combination Providing Safety Berthing, Unloading of Oil, and Conduit Carriage to Refineries on Land, of Large Deep-Sea-Requiring Tankers,
W76-09865 5G

Furnace for Thermal Treatment of Liquid Industrial Waste Waters Containing Toxic Organic Impurities (Pech' Dlya Termicheskogo Obezvrezhivaniya Zhidkikh Promyshlennykh Stokov S Toksicheskimi Organicheskimi Primesyami),
W76-09875 5D

WATER POLLUTION EFFECTS

Re-Evaluation of the Effects of Man-Made Modifications on Gordon Creek Between 1887 and 1973 and Especially as Regards its Fish Fauna,
W76-09407 4C

An Assessment of Possible Pollution Effects Over a Century of the Benthic Marine Algae of Co. Durham, England,
W76-09595 5C

Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

Effects of Petroleum Pollutants on Arctic Microbial Populations,
W76-09909 5C

WATER POLLUTION SOURCE

Effects of Storm Discharges on River Water Quality,
W76-09401 5B

WATER POLLUTION SOURCES

Longitudinal Dispersion Coefficients for Streams,
W76-09589 5B

Reconnaissance Map Showing Relative Amounts of Soil and Bedrock in the Mountainous Part of the Morrison-Evergreen Quadrangles and Adjoining Areas to the West in Jefferson County, Colorado,
W76-09825 7C

Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

Oil in the Arctic,
W76-09902 5C

Recommended Procedure for Developing Deepwater Ports Design Criteria,
W76-09907 5G

ATER POLLUTION TREATMENT
Water Treatment Process and Apparatus,
W76-09855 5D

Method of Biological Purification of Industrial Effluents from Chromates and Bichromates,
W76-09856 5D

Method and Composition for Preventing Water Contaminated with Industrial Waste from Seeping Through Soil Containing Said Water,
W76-09858 5G

Open-Loop Water-Washable Inspection Penetrant Process,
W76-09859 5D

Method of Operating a Purifying Plant and Tank for Practicing Said Method,
W76-09873 5D

Furnace for Thermal Treatment of Liquid Industrial Waste Waters Containing Toxic Organic Impurities (Pech' Dlya Termicheskogo Obezvrezhivaniya Zhidkikh Promyshlennykh Stokov S Toksicheskimi Organicheskimi Primesyami),
W76-09875 5D

ATER POTENTIAL (PLANTS)
Contribution of Salts to the Water Potential of Woody Plants,
W76-09691 3C

Hydratability as a Parameter of Plant Water Potential, (In French),
W76-09918 2I

ATER PRESSURE
An Underwater Temperature-Depth Data Collection Device,
W76-09727 2H

ATER PURIFICATION
New Technologies in Water Purification and Their Application to Arid Lands,
W76-09481 3A

Water Treatment Process and Apparatus,
W76-09855 5D

Membrane Support-Plates and Fluid Separating Apparatus in which They are Present,
W76-09857 5D

Apparatus for Purification of Industrial Waste Water,
W76-09861 5D

Domestic Water Filtration Apparatus,
W76-09862 5F

Method and Apparatus for Converting Saline Water to Fresh Water,
W76-09871 3A

Method of Operating a Purifying Plant and Tank for Practicing Said Method,
W76-09873 5D

Preparation of Reverse Osmosis Membranes by Complete Evaporation of the Solvent System,
W76-09876 3A

ATER QUALITY
Changes in Water Chemistry Resulting from Surface-Mining of Coal on Four West Virginia Watersheds,
W76-09470 4C

New Technologies in Water Purification and Their Application to Arid Lands,
W76-09481 3A

Swedish Studies on Combination Effects of Thermal Discharges in the Aquatic Environment, Some Aspects of Power Plant Siting Policy,
W76-09495 5C

Optimal Ground Water Quality Management: Well Injection of Waste Waters,
W76-09511 5D

Monitoring Wells,
W76-09558 4B

Water Chemistry of the St. Lawrence Estuary,
W76-09581 5A

The Design of Water Quality Management Projects with Inadequate Data,
W76-09623 5G

Ecosystem Modeling,
W76-09645 5C

Use of the Computer Program 'STORM' for Analysis of the Quantity and Quality of Urban Storm Water Runoff,
W76-09740 5B

Appraisal of Water Resources of Northwestern El Paso County, Colorado,
W76-09828 2E

Hydrology and Sedimentation of Bixler Run Basin, Central Pennsylvania,
W76-09830 2J

Oil in the Arctic,
W76-09902 5C

WATER QUALITY ACT
The Role of Bioassays in Environmental Research,
W76-09644 5A

Report to the Congress by the National Commission on Water Quality,
W76-09663 5G

WATER QUALITY CONTROL
Anaerobic Treatment of Leachate with High Sodium Concentrations,
W76-09641 5D

Report to the Congress by the National Commission on Water Quality,
W76-09663 5G

Method and Composition for Preventing Water Contaminated with Industrial Waste from Seeping Through Soil Containing Said Water,
W76-09858 5G

Furnace for Thermal Treatment of Liquid Industrial Waste Waters Containing Toxic Organic Impurities (Pech' Dlya Termicheskogo Obezvrezhivaniya Zhidkikh Promyshlennykh Stokov S Toksicheskimi Organicheskimi Primesyami),
W76-09875 5D

Reverse Osmosis Process Using Crosslinked Aromatic Polyamide Membranes,
W76-09877 3A

Development of a Batchwise In-situ Regeneration Type Separator to Remove Oil from Oil-Water Suspensions,
W76-09895 5G

Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

Engineering and Ecological Evaluation of Artificial-Island Design, Rincon Island, Punta Gorda, California,
W76-09903 2L

Recommended Procedure for Developing Deepwater Ports Design Criteria,
W76-09907 5G

Academic Data-Needs for Environmental Assessments of Offshore Technological Operations,
W76-09914 6G

Coast Guard's Response to Spilled Oil,
W76-09915 5A

WATER QUALITY STANDARDS
Report to the Congress by the National Commission on Water Quality,
W76-09663 5G

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

Results of Hygienic and Toxicological Studies of Pesticides in Countries of the Council of Mutual Economic Assistance in 1962-1972, (In Russian),
W76-09884 5G

Hygienic Standardization of Flotation Reagent BB-2 and its Components as Industrial Contaminants of Water Bodies, (In Russian),
W76-09886 5B

WATER RESOURCES
Design of Water Resources Project with Inadequate Data in India - General and Particular Case Studies,
W76-09621 4A

Improved Techniques for Water Resource Systems Design,
W76-09624 4A

The Cost-Effectiveness of Water Resources Systems Considering Inadequate Hydrological Data,
W76-09626 6A

NEPA and a State's Role in Water Resources Management,
W76-09627 6E

On The Rainfall and Water Potential of Nepal,
W76-09642 2B

Hydrologic Unit Map--1974, State of Alaska,
W76-09826 7C

Appraisal of Water Resources of Northwestern El Paso County, Colorado,
W76-09828 2E

Water-Resources Investigations of the U.S. Geological Survey in the Major Coal and Oil Shale Areas of Wyoming, 1975-76,
W76-09833 4A

Metagame Theory and its Applications to Water Resources,
W76-09847 6A

Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

WATER RESOURCES DEVELOPMENT
The Cost Assignment of the Cooperative Water Resource Development: A Game Theoretical Approach,
W76-09619 6A

Maximum Information Obtainable from Inadequate Design Data: from Multivariate to Bayesian Methods,
W76-09625 4A

National Conference of District Chiefs, Albuquerque, New Mexico, September 28-October 3, 1975--Proceedings,
W76-09838 2A

A Water-Land Use Management Model for the Sevier River Basin Phases I and II,
W76-09844 4A

WATER REUSE
Radiation for a Clean Environment.
W76-09512 5D

Current Technology and Advances in True Re-Use of Effluents,
W76-09515 5D

The Desert War on Pollution,
W76-09711 5D

WATER SAMPLING
Operation and Maintenance of a Deep-Well Water-Level Measurement Device, 'The Iron Horse',
W76-09835 4B

Technique of Water Sampling in Sanitary Investigations of Large Bodies of Water, (In Russian),
W76-09928 5A

WATER SHORTAGE
Effects of Management Practices on Water Quality and Quantity: Newark, New Jersey, Municipal Watersheds,
W76-09465 4D

WATER STORAGE
Effects of Management Practices on Water Quality and Quantity: Newark, New Jersey, Municipal Watersheds,
W76-09465 4D

WATER STRESS
Drought Adaptations in Two Californian Evergreen Sclerophylls,
W76-09476 2I

WATER SUPPLY
Municipal Watershed Management: What are the Opportunities,
W76-09472 4D

WATER TEMPERATURE
Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

Phosphorus and Nitrogen Cycle on a Transect in Lake Ontario During the International Field Year 1972-1973 (IFYGL),
W76-09594 5C

Microbial Degradation of Model Petroleum at Low Temperatures,
W76-09648 5C

An Underwater Temperature-Depth Data Collection Device,
W76-09727 2H

On the Extermination of Polyclads: Calcium Hypochlorite (CaOC12) Treatment in the Period of High Water Temperature, (In Korean),
W76-09801 5C

Calculation of Water Temperatures in Clear Lake, Iowa,
W76-09879 5B

Water Transport in the Sill Area of Balsfjord North Norway, During Vernal Meltwater Discharge,
W76-09999 2L

WATER TREATMENT
Van Clarifies Sludge Options,
W76-09438 5F

The Need for the Use of High-Level Radiation in Water Treatment and in Waste-Water (Sewage) Treatment,
W76-09518 5D

Practical Application of the Germicidal Power of Ultraviolet Irradiation to Drinking-water, (In French),
W76-09646 5F

Monitoring and Automatic Filter Control of the Dreis-Tiefenback Treatment Plant (Betriebsueberwachung und Automatische Filtersteuerung der Aufbereitungsanlage Dreis-Tiefenbach),
W76-09679 5F

The Chemistry of Ozone in the Treatment of Water,
W76-09684 5F

Modern Techniques of Waste Detection,
W76-09685 5F

Operation of Ozone Treatment Apparatus (Ozone shori sochi no unten),
W76-09713 5F

Hygienic Assessment of Changes in Mineral Water Properties During its Treatment for Use in Internal Balneotherapeutic Procedures, (In Russian),
W76-09795 5C

On the Extermination of Polyclads: Calcium Hypochlorite (CaOC12) Treatment in the Period of High Water Temperature, (In Korean),
W76-09801 5C

Domestic Water Filtration Apparatus,
W76-09862 5F

Experimental Effect of Boron on Anticarious Action of Fluorine in Drinking Water, (In Russian),
W76-09885 5F

WATER UTILIZATION
Micro-Climate Effects on Water Use Efficiency by Plants in an Arid Climate,
W76-09480 3B

Water System Behavior: Determinants in an Arid Region,
W76-09483 4A

Arizona Energy: A Framework for Decision.
W76-09484 6D

Water Authority Rate Making,
W76-09717 6C

Water Use Policies and Power Plant Economics,
W76-09776 5G

Effectiveness of Water Utilization by Plants, (In Ukranian),
W76-09809 2D

WATER-WASHABLE PENETRANTS
Open-Loop Water-Washable Inspection Penetrant Process,
W76-09859 5D

WATER WELLS
Sioux Falls Restores Four Wells with Collector Pipe,
W76-09510 3B

WATER WORKS
Monitoring and Automatic Filter Control of the Dreis-Tiefenback Treatment Plant (Betriebsueberwachung und Automatische Filtersteuerung der Aufbereitungsanlage Dreis-Tiefenbach),
W76-09679 5F

WATER YIELD
Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

Effects of Management Practices on Water Quality and Quantity: Baltimore, Maryland, Municipal Watersheds,
W76-09464 4D

WATER YIELD IMPROVEMENT
Effects of Management Practices on Water Quality and Quantity: Newark, New Jersey, Municipal Watersheds,
W76-09465 4D

WATERSHED MANAGEMENT
Effects of Management Practices on Water Quality and Quantity: Baltimore, Maryland, Municipal Watersheds,
W76-09464 4D

Effects of Management Practices on Water Quality and Quantity: Newark, New Jersey, Municipal Watersheds,
W76-09465 4D

Summary of Municipal Watershed Management Surveys in Eastern United States,
W76-09466 4D

Municipal Watershed Management: What are the Opportunities,
W76-09472 4D

A Review and Analysis of Selected Hydrologic Modeling Concepts,
W76-09718 2E

Watershed Management and Sediment Control in Montgomery County,
W76-09748 4D

WATERSHED RUNOFF MODELS
A Review and Analysis of Selected Hydrologic Modeling Concepts,
W76-09718 2E

WATERSHEDS (BASINS)
Summary of Municipal Watershed Management Surveys in Eastern United States,
W76-09466 4D

Conceptual Hydrological Model for an Averaged-Sized Catchment Area, I. Concepts and Relationships,
W76-09579 2A

Conceptual Hydrological Model for an Average-Sized Catchment Area, II. Estimate of Parameters, Validity of Model, Application,
W76-09580 2A

Estimating Selected Parameters for the Kentucky Watershed Model from Watershed Characteristics,
W76-09852 2A

Parameter Optimization for Watershed Models,
W76-09853 2A

WAVE SPECTRA
Modeling of Wind-Waves with Jonswap Spectra,
W76-09948 8B

WAVES (WATER)
Transverse Forces on Vertical Cylinders in Waves,
W76-09583 8B

Probability Distributions of Breaking Wave Heights Emphasizing the Utilization of the Jonswap Spectrum,
W76-09721 2L

The Wind Drift and Wave Breaking,
W76-09724 2L

Wave Breaking in the Presence of Wind Drift and Swell,
W76-09874 2L

Origin, Effect and Suppression of Secondary Waves,
W76-09878 2J

Hybrid-Element Method for Water Waves,
W76-09945 8B

Large Wave Channel for 'Full Scale-Modeling' of Wave Dynamics in Surf Zones,
W76-09946 8B

Wave Motions in an Offshore Harbor,
W76-09947 8B

Modeling of Wind-Waves with Jonswap Spectra,
W76-09948 8B

WELL DESIGN
Monitoring Wells,
W76-09558 4B

WEST GERMANY
Accuracy of Reservoir Inflow Forecasts Based on Radar Rainfall Measurements,
W76-09574 2B

WEST VIRGINIA
Changes in Water Chemistry Resulting from Surface-Mining of Coal on Four West Virginia Watersheds,
W76-09470 4C

WETTING FRONTS
Stability Analysis of Infiltration,
W76-09588 2G

WHITE ROCK CREEK (TEX)
Changes in the Sedimentation Characteristics of an Urbanizing Watershed, Dallas and Collin Counties, Texas,
W76-09745 4C

WHITE ROCK LAKE (TEX)
Changes in the Sedimentation Characteristics of an Urbanizing Watershed, Dallas and Collin Counties, Texas,
W76-09745 4C

WHITEFISH
Feeding Habits of the Population of Whitefish (Coregonus Lavaretus (L.)) in Haugatjern: A Eutrophic Norwegian Lake,
W76-09882 2H

WILDLIFE
Pesticide and PCB Residue in Organs of Wild Animals as Indicators of Environmental Contamination, (In German),
W76-09922 5A

WIND DRIFT
The Wind Drift and Wave Breaking,
W76-09724 2L

WINDS
The Wind Drift and Wave Breaking,
W76-09724 2L

Wave Breaking in the Presence of Wind Drift and Swell,
W76-09874 2L

WINTER
St. Lawrence Seaway: A New Goal of Year-Round Navigation,
W76-09942 2C

WISCONSIN
An Application of the Storm Water Management Model,
W76-09738 5D

WITHDRAWAL
The Over-Exploitation of Groundwater Resources in Dry Regions,
W76-09479 4B

WOOL FIBERGLASS INDUSTRY
Economic Analysis of Effluent Guidelines: Insulation Fiberglass Industry.
W76-09780 5G

WYOMING
Hydrology of the Madison Formation and its Potential use for Water Supply for Energy Development,
W76-09757 2F

Water-Resources Investigations of the U.S. Geological Survey in the Major Coal and Oil Shale Areas of Wyoming, 1975-76,
W76-09833 4A

X-RAY ANALYSIS
Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

X-RAY SPECTROSCOPY
Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

XEROPHYTES
Micro-Climate Effects on Water Use Efficiency by Plants in an Arid Climate,
W76-09480 3B

ZIMMERMAN PROCESS
Industrial Experience of Sewage Sludge Processing with Zimpro Installations in the Netherlands,
W76-09709 5D

ZINC
Environmental Pollution by Cadmium and Zinc Discharged from a Braun Tube Factory, (In Japanese)
W76-09405 5B

ZN-65
Cycling of Fe55 and Zn65 in Columbia River Carp Following Reactor Shutdown,
W76-09508 5C

ZOOPLANKTON
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

On Long-Term Stability of Zooplankton Composition,
W76-09600 5C

Environmental Responses to Thermal Discharges from the Chesterfield Station, James River, Virginia,
W76-09652 5C

Acid-Iron Waste as a Factor Affecting the Distribution and Abundance of Zooplankton in the New York Bight: I. Laboratory Studies on the Effects of Acid Waste on Copepods,
W76-09700 5C

AUTHOR INDEX

AAGAARD, K.
Upwelling Near Samalga Pass,
W76-09585 2L

ABBOTT, J. W.
Use of the Computer Program 'STORM' for Analysis of the Quantity and Quality of Urban Storm Water Runoff,
W76-09740 5B

ABBOTT, M. B.
River and Estuary Modeling with the Siva System,
W76-09982 2A

Systems Modeling of Stratified Fluids,
W76-09976 8B

ABEL, M. E.
Irrigation Systems in Taiwan: Management of a Decentralized Public Enterprise,
W76-09848 3F

ADAMS, E. E.
Temperature Predictions for Offshore Power Plants,
W76-09960 5B

ADYALKAR, P. G.
Influence of Hydraulic Trough and Lateral Joints on the Groundwater Potential of the Massive Trap Unit at Tanoria in Shajapur District (MP),
W76-09614 4B

AIM, R. B.
Development of a Measurement Method for the Total Activity Rate of Activated Sludge (Contribution a La Mise Au Point D'une Methode De Mesure Du Taux D'Activite Totale Des Boues Activees),
W76-09695 5D

AKHUNDOV, F. G.
Transformation of Concentrated and Complex Phosphorus Fertilizers in Modow-Bog Soil with a High Moisture Content, (In Azerbaijani),
W76-09786 5B

ALBURGER, J. R.
Open-Loop Water-Washable Inspection Penetrant Process,
W76-09859 5D

ALDAG, W.
Separation of Sludge,
W76-09421 5D

ALEKSAKHIN, R. M.
Use of the Principles and Methods of Radio-Ecology in Solving Some Urgent Problems of Man's Effect on the Environment, (In Russian),
W76-09936 6G

ALEXANDER, R. C.
Diagnostic Model Study of Mixed-Layer Depths in the Summer North Pacific,
W76-09719 2L

ALLANSON, J. T.
Development of a Continuous Inclined Sand Bed Filter,
W76-09668 5D

ALLDREDGE, A. L.
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

ALLEN, A. A.
Development of a Boat and Helicopter Deployable Oil Slick Sampler,
W76-09892 5A

AMIR, I.
A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

AMOROS, C.
Changes in the Population of Cladocera and Copepoda in Three Fishponds of the Dombes, (In French),
W76-09995 2I

ANCELLIN, J.
Influence De La Temperature Sur La Contamination D'Especes Marines Par Le Fer-59, (Influence of Temperature on the Contamination of Marine Species by Iron-59),
W76-09494 5C

ANDERL, B.
Accuracy of Reservoir Inflow Forecasts Based on Radar Rainfall Measurements,
W76-09574 2B

ANDERSON, A. G.
Modeling of Meandering and Braiding in Rivers,
W76-09974 2J

ANDREEV, N. G.
Dependence of Pasture Grass Yield on Soil Moisture Level, (In Russian),
W76-09930 4A

ANIKIEV, V. V.
Effect of Excess Soil Moisture on the Content of Phosphorus Compounds in Barley, (In Russian),
W76-09913 3F

ANTONENKO, T. M.
Concentration of Cesium-137 in Aquatic Organisms, Water and Bottom Deposits of Water Bodies with a Different Mineral Compositions of the Water, (In Russian),
W76-09410 5C

APMANN, R. P.
The Influence of Urbanization on Stream Channel Behavior,
W76-09744 4C

APOSTOL, S.
The Action of Some Pollutants on the Growth of Daphnia Magna Strauss, (In French),
W76-09937 5C

APRIL, G. C.
Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

ARAVIO-TORRE, J.
The Mercury Content of Industrial Fish Products: Its Relative Variation with the Treatment (Cooking in Salt Water, Pickling and Fish Production), (In Spanish),
W76-09802 5C

ARD, R. W. JR.
Coast Guard's Response to Spilled Oil,
W76-09915 5A

ARDICA, S.
Possible use of High-Level Radiation for the Degradation of Some Substances Present in Urban and Industrial Waters,
W76-09533 5D

AREVALO, A.
The Mercury Content of Industrial Fish Products: Its Relative Variation with the Treatment (Cooking in Salt Water, Pickling and Fish Production), (In Spanish),
W76-09802 5C

ARMSTRONG, D. A.
Pathology of Acute Poisoning with the Insecticide Sevin in the Bent-Nosed Clam, Macoma Nasuta,
W76-09649 5C

ARNETTE, J. L.
Methodologies for the Determination of Stream Resource Flow Requirements: An Assessment,
W76 09666 6G

ASAKAWA, S.
The Heavy Metal Concentrations in the Waters Along the Coast of Fukuyama, (In Japanese),
W76-09815 5A

ASAMI, T.
Environmental Pollution by Cadmium and Zinc Discharged from a Braun Tube Factory, (In Japanese)
W76-09405 5B

ATLAS, R. M.
Effects of Petroleum Pollutants on Arctic Microbial Populations,
W76-09909 5C

ATTMANNSPACHER, W.
Accuracy of Reservoir Inflow Forecasts Based on Radar Rainfall Measurements,
W76-09574 2B

AURAND, D. W.
Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

AUSTIN, E. P.
Development of a Continuous Inclined Sand Bed Filter,
W76-09668 5D

AVARIA, P. S.
Studies of Phytoplankton Ecology in the Bay of Valparaiso: II. Phytoplankton 1970-1971, (In Spanish),
W76-09408 5A

BABU, V. R.
On The Rainfall and Water Potential of Nepal,
W76-09642 2B

BACHMAN, G. O.
Cenozoic Deposits of Southeastern New Mexico and an Outline of the History of Evaporite Dissolution,
W76-09837 2J

BACHMANN, R. W.
Calculation of Water Temperatures in Clear Lake, Iowa,
W76-09879 5B

BAILEY, A. K.
Concentration of Heavy Metals in Sediments of a Hydroelectric Impoundment,
W76-09755 5A

BALAKOVSKII, M. S.
Isolation of Salmonella from Sewage and Surface Waters, (In Russian),
W76-09411 5A

BALAN, S.
Studies on the Relationships Between Moisture and Suction in Some Soils of the Tisa Plain, (In Rumanian),
W76-10000 2G

BALANI, M. C.
Impact of Thermal and Radioactive Effluents on a Tropical Nearshore Ecosystem,
W76-09492 5C

BALCER, Y.
A Probabilistic Model of the Oil and Gas Discovery Process,
W76-09604 6A

BALDWIN, J. P.
A Quantitative Analysis of the Factors Affecting Plant Nutrient Uptake from Some Soils,
W76-09489 2G

BALLANTINE, D. S.
Alternative High-Level Radiation Sources for Sewage and Waste-Water Treatment,
W76-09536 5D

BAMFORTH, S. S.
Interstitial Protozoa and Algae of Louisiana Salt Marshes,
W76-09593 5C

BANAGA, S. E. I.
A Study of Rotating-Disc Treatment Units Operating at Different Temperatures,
W76-09674 5D

BANERJI, S.
Design of Water Resources Project with Inadequate Data in India - General and Particular Case Studies,
W76-09621 4A

BANNER, M. L.
Wave Breaking in the Presence of Wind Drift and Swell,
W76-09874 2L

BARNARD, J. R.
Physical and Economic Aspects Associated with Runoff from Urban Growth: A Methodological Approach,
W76-09749 4C

BARNETT, M. I.
Laboratory Evaluation of the Coulter On-Line Particle Monitor,
W76-09699 5A

BARNWELL, T. O. R.
Application of Water Quality Models to Finger Fill Canals,
W76-09981 5B

BAROYAN, O. V.
Ecology of Cholera Vibrios, (In Russian),
W76-09409 5C

BARRANTI, L.
Hydrologic and Chemical Analysis of the Principal Piedmontese Tributaries of Lago Maggiore in Relation to its Trophic Modifications, (In Italian),
W76-09576 5C

BARRY, W. F.
Effects of Shock Temperature on Biological Systems,
W76-09660 5C

BASKERVILLE, R. C.
Increasing the Capacity of Sedimentation Tanks by Means of Sloping Plates,
W76-09706 5D

BAT', I. I.
Sanitary Inspection of Surface Waters Polluted with Aromatic Amino and Nitro-Compounds, (In Russian),
W76-09798 5A

BATCH, D. L.
Additional Observations on the Effects of Strip Mining on Small-Stream Fishes in East-Central Kentucky,
W76-09468 5C

BATORA, V.
Results of Hygienic and Toxicological Studies of Pesticides in Countries of the Council of Mutual Economic Assistance in 1962-1972, (In Russian),
W76-09884 5G

BAUCHHENSS, J.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Results on the Effect of Differently Treated Sewage Sludge on Plants and Soil,
W76-09551 5D

BAUGHMAN, M. L.
Energy Consumption and Fuel Choice by Residential and Commercial Consumers in the United States,
W76-09609 6A

Energy Systems: Modeling and Policy Planning,
W76-09608 6A

BAUMGARTNER, D. N.
An Underwater Temperature-Depth Data Collection Device,
W76-09727 2H

BEAL, G. S.
Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

BEAL, K.
Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

BECK, T.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Results on the Effect of Differently Treated Sewage Sludge on Plants and Soil,
W76-09551 5D

BEEMAN, O.
Specifications for Container Facilities by Simulation,
W76-09943 6A

BEER, C.
Waste Treatment Apparatus,
W76-09432 5D

BEHRE, K.
The Algal Population of Duemmer Lake in the Years 1970/71, (In German),
W76-09812 5C

BEJDA, A. J.
The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

BEKIEV, K.
Evaporation from Highly Saline Soils in an Experimental Plot in the Turkmen SSR, (In Russian),
W76-09887 2D

BEN-DAVID, A.
A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

BENDER, E. S.
Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

BENNER, B. L.
Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

BENNETT, L.
Effluent Detention Ponds Dechlorinate Wastewater,
W76-09678 5D

BERRIEN, P. L.
A Description of Atlantic Mackerel, Scomber Scombrus, Eggs and Early Larvae,
W76-09656 2I

BERTELSEN, J. AA.
Systems Modeling of Stratified Fluids,
W76-09976 8B

BERTOGLIO RIOLO, C.
Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

BEST, G. A.
Steroids in Effluents,
W76-09696 5A

BINGHAM, D. L.
Appraisal of Water Resources of Northwestern El Paso County, Colorado,
W76-09828 2E

BLACK, R. D.
A Review and Analysis of Selected Hydrologic Modeling Concepts,
W76-09718 2E

BLAGUS, S.
Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

BLANC, F. C.
Anaerobic Treatment of Leachate with High Sodium Concentrations,
W76-09641 5D

BLANK, M. A.
Results of Salinity Tests on the San Francisco Bay-Delta Hydraulic Model,
W76-09978 2L

BLANTON, J. O.
Characteristics of Coastal Circulation Affecting the Transport and Dispersion of Material Released from the Nuclear Industry,
W76-09504 5C

BLOCK, C. S.
Wastewater Treatment System with Controlled Mixing,
W76-09433 5D

BLOCK, J. C.
Problems Concerning the Character of Oxidizability of Certain Organic Substances in Water Treated with Ozone (Problemes lies A L'Evolution Du Caractere D'Oxydabilite De Certain Corps Organiques Presents Dans L'Eau Tratee Par L'Ozone),
W76-09692 5D

BLOESCH, J.
Sedimentation and Phosphorus Balance in Lake Lucerne (Horw Bay) and in the Rotsee, (In German),
W76-09790 5C

BLOK, J.
Methods for Measurement of Biodegradability of Chemical Compounds,
W76-09599 5C

BLOWS, D. G.
Waste Treatment Plants,
W76-09427 5E

BOGATSKII, M. A.
Gas-Liquid Chromatographic Determination of Butyl Acetate, Butanol and Acetone Present Together in Waste Waters, (In Russian),
W76-09929 5A

BOGUCHARSKOV, V. T.
Bottom Deposits of the Kuban Deltaic Limans, (In Russian),
W76-09935 2L

BOMMARITO, J. J.
Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

BONKA, H.
Possible Future Effects on the Population of the Federal Republic of Germany of Gaseous Radioactive Effluents from Nuclear Facilities,
W76-09499 5A

BORCHERT, H.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Results on the Effect of Differently Treated Sewage Sludge on Plants and Soil,
W76-09551 5D

BORGESE, D.
A Site Study of the Multiple Effects of Thermal Releases on the Aquatic Life in an Estuarine Area,
W76-09505 5C

BOTTRELL, H. H.
Generation Time, Length of Life, Instar Duration and Frequency of Moulting, and their Relationship to Temperature in Eight Species of Cladocera from the River Thames, Reading,
W76-09658 5C

The Relationship Between Temperature and Duration of Egg Development in Some Epiphytic Cladocera and Copepoda from the River Thames, Reading, with a Discussion of Temperature Functions,
W76-09659 5C

BOYSEN, S. M.
Predicting Sediment Yield in Urban Areas,
W76-09746 4D

BRADLEY, E. H.
Stabilization of Waste Material,
W76-09425 5D

BRANDES, R. J.
Estuarine Ecologic Simulations,
W76-09950 2L

Simulation of Tidal Hydrodynamics - Masonboro Inlet,
W76-09953 8B

BRANSON, B. A.
Additional Observations on the Effects of Strip Mining on Small-Stream Fishes in East-Central Kentucky,
W76-09468 5C

BRAS, R. L.
Evaluation of Mean Square Error Involved in Approximating the Areal Average of a Rainfall Event by a Discrete Summation,
W76-09572 2B

BRAZHNIKOV, V. I.
Furnace for Thermal Treatment of Liquid Industrial Waste Waters Containing Toxic Organic Impurities (Pech' Dlya Termicheskogo Obezvrezhivaniya Zhidkikh Promyshlennykh Stokov S Toksicheskimi Organicheskimi Primesyami),
W76-09875 5D

BREEN, R. L.
Energy Models and Forecasts: A User's Point of View,
W76-09613 6A

BREER, C.
Sanitary Effect of Gamma Irradiation on Sewage Sludge,
W76-09527 5D

BRENK, D.
Possible Future Effects on the Population of the Federal Republic of Germany of Gaseous Radioactive Effluents from Nuclear Facilities,
W76-09499 5A

BRESLER, E.
Water Utilization and Soil Salinity: Control in Arid Zone Agriculture,
W76-09482 3C

BREZINA, J.
Experience with a Small Scale, Highly Distorted Fixed Bed Model of the Lago Maracaibo Estuary,
W76-09979 2L

BRINCKERHOFF, G. G.
New York Takes Another Giant Step,
W76-09710 5D

BROCKETT, O. D.
Microbial Reactions in Facultative Oxidation Ponds -- I. The Anaerobic Nature of Oxidation Pond Sediments,
W76-09435 5D

BRUEGGEMANN, J.
Pesticide and PCB Residue in Organs of Wild Animals as Indicators of Environmental Contamination, (In German),
W76-09922 5A

BRUSSERMANN, K.
Possible Future Effects on the Population of the Federal Republic of Germany of Gaseous Radioactive Effluents from Nuclear Facilities,
W76-09499 5A

BUCKNER, H. D.
Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1974,
W76-09829 7C

BUHATEL, T.
The Hygienic Quality of the Water in a Growing-Finishing Piggery, (In Romanian),
W76-09883 5B

BUIKEMA, A. L. JR.
A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

BULTOT, F.
Conceptual Hydrological Model for an Average-Sized Catchment Area, II. Estimate of Parameters, Validity of Model, Application,
W76-09580 2A

Conceptual Hydrological Model for an Averaged-Sized Catchment Area, I. Concepts and Relationships,
W76-09579 2A

BURAS, N.
The Cost-Effectiveness of Water Resources Systems Considering Inadequate Hydrological Data,
W76-09626 6A

BURCH, R. H.
Modern Techniques of Waste Detection,
W76-09685 5F

BURGASOV, P. N.
Ecology of Cholera Vibrios, (In Russian),
W76-09409 5C

BURKHAM, D. E.
Proposed Revision to the Modified Einstein Method of Computing Total Sediment Discharge,
W76-09842 2J

BURNASH, R. J. C.
Forecasts for the Sacremento River System,
W76-09967 2E

BUSCH, L.
Pesticide and PCB Residue in Organs of Wild Animals as Indicators of Environmental Contamination, (In German),
W76-09922 5A

BUYANOV, N. I.
Concentration of Cesium-137 in Aquatic Organisms, Water and Bottom Deposits of Water Bodies with a Different Mineral Compositions of the Water, (In Russian),
W76-09410 5C

CAIRNS, J. JR.
A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

CALDERARO, E.
Possible use of High-Level Radiation for the Degradation of Some Substances Present in Urban and Industrial Waters,
W76-09533 5D

CALDERONI, A.
Hydrologic and Chemical Analysis of the Principal Piedmontese Tributaries of Lago Maggiore in Relation to its Trophic Modifications, (In Italian),
W76-09576 5C

CALDWELL, J. C.
The Sahelian Drought and Its Demographic Implications,
W76-09486 6G

CAMERON, R. E.
Effects of Petroleum Pollutants on Arctic Microbial Populations,
W76-09909 5C

CAMPBELL, R. B.
Crop Response to Chiseling and Irrigation in Soils with a Compact A2 Horizon,
W76-09985 3F

CAPPADONA, C.
Possible use of High-Level Radiation for the Degradation of Some Substances Present in Urban and Industrial Waters,
W76-09533 5D

CARMICHAEL, R. S.
Gravity Geophysics for Groundwater Exploration in Glaciated Areas,
W76-09758 4B

CAROLLO, A.
Hydrologic and Chemical Analysis of the Principal Piedmontese Tributaries of Lago Maggiore in Relation to its Trophic Modifications, (In Italian),
W76-09576 5C

CARR, J. C.
Estimating Selected Parameters for the Kentucky Watershed Model from Watershed Characteristics,
W76-09852 2A

CARTER, J. L.
Effects of Shock Temperature on Biological Systems,
W76-09660 5C

CAVINDER, T. R.
Application of Water Quality Models to Finger Fill Canals,
W76-09981 5B

CHAKRABARTI, S. K.
Modeling of Wind-Waves with Jonswap Spectra,
W76-09948 8B

CHANDRASHEKAR, M.
Numerical Two-Dimensional Flow Model for River Systems,
W76-09964 2E

CHANG, S.
A Proposed Algorithm for the Solution of the Large-Scale Inverse Problem in Groundwater,
W76-09850 2F

CHAO, P. C.
Sediment Deposition Model for Tarbela Reservoir,
W76-09970 2J

CHAPOVSKAYA, G. V.
The Water Supply System of Soil and Nitrogen Loss with Runoff Waters in Nonchernozem Areas, (In Russian),
W76-09794 2G

CHATURVEDI, A. C.
Flood Problems in Uttar Pradesh,
W76-09640 4A

CHEN, C-N.
Evaluation and Control of Soil Erosion in Urbanizing Watersheds,
W76-09742 4D

CHEN, C. W.
Organic Sediment Model for Wastewater Outfall,
W76-09951 5B

CHEN, H. S.
Hybrid-Element Method for Water Waves,
W76-09945 8B

CHEN, M. S.
Wastewater Treatment System with Controlled Mixing,
W76-09433 5D

CHEN, Y. H.
Mathematical Modeling of Alluvial Channels,
W76-09968 8B

Riverbank Recessions for Power Plant Facilities,
W76-09973 8B

CHERKINSKII, S. N.
Isolation of Salmonella from Sewage and Surface Waters, (In Russian),
W76-09411 5A

CHKHIKVISHVILI, V. I.
The Critical Depth of the Level of Soil-Salinizing Ground Waters, (In Russian),
W76-09808 2G

CHO, B.
Surveys on Radiation-Resistant Asporogenic Bacteria in Natural Environments,
W76-09519 5C

CHUPEK, C.
A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

CILLIE, G. G.
Current Technology and Advances in True Re-Use of Effluents,
W76-09515 5D

CINI, R.
A Simple Physicochemical Method of Detecting Traces of Surfactants in Water,
W76-09927 5A

CLARK, D. W.
How to Build a Better Bench Sheet,
W76-09701 5D

CLELAND, M. R.
Use of High-Power Electron Beam Radiation for the Treatment of Municipal and Industrial Wastes,
W76-09537 5D

CLEM, A. G.
Method and Composition for Preventing Water Contaminated with Industrial Waste from Seeping Through Soil Containing Said Water,
W76-09858 5G

CODELL, R. B.
Two-Dimensional Model of Flow Toward Intakes,
W76-09965 2E

COHEN, J. J.
Cost Effectiveness of Release Prevention Controls for Tritium and Krypton-85,
W76-09506 5G

COLWELL, R. R.
Microbial Degradation of Model Petroleum at Low Temperatures,
W76-09648 5C

COOPER, P. C.
Synergistic Effects of Irradiation of Wastewater.
W76-09524 5D

COOPER, R.
Environmental Quality Research, First Annual Report,
W76-09654 5C

COOPER, R. N.
An Economist's View of the Oceans,
W76-09617 6E

CORBETT, E. S.
Effects of Management Practices on Water Quality and Quantity: Baltimore, Maryland, Municipal Watersheds,
W76-09464 4D

Effects of Management Practices on Water Quality and Quantity: Newark, New Jersey, Municipal Watersheds,
W76-09465 4D

Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

Municipal Watershed Management: What are the Opportunities,
W76-09472 4D

Summary of Municipal Watershed Management Surveys in Eastern United States,
W76-09466 4D

Watershed Response to Partial Area Applications of Simulated Rainfall,
W76-09467 2A

CORNISH, A. H.
Sewage Treatment System,
W76-09854 5D

COSCIA, A. T.
Cationic Acrylamide-Styrene Copolymers and Flocculation of Sewage Therewith,
W76-09434 5D

COSTA, S. L.
Anisotropic Sand Transport in Tidal Inlets,
W76-09955 2L

CRITES, R. W.
Costs of Wastewater Treatment by Land Application,
W76-09774 5D

CROCKETT, A. S.
Development of Edinburgh's Sewage Disposal Scheme,
W76-09707 5D

CROLEY, T. E. II.
Physical and Economic Aspects Associated with Runoff from Urban Growth: A Methodological Approach,
W76-09749 4C

CROSBY, S. C.
Sanitary Waste Treatment Plant,
W76-09414 5D

CROWLEY, W. P.
Differentiation of Serpentinitic from Non-Serpentinitic Ultramafic Rocks in ERTS-1 MSS Imagery,
W76-09566 4A

CURRAN, T. P.
NEPA and a State's Role in Water Resources Management,
W76-09627 6E

URRY JR, L.
Relationship of Rational and Unit Graph Methods in Retention Basin Design,
W76-09732 4C

UTSHALL, N. H.
Cycling of Fe55 and Zn65 in Columbia River Carp Following Reactor Shutdown,
W76-09508 5C

ZERNIEC, J.
Dissolved Oxygen Analyzer T-01 Analyzer. A Simple Apparatus for Electrochemical Determination of Dissolved Oxygen in Water (Tlenomierz T-01 uproszczony przyrzad elektrochemicznego oznaczania tleunu roxpuszczomego w roztworach wodnych),
W76-09688 5A

'ANGLEJAN, B.
Water Chemistry of the St. Lawrence Estuary,
W76-09581 5A

AHL-MADSEN, K. I.
River and Estuary Modeling with the Siva System,
W76-09982 2A

AMELIN, E.
Optimal Operation of the Pumping Stations in the Kinnereth-Eshkol Section of the National Water Carrier,
W76-09629 4A

ANDY, G. C.
Sampling Network Design for Dispersion Verification,
W76-09961 5B

ATTA, O. P.
Construction Planning of a Hydro Power Station,
W76-09616 8C

AVID, M. L.
Economic Analysis of Effluent Guidelines: Fertilizer Industry,
W76-09777 5G

AVIES, R. J.
Waste Treatment Plants,
W76-09427 5E

AVIS, R. B.
Sewage Treatment System,
W76-09854 5D

AVIS, W. J.
Watershed Management and Sediment Control in Montgomery County,
W76-09748 4D

AWDY, D. R.
Proposed Revision to the Modified Einstein Method of Computing Total Sediment Discharge,
W76-09842 2J

AWSON, J. P.
Steroids in Effluents,
W76-09696 5A

AY, J. C.
A Linear Programming Model for Use in Guiding Urban Floodplain Management,
W76-09849 6F

AY, M. C.
Increasing the Capacity of Sedimentation Tanks by Means of Sloping Plates,
W76-09706 5D

DE BOODT, M.
Comparative Study in Measuring Fluid Surface Tension and Fluid Content with the Aid of Electrical Resistance Elements 'In Situ' and in the Laboratory, (In Flemish),
W76-09923 2G

DE VRIES, M.
Movable-Bed River-Models,
W76-09969 2E

DEANER, D. G.
Laboratory Centrifuge Saves Time and Money,
W76-09704 5D

DEGUIDA, R. N.
Sampling Network Design for Dispersion Verification,
W76-09961 5B

DEKSBAKH, N. K.
Anthropogenic Effect on Continental, Marine, and Oceanic Biohydrocoenoses, (In Russian),
W76-09819 5C

DEMCHENKO, I. F.
Engineering Reclamation, A Most Important Means of Increasing Fish Productivity of Waters, (In Russian),
W76-09800 8I

DEMPSEY, J. G.
Sewage Septic System for a Plurality of Drain Fields,
W76-09430 5D

DETCHEVA, R.
Pollution Influence on the Infusorial Fauna (Protozoa, Ciliata) of Bulgarian Rivers II. The Ogosta River and its Effluents,
W76-09714 5A

DEVARAJ, M.
Experiments on the Culture of the Large Snake-Head Ophicephalus Marulius (Hamilton),
W76-09487 8I

DEVILLIERS, J. N.
Airborne Detection and Mapping of Oil Spills, Grand Bahamas,
W76-09891 5A

DEWITT, F. A. JR.
Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

DICKENS, W. L.
Planting Pattern, Plant Population, Irrigation, and Insect Interactions in Cotton.
W76-09998 3F

DIEHL, D. S.
How Many Sewer Leaks Can You Afford.
W76-09404 8G

DILLON, G. S.
Scope of Tidal Power from Indian Estuaries,
W76-09639 2L

DINELLI, G.
A Site Study of the Multiple Effects of Thermal Releases on the Aquatic Life in an Estuarine Area,
W76-09505 5C

DINGES, W. R.
Who Says Sewage Treatment Plants Have to be Ugly,
W76-09437 5D

DINIZ, E. V.
Changes in the Sedimentation Characteristics of an Urbanizing Watershed, Dallas and Collin Counties, Texas,
W76-09745 4C

DISSMEYER, G. E.
Summary of Municipal Watershed Management Surveys in Eastern United States,
W76-09466 4D

DITMARS, J. D.
Particle-Laden Jets with Application to Ocean Dumping,
W76-09959 5B

DIX, G. P.
Considerations in the Public Acceptance of Sewage Sludge Irradiation Systems,
W76-09543 5D

DODIN, A.
Practical Application of the Germicidal Power of Ultraviolet Irradiation to Drinking-water, (In French),
W76-09646 5F

DORCHAK, K. J.
Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

DORNHELM, R.
A Post Construction Survey of Several Man-made Islands Off the Coast of California,
W76-09911 2L

DOTY, C. W.
Crop Response to Chiseling and Irrigation in Soils with a Compact A2 Horizon,
W76-09985 3F

DOWLER, W. L.
Carbon Wastewater Treatment Process,
W76-09441 5D

DOWLING, J. J.
Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

DRAGAS, A. Z.
Is the Examination of Drinkable Water and Swimming Pools on Presence of Enteropathogenic E. Coli Necessary, (In German),
W76-09785 5C

DRESCHER-KADEN, U.
Pesticide and PCB Residue in Organs of Wild Animals as Indicators of Environmental Contamination, (In German),
W76-09922 5A

DRESSEL, J.
The Leaching Behavior of Different Nitrogen Sources in Lysimeter Experiments, (In German),
W76-09793 2G

DUBACH, M.
Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W76-09413 5D

DUCKSTEIN, L.
Maximum Information Obtainable from Inadequate Design Data: from Multivariate to Bayesian Methods,
W76-09625 4A

DUFRESNE, A. F.
Liquid Distribution System for Irrigation and the Like,
W76-09868 3F

DUGDALE, J.
Development of Edinburgh's Sewage Disposal Scheme,
W76-09707 5D

DUPRIEZ, G. L.
Conceptual Hydrological Model for an Average-Sized Catchment Area, II. Estimate of Parameters, Validity of Model, Application,
W76-09580 2A

Conceptual Hydrological Model for an Averaged-Sized Catchment Area, I. Concepts and Relationships,
W76-09579 2A

DURKIN, M. K.
The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

DZIEDZIC, J.
The Vegetation of the 'Lukniany Lake' Nature Reserve in the Mazurian Lake District,(In Polish),
W76-09990 5C

ECKENFELDER, W. W. JR.
Nitrification Studies of Ship Channel Waters,
W76-09453 5D

EDGE, B. L.
Physical Model of Discharge in a Two-Layer Stratified Ambient,
W76-09963 8B

EDGERTON, A. T.
Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

EDWARDS, J. JR.
Observation of Linear Features in the Maryland Piedmont as Shown on ERTS-1 MSS Imagery and Aircraft Support Photography,
W76-09567 4A

EDWARDS, P.
An Assessment of Possible Pollution Effects Over a Century of the Benthic Marine Algae of Co. Durham, England,
W76-09595 5C

EGER, L. O.
Sanitary Waste Treatment Plant,
W76-09414 5D

EGLINTON, G.
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. I. Computerized High Resolution Mass Spectrometry and Gas Chromatography-Low Resolution Mass Spectrometry,
W76-09687 5A

EHLERS, W.
Total Porosity and Pore Size Distribution in Untilled and Tilled Loess Soils, (In German),
W76-09939 2G

EHLIN, U.
Swedish Studies on Combination Effects of Thermal Discharges in the Aquatic Environment, Some Aspects of Power Plant Siting Policy,
W76-09495 5C

EISELE, W.
Pesticide and PCB Residue in Organs of Wild Animals as Indicators of Environmental Contamination, (In German),
W76-09922 5A

ELLIOT, P. B.
Interstitial Protozoa and Algae of Louisiana Salt Marshes,
W76-09593 5C

ELLIS, K. V.
A Study of Rotating-Disc Treatment Units Operating at Different Temperatures,
W76-09674 5D

EMERY, W. J.
The Role of Vertical Motion in the Heat Budget of the Upper Northeastern Pacific Ocean,
W76-09720 2L

EMPAIN, A.
The Aquatic and Subaquatic Bryophytic Vegetation of the Belgian Part of the River Sambre, Related to Ecological Conditions and Water Pollution, (In French),
W76-09986 5C

ENFIELD, C. G.
Steady-State Method of Measuring Unsaturated Hydraulic Conductivity,
W76-09924 2G

EPP, C.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Experiments on the Inactivation of Viruses in Sewage Sludge after Radiation Treatment,
W76-09549 5D

ERICKSEN, N. J.
Landslide Hazard in the United States: A Research Assessment,
W76-09781 6F

ERIKSSON, E.
Nuclear Techniques in Hydrological Studies,
W76-09996 2F

ESCALLIER, G.
Practical Application of the Germicidal Power of Ultraviolet Irradiation to Drinking-water, (In French),
W76-09646 5F

ESCHBACH, E. A.
Joint USA/Japan Project on Global Systems Analysis and Simulation (GLOSAS) of Energy, Resources, and Environmental (ERE) Systems,
W76-09610 6A

FARRELL, J. B.
Methods for Reducing the Infection Hazard of Waste-Water Sludge,
W76-09514 5D

FARRELL, J. P.
Use of High-Power Electron Beam Radiation for the Treatment of Municipal and Industrial Wastes,
W76-09537 5D

FAUSAK, L. E.
Development of a Boat and Helicopter Deployable Oil Slick Sampler,
W76-09892 5A

FEATES, F. S.
Radiation Treatment of Wastes, A Review,
W76-09517 5D

FEINGOLD, H.
Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume II,
W76-09900 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume III,
W76-09901 5A

FELDMAN, A. D.
Use of the Computer Program 'STORM' for Analysis of the Quantity and Quality of Urban Storm Water Runoff,
W76-09740 5B

FELDMAN, L.
A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

FERNANDEZ, C. G.
The Mercury Content of Industrial Fish Products: Its Relative Variation with the Treatment (Cooking in Salt Water, Pickling and Fish Production), (In Spanish),
W76-09802 5C

FERNANDEZ, J. G. M.
Effecto De La Temperatura De Aclimatacion Sobre La Proliferacion De Precursores Eritropoyeticos En Carassius Auratus, (The Effect of Acclimation Temperature on Proliferation of Erythropoietic Precursors in Carrassius Auratus and on the Uptake of Tritiated Thymidine in Haematopoietic and Intestinal Tissue),
W76-09509 5C

FERRAL, R. L.
Forecasts for the Sacremento River System,
W76-09967 2E

FERRERE, F.
Effects of Gamma Irradiation on the Degradation of Dyes,
W76-09532 5D

FETT, R. W.
Island Barrier Effects on Sea State as Revealed by a Numerical Wave Model and DMSP Satellite Data,
W76-09559 2L

FFOLLIOTT, P. F.
Distribution of Ponderosa Pine Forest Densities on the Salt-Verde River Basin,
W76-09477 4A

FICALBI, A.
A Simple Physicochemical Method of Detecting Traces of Surfactants in Water,
W76-09927 5A

FIEDLER, I.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Analytical Studies on Sewage Sludge and Plant Material,
W76-09552 5D

FIELD, R. I.
Give Stormwater Pollutants the Spin,
W76-09461 5D

FIELDING, L.
Sewer Inspection: Checking it Out,
W76-09460 8G

FILIPPOV, P. I.
Hygienic Assessment of Changes in Mineral Water Properties During its Treatment for Use

in Internal Balneotherapeutic Procedures, (In Russian),
W76-09795 5C

FINCH, H. J.
The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

FINCH, J.
Solution of the Operating Problems of a Modern Sewage Treatment Plant,
W76-09455 5D

FINGER, S.
Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume II,
W76-09900 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume III,
W76-09901 5A

FLIGIER, J.
Dissolved Oxygen Analyzer T-01 Analyzer. A Simple Apparatus for Electrochemical Determination of Dissolved Oxygen in Water (Tlenomierz T-01 uproszczony przyrzad elektrochemicznego oznaczania tleunu roxpuszczomego w roztworach wodnych),
W76-09688 5A

FLUHR, W. E.
Irrigation System Pivot Swivel,
W76-09866 3F

FOGLEMAN, W. W.
Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

FOLIGUET, J. M.
Problems Concerning the Character of Oxidizability of Certain Organic Substances in Water Treated with Ozone (Problemes lies A L'Evolution Du Caractere D'Oxydabilite De Certain Corps Organiques Presents Dans L'Eau Tratee Par L'Ozone),
W76-09692 5D

FOSTER, J. E.
Physical Modeling Techniques Used in River Models,
W76-09972 2E

FOSTER, J. H.
A Floodplain Management Framework with Structural and Non-Structural Measures,
W76-09754 6F

FRAIZIER, A.
Influence De La Temperature Sur La Contamination D'Especes Marines Par Le Fer-59, (Influence of Temperature on the Contamination of Marine Species by Iron-59),
W76-09494 5C

FRASER, A.
Phosphorus and Nitrogen Cycle on a Transect in Lake Ontario During the International Field Year 1972-1973 (IFYGL),
W76-09594 5C

FRENETTE, M.
Principle of Management of Degenerated Inlets and Estuaries,
W76-09958 8B

FREY, J. R.
Species Composition and Diversity of Polychaetes in the New York Bight,
W76-09650 5C

FRIEDMAN, Y.
A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

FRITH, C. F.
Reverse Osmosis -- Can it Replace Distillation,
W76-09667 5D

FROMMHOLD, I.
The Effect of Silicon Oils on the Water Loss of Hordeum Vulgare L, (In German),
W76-09806 3B

FRUMAN, D. H.
Development of a Batchwise In-situ Regeneration Type Separator to Remove Oil from Oil-Water Suspensions,
W76-09895 5G

FRY, J. C.
Distribution of Bdellovibrio Bacteriovorus in Sewage Works, River Water, and Sediments,
W76-09698 5A

FUCHS, H.
Synergistic Effects of Airborne Emissions from Nuclear Power Plants,
W76-09503 5A

FUCHS, M.
Micro-Climate Effects on Water Use Efficiency by Plants in an Arid Climate,
W76-09480 3B

FUHRBOTER, A.
Large Wave Channel for 'Full Scale-Modeling' of Wave Dynamics in Surf Zones,
W76-09946 8B

FULLE SOLDI, T.
Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

GABOVICH, R. D.
Experimental Effect of Boron on Anticarious Action of Fluorine in Drinking Water, (In Russian),
W76-09885 5F

GACS, F.
The Waste-Water and Sludge Re-Use Project by Gamma Irradiation at Kecskemet, Hungary, Some Approaches and Investigations,
W76-09544 5D

GAILONSKAYA, I. N.
Ecology of Cholera Vibrios, (In Russian),
W76-09409 5C

GAJBHIYE, N. G.
Influence of Hydraulic Trough and Lateral Joints on the Groundwater Potential of the Massive Trap Unit at Tanoria in Shajapur District (MP),
W76-09614 4B

GALSTYAN, R. A.
Comparative Evaluation of Food Plants of the Ararat Cochineal Scale (Porphyrophora Hamelii) (In Russian),
W76-09406 2I

GARCIA, M. N.
Effecto De La Temperatura De Aclimatacion Sobre La Proliferacion De Precursores Eritropoyeticos En Carassius Auratus, (The Effect of Acclimation Temperature on Proliferation of Erythropoietic Precursors in Carrassius Auratus and on the Uptake of Tritiated Thymidine in Haematopoietic and Intestinal Tissue),
W76-09509 5C

GARDNER, N.
The Desert War on Pollution,
W76-09711 5D

GARETH, E. B.
The Eradication of the Seaweed Sargassum Muticum from Britain,
W76-09989 5G

GARLAND, J. H. N.
Effects of Storm Discharges on River Water Quality,
W76-09401 5B

GARTMAN, D. K.
Re-Evaluation of the Effects of Man-Made Modifications on Gordon Creek Between 1887 and 1973 and Especially as Regards its Fish Fauna,
W76-09407 4C

GAST, W. W.
Urban Stormwater Management--Problems, Solutions and Impact: A Summary of Interviews,
W76-09752 4C

GEORGE, D.
Radiation Treatment of Wastes, A Review,
W76-09517 5D

GERBER, H. B.
Activated Sludge Process with Alum Addition and Heat Treatment,
W76-09456 5D

New York Takes Another Giant Step,
W76-09710 5D

GILEAD, A.
Hydroelectric Power Potential at Corps of Engineers Projects,
W76-09765 6B

GILMER, R. W.
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

GINN, T. C.
Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

GLOCKER, J. J.
The Pollution Control Bond,
W76-09771 5G

GOEL, M. C.
Howell Bunger Valves as Irrigation Outlets,
W76-09615 3F

GOLDBERG, M. D.
Coupled Energy System-Economic Models,
W76-09605 6A

GOLDSTEIN, G.
Biological Indicators of Environmental Quality. A Bibliography of Abstracts,
W76-09860 5A

GORBUSHINA, N. M.
Effect of Excess Soil Moisture on the Content of Phosphorus Compounds in Barley, (In Russian),
W76-09913 3F

GORMAN, W. D.
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

GORYUNOVA, S. V.
'Toxic' or 'Poisonous' Water, (In Russian),
W76-09932 5C

GOTTSCHLING, R. D.
Ozone Provides Alternative for Secondary Effluent Disinfection. Part 1,
W76-09445 5D

Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

GOVETT, G. J. S.
Exploration Rock Geochemistry-Detection of Trace Element Halo at Heath Steele Mines (N. B., Canada) by Discriminant Analysis,
W76-09473 2K

GRADY, C. P. L. JR.
Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

GRAEF, W.
Myxobacteria of the Myxococcus Group as Indirect Indicators of Fecal Matter in Surface Water: 1. Communication, (In German),
W76-09591 5A

GRASS, L. B.
Redox Potential in Irrigated Desert Soils as an Indicator of Aeration Status,
W76-09488 2G

GRAY, A. C. JR.
Activated Sludge Process with Alum Addition and Heat Treatment,
W76-09456 5D

GREENHOUSE, G.
Environmental Quality Research, First Annual Report,
W76-09654 5C

GREENLEAF, J. E.
Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

GREGOROWICZ, Z.
Dissolved Oxygen Analyzer T-01 Analyzer. A Simple Apparatus for Electrochemical Determination of Dissolved Oxygen in Water (Tlenomierz T-01 uproszczony przyrzad elektrochemicznego oznaczania tleunu roxpuszczomego w roztworach wodnych),
W76-09688 5A

GRENNEY, W. J.
Development of a Dynamic Programming Model for the Regionalization and Staging of Wastewater Treatment Plants,
W76-09845 5D

Ecosystem Modeling,
W76-09645 5C

GRICE, G. D.
Acid-Iron Waste as a Factor Affecting the Distribution and Abundance of Zooplankton in the New York Bight: I. Laboratory Studies on the Effects of Acid Waste on Copepods,
W76-09700 5C

GRIFFES, D. A.
Costs of Wastewater Treatment by Land Application,
W76-09774 5D

GRIFFIN, J. M.
Methdological Issues in the Econometric Estimation of Energy Demand Elasticities,
W76-09607 6A

GRIGALUNAS, T. A.
Offshore Petroleum and New England - A Study of the Regional Economic Consequences of Potential Offshore Oil and Gas Development,
W76-09893 6B

GRIGOR'EV, V. Y.
Method of Evaluating the Effectiveness of Techniques for Increasing the Resistance of Soils to Erosion, (In Russian),
W76-09805 4D

GRIMAS, U.
Swedish Studies on Combination Effects of Thermal Discharges in the Aquatic Environment, Some Aspects of Power Plant Siting Policy,
W76-09495 5C

GRIMES, D. W.
Planting Pattern, Plant Population, Irrigation, and Insect Interactions in Cotton.
W76-09998 3F

GRONEMAN, A. F.
Effects of Gamma Radiation at Pilot Plant Level Compared with the Effects of Pasteurization on the Dewatering of Sewage Sludge,
W76-09550 5D

GROSSE, B.
Investigations on the Erodibility of a Deeply Plowed Gray-Brown Podzolic Soil from Loess on a Slope by Means of Simulated Rain, (In German),
W76-09917 2J

GRUNE, J.
Large Wave Channel for 'Full Scale-Modeling' of Wave Dynamics in Surf Zones,
W76-09946 8B

GUARINO, P.
Possible use of High-Level Radiation for the Degradation of Some Substances Present in Urban and Industrial Waters,
W76-09533 5D

GUERARD, T. B.
Presentation Concerning Pollution Control Facilities Revenue Bonds,
W76-09767 5G

GUM, R. L.
Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-09633 6D

GUMTZ, G. D.
Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

GUNN, I. W.
Wastewater Treatment in New Zealand,
W76-09670 5D

GUNTERMANN, K. L.
A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

GUPTA, S. K.
A Three-Dimensional Galerkin Finite Element Solution of Flow Through Multiaquifers in Sutter Basin, California,
W76-09562 2F

GUSEINOV, R. K.
Transformation of Concentrated and Complex Phosphorus Fertilizers in Modow-Bog Soil with a High Moisture Content, (In Azerbaijani),
W76-09786 5B

GUZZI, L.
A Site Study of the Multiple Effects of Thermal Releases on the Aquatic Life in an Estuarine Area,
W76-09505 5C

HAAN, C. T.
Overview of Rainfall-Runoff Process in Urban Areas,
W76-09730 2A

HAGIWARA, M.
Radiation Recycling Process of Waste Poly(Tetrafluorethylene) Scrap,
W76-09556 5D

HALL, W. A.
Aqueduct Optimization with Intermediate Storage,
W76-09636 4A

HALLER, J. E.
The Industrial Revenue Bond for Pollution Control: One Company's Perspective,
W76-09769 5G

HALPERN, D.
Observations of the California Undercurrent Off Washington and Vancouver Island,
W76-09584 2L

HALTEMAN, J. G.
Water Authority Rate Making,
W76-09717 6C

HAMILTON, C. E.
Organic Contaminants of Water,
W76-09689 5A

HAMNER, P. P.
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

HAMNER, W. M.
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

HANSEN, C. A.
An Application of the Storm Water Management Model,
W76-09738 5D

HARLEMAN, D. R. F.
Temperature Predictions for Offshore Power Plants,
W76-09960 5B

HARMS, H. K.
Water Treatment Process and Apparatus,
W76-09855 5D

ARTMANN, R.
Comparative Study in Measuring Fluid Surface Tension and Fluid Content with the Aid of Electrical Resistance Elements 'In Situ' and in the Laboratory, (In Flemish),
W76-09923 2G

ASHMI, A. K.
Effect of Water Quality and Management Practices on Some Chemical Properties of Soils,
W76-09926 3C

AY, W. C.
Pilot Plant Experience in the Treatment of Industrial and Municipal Waste-Water by Means of Radiation-Induced Oxidation,
W76-09545 5D

IEBERT, P. V.
A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

IECOCK, RICHARD D.
Land Use Changes and Reservoir Development: An Application of Land Use Information Systems,
W76-09905 4A

IEERTJES, P. M.
Anaerobic Treatment of Dilute Waste Waters,
W76-09673 5D

IEILMAN, J. H.
Effects of Management Practices on Water Quality and Quantity: Newark, New Jersey, Municipal Watersheds,
W76-09465 4D

IENDRICK, J. D.
Organic Sediment Model for Wastewater Outfall,
W76-09951 5B

IENLEY, E. J.
Water Use Policies and Power Plant Economics,
W76-09776 5G

IENNIG, E.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

IENSELER, G.
Dewatering of Sewage Sludge Viewed as Part of the Purification Process -- Planning Criteria (Klaerschlammentwaesserung als Teil der Gesamten Klaeraufgabe Betrachtet -- Planungskriterien),
W76-09681 5D

IENSON, E. B.
Materials Budgets of Lake Champlain,
W76-09756 5A

IERB, W. J.
Storm-Period Variables Affecting Sediment Transport from Urban Construction Areas,
W76-09840 2J

Urban-Area Sediment Yield--Effects of Construction-Site Conditions and Sediment-Control Methods,
W76-09841 4D

IERBERT, L. R.
Report of Water Levels in Selected Observation Wells in Utah--April 1976,
W76-09832 4B

HERODEK, S.
Primary Production in the Frozen Lake Balaton,
W76-09991 5C

The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

HERRNBERGER, V. R. D.
Fission Product Gamma-Ray Sources as an Alternative to Cobalt-60 Sources for Sewage Sludge Sterilization,
W76-09541 5D

HESS, E.
Sanitary Effect of Gamma Irradiation on Sewage Sludge,
W76-09527 5D

HESS, H. D.
Environmental Impact Study of Offshore Sand and Gravel Mining,
W76-09910 6G

HESS, J. W.
Characterization of Nitrogen Sources Contaminating Shallow Ground Water in an Arid Basin. Las Vegas Area, Nevada,
W76-09762 5B

HESTAND, R. S.
Comparative Effects of Diquat Plus Copper Sulfate on Aquatic Organisms,
W76-09821 5C

HIGGINS, B. R.
The Contribution of a Water Information System for Environmental Planning in Minnesota,
W76-09753 6G

HILL, D. O.
Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

HILLEL, D.
Water Conservation in Arid-Zone Soils,
W76-09478 3B

HINSTRUP, P. I.
River and Estuary Modeling with the Siva System,
W76-09982 2A

HIPEL, K. W.
Metagame Theory and its Applications to Water Resources,
W76-09847 6A

HIRS, G.
Method and Apparatus for Rejuvenating a Bed of Granular Filter Medium,
W76-09424 5D

HNATIUK, J.
An Environmental Research Program for Drilling in the Canadian Beaufort Sea,
W76-09912 5G

HNYILICZA, E.
Energy Systems: Modeling and Policy Planning,
W76-09608 6A

HOAGLAND, E.
Acid-Iron Waste as a Factor Affecting the Distribution and Abundance of Zooplankton in the New York Bight: I. Laboratory Studies on the Effects of Acid Waste on Copepods,
W76-09700 5C

HOFFERBERT, W. L.
Reverse Osmosis Process Using Crosslinked Aromatic Polyamide Membranes,
W76-09877 3A

HOFFMAN, K. C.
Coupled Energy System-Economic Models,
W76-09605 6A

Energy Projections--Relationship to Policy Issues,
W76-09603 6A

HOFMANN, E. G.
Practical Aspects of the Pasteurization of Sewage Sludge by Electron Irradiation,
W76-09540 5D

HOFMANN, W.
Synergistic Effects of Airborne Emissions from Nuclear Power Plants,
W76-09503 5A

HOIGNE, J.
Aqueous Radiation Chemistry in Relation to Waste Treatment, An Introductory Review,
W76-09529 5D

Comparison of the Chemical Effects of Oxone and of Irradiation on Organic Impurities in Water,
W76-09535 5D

HOLL, P.
Disinfection of Sludge and Waste-Water by Irradiation with Electrons of Low Accelerating Voltage,
W76-09521 5D

An Electron Accelerator with Electrons of Low-Accelerating Voltage for Irradiating Sewage Sludge and Waste Water,
W76-09539 5D

HOLLIS, H. D.
Gamma Irradiation for Sewage Treatment at US Army Facilities,
W76-09525 5D

HOLMES, P. W.
Anaerobic Treatment of Leachate with High Sodium Concentrations,
W76-09641 5D

HONDA, Z.
Semipermeable Membrane and Process for the Preparation Thereof,
W76-09864 3A

HOPPE, P.
Pesticide and PCB Residue in Organs of Wild Animals as Indicators of Environmental Contamination, (In German),
W76-09922 5A

HORTON, G. T.
Legal Approaches to Control Runoff and Sedimentation: A Case Study of Georgia,
W76-09747 4D

HOSKING, P. J.
The Erodibility of Pumice Soils of the North Island, New Zealand,
W76-09787 4D

HOULT, D. P.
Oil in the Arctic,
W76-09902 5C

HRONCICH, M. J.
Undistorted Movable-Bed Model Study for a River and Power Plant Intake System,
W76-09971 8B

HSIEH, J. J. C.
Steady-State Method of Measuring Unsaturated Hydraulic Conductivity,
W76-09924 2G

HUBSCHMANN, W. G.
Discussion of Possible Effects Due to Mixing of Radioactive and Thermal Releases to the Atmosphere from Nuclear Power Plants,
W76-09502 5A

HUDSON, E. A.
Energy Policy and Economic Growth,
W76-09606 6A

HUDSON, W. Q.
Legal Approaches to Control Runoff and Sedimentation: A Case Study of Georgia,
W76-09747 4D

HUFF, F. A.
The Distribution of Heavy Rainfall in a Major Urban Area,
W76-09734 2B

HUGHES, W. C.
Runoff Frequency Procedure for Synthetic Hydrograph Development,
W76-09733 2A

HULLS, J. R.
Waste Purification System,
W76-09431 5D

HULSBERGEN, C. H.
Origin, Effect and Suppression of Secondary Waves,
W76-09878 2J

HUMPHREY, M. F.
Carbon Wastewater Treatment Process,
W76-09441 5D

HUNG, Y. T.
Nitrification Studies of Ship Channel Waters,
W76-09453 5D

HUNT, A. S.
Sediment Properties, Lake Champlain: 1971-1975,
W76-09763 5B

HUNTOON, P. W.
Hydrology of the Madison Formation and its Potential use for Water Supply for Energy Development,
W76-09757 2F

HURST, A. J.
Sediment Deposition Model for Tarbela Reservoir,
W76-09970 2J

IGUMNOV, A. S.
Hygienic Standardization of Tin Dibutyl Diisooctylthioglycolate in Water Bodies, (In Russian),
W76-09797 5C

IKESHOJI, T.
Insect Growth Regulators for the Control of Aquatic Midges,
W76-09997 5G

ILICHKINA, A. G.
Sanitary Inspection of Surface Waters Polluted with Aromatic Amino and Nitro-Compounds, (In Russian),
W76-09798 5A

ILTIS, A.
Phytoplankton of the Saline Waters of Kanem (Chad): X. Conclusions, (In French),
W76-09596 2H

INOUE, A.
The Heavy Metal Concentrations in the Waters Along the Coast of Fukuyama, (In Japanese),
W76-09815 5A

INOUE, K.
Water Use Policies and Power Plant Economics,
W76-09776 5G

IOANNILLI, E.
Evaluation of the Thermal Effects of a Nuclear Power Plant,
W76-09496 5C

ISAACS, J. D.
Anisotropic Sand Transport in Tidal Inlets,
W76-09955 2L

ISAACSON, M. DE ST. Q.
Transverse Forces on Vertical Cylinders in Waves,
W76-09583 8B

ISERENTANT, R.
Hydratability as a Parameter of Plant Water Potential, (In French),
W76-09918 2I

ISHII, K.
Semipermeable Membrane and Process for the Preparation Thereof,
W76-09864 3A

Supported Semi-Permeable Membranes,
W76-09863 3A

ISRAELSEN, E. K.
A Water-Land Use Management Model for the Sevier River Basin Phases I and II,
W76-09844 4A

IVANOV, A. V.
Hygienic Standardization of Flotation Reagent BB-2 and its Components as Industrial Contaminants of Water Bodies, (In Russian),
W76-09886 5B

JACKSON, C. E.
Planting Pattern, Plant Population, Irrigation, and Insect Interactions in Cotton.
W76-09998 3F

JACKSON, J. D.
Organic Sediment Model for Wastewater Outfall,
W76-09951 5B

JACOBSEN, O. J.
Feeding Habits of the Population of Whitefish (Coregonus Lavaretus (L.)) in Haugatjern: A Eutrophic Norwegian Lake,
W76-09882 2H

JACOBSEN, T. V.
Calculation of Water Temperatures in Clear Lake, Iowa,
W76-09879 5B

JAHNSEN, K. W.
Apparatus for Purification of Industrial Waste Water,
W76-09861 5D

JAIN, S. C.
Longitudinal Dispersion Coefficients for Streams,
W76-09589 5B

JAMES, I. C. II.
Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W76-09622 4A

JAMES, L. D.
Remedial Measures for Urban Flood Peak Reduction,
W76-09736 2E

JAMET, B.
Membrane Support-Plates and Fluid Separating Apparatus in which They are Present,
W76-09857 5D

JAMIESON, D. G.
Improved Techniques for Water Resource Systems Design,
W76-09624 4A

JENKINS, E. E.
Irrigation Vehicle,
W76-09869 3F

JENKINS, R.
Representative Dirty Water Sampling,
W76-09702 5A

JENNINGS, C. D.
Cycling of Fe55 and Zn65 in Columbia River Carp Following Reactor Shutdown,
W76-09508 5C

JENSEN, L. D.
Environmental Responses to Thermal Discharges from the Chesterfield Station, James River, Virginia,
W76-09652 5C

JERIS, J. S.
Waste Treatment Apparatus,
W76-09432 5D

JOHNSON, A.
Remedial Measures for Urban Flood Peak Reduction,
W76-09736 2E

JOHNSON, G. P.
Hydroelectric Power Potential at Corps of Engineers Projects,
W76-09765 6B

JOHNSTON, P. R.
Parameter Optimization for Watershed Models,
W76-09853 2A

JONES, C. C.
Economic Analysis of Effluent Guidelines: Fertilizer Industry,
W76-09777 5G

JONES, W. F.
The Eradication of the Seaweed Sargassum Muticum from Britain,
W76-09989 5G

JONES, W. M.
Cycling of Fe55 and Zn65 in Columbia River Carp Following Reactor Shutdown,
W76-09508 5C

JORDENING, D. L.
Economic Analysis of Effluent Guidelines: Apple, Citrus and Potato Processing Segments of the Canned and Preserved Fruits and Vegetable Industry,
W76-09779 5G

JORGENSON, D. W.
Energy Policy and Economic Growth,
W76-09606 6A

OSKOW, P. L.
Energy Consumption and Fuel Choice by Residential and Commercial Consumers in the United States,
W76-09609 6A

UNG, J.
The Leaching Behavior of Different Nitrogen Sources in Lysimeter Experiments, (In German),
W76-09793 2G

AGIYA, V. T.
Radiation Recycling Process of Waste Poly(Tetrafluorethylene) Scrap,
W76-09556 5D

AIBARA, R.
The Heavy Metal Concentrations in the Waters Along the Coast of Fukuyama, (In Japanese),
W76-09815 5A

ALAPOTHAKI, V.
Isolation of Water Vibrios in Greece, (In French),
W76-09601 5A

ARANIK, J. M.
Give Stormwater Pollutants the Spin,
W76-09461 5D

ARSCHON, R.
Effects of Flooding and of Irrigation Water Salinity on Eucalyptus Camaldulensis Dehn. From Three Seed Sources,
W76-09664 3C

AUFMAN, G. M.
A Probabilistic Model of the Oil and Gas Discovery Process,
W76-09604 6A

AUFMAN, H. L.
Combined Sewage Overflows - Frequency, Environmental Effects, and a Corrective Program,
W76-09741 5D

AUL, J. L.
A Floodplain Management Framework with Structural and Non-Structural Measures,
W76-09754 6F

EITH, J. M.
Engineering and Ecological Evaluation of Artificial-Island Design, Rincon Island, Punta Gorda, California,
W76-09903 2L

EJ, A.
River and Estuary Modeling with the Siva System,
W76-09982 2A

Systems Modeling of Stratified Fluids,
W76-09976 8B

ERHIN, R. T.
Linear Distribution of the High Marsh Vegetation Communities of the Lower Eastern Shore and its Geological Significance,
W76-09570 2L

Maryland Chesapeake Bay Beaches - General Distribution and Classification,
W76-09568 2L

Visual Observation of the Suspended Sediments and Nearshore Ice Signatures in Chesapeake Bay,
W76-09571 2L

KERSHAW, K. A.
Dependence of the Level of Nitrogenase Activity on the Water Content of the Thallus in Peltigera Canina, P. Evansiana, P. Polydactyla, and P. Praetextata,
W76-09916 5A

KERSHAW, M. A.
The Water Industry: A Review Relating to Waste Water Treatment,
W76-09454 5D

KESTING, R. E.
Preparation of Reverse Osmosis Membranes by Complete Evaporation of the Solvent System,
W76-09876 3A

KHALID, R. A.
Effect of Water Quality and Management Practices on Some Chemical Properties of Soils,
W76-09926 3C

KHOANG, T.
Phytomass Dynamics of Aboveground and Underground Organs of Meadow Steppe Plants, (In Russian),
W76-09817 2I

KHRISTIANOVA, L. A.
Determination of Fluorine in Drinking Water with a Cerium(III)- or Lanthanum Alizarin Complex, (In Russian),
W76-09796 5A

KIBLER, D. F.
Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

KIM, I. B.
An Observation of Water Quality and Red Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

KIM, J-W.
Diagnostic Model Study of Mixed-Layer Depths in the Summer North Pacific,
W76-09719 2L

KING, R. P.
The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

KING, T. W. JR.
NEPA and a State's Role in Water Resources Management,
W76-09627 6E

KIRICHENKO, V. V.
Sanitary Inspection of Surface Waters Polluted with Aromatic Amino and Nitro-Compounds, (In Russian),
W76-09798 5A

KIRSHEN, P. H.
A Flood Management Model for Urbanizing River Basins,
W76-09737 4C

KIRYUKHINA, L. N.
Marine Soil Pollution and Self-Purification, (In Russian),
W76-09789 5A

KISIEL, C. C.
Maximum Information Obtainable from Inadequate Design Data: from Multivariate to Bayesian Methods,
W76-09625 4A

KITITSINA, L. A.
Effect of Heated Water Discharge of Thermal and Nuclear Power Plants on Invertebrates of Cooling Ponds, (In Russian),
W76-09811 5C

KLEBER, E. V.
Removal of Phosphate from Waste Water,
W76-09458 5D

KLEIN, J. M.
Appraisal of Water Resources of Northwestern El Paso County, Colorado,
W76-09828 2E

KLEINKOPF, G. E.
Contribution of Salts to the Water Potential of Woody Plants,
W76-09691 3C

KLEMETSON, S. L.
Development of a Dynamic Programming Model for the Regionalization and Staging of Wastewater Treatment Plants,
W76-09845 5D

KLIMENKOVA, K. M.
Isolation of Salmonella from Sewage and Surface Waters, (In Russian),
W76-09411 5A

KOENE, B. K. S.
Chemistry of Dissolved Inorganic Carbon in Estuarine and Coastal Brackish Waters,
W76-09597 2L

KOHLER, M. A.
Hydrology for Engineers, Second Edition,
W76-09661 8B

KOLLIAS, J.
Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

KOMAMURA, M.
The Softening of the Kanto Volcanic Ash Soil, (In Japanese),
W76-09925 2G

KOMARENKO, N. I.
Induced Change of Nitrate Reductase Activity in Microcystis Aeruginosa Kutz. Emend. Elenk, (In Russian),
W76-09816 5C

KOMSKII, M. S.
Gas-Liquid Chromatographic Determination of Butyl Acetate, Butanol and Acetone Present Together in Waste Waters, (In Russian),
W76-09929 5A

KONOMI, S.
Supported Semi-Permeable Membranes,
W76-09863 3A

KONTUR, I.
Hydrologic Systems Analysis Model for Generating Runoff Time Series (Hidrologiai) Rendszervizsgalati Modell Vizhozamidoser Eloallitasara (II. RESZ),
W76-09557 2A

KOPLYAY, T. M.
Urban Drainage Studies,
W76-09402 5B

KOPPEL, L. B.
Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

KORENKOV, V. N.
Method of Biological Purification of Industrial Effluents from Chromates and Bichromates,
W76-09856 5D

KORTE, F.
Degradation of Persistent Organochlorine Pollutants by Gamma Radiation and its Possible use for Waste-Water Treatment,
W76-09534 5D

KOSTER, E. L. C.
Industrial Experience of Sewage Sludge Processing with Zimpro Installations in the Netherlands,
W76-09709 5D

KOTRAS, T. V.
St. Lawrence Seaway: A New Goal of Year-Round Navigation,
W76-09942 2C

KRAMER, W. L.
Insect Growth Regulators for the Control of Aquatic Midges,
W76-09997 5G

KREPKOGORSKII, L. N.
Technique of Water Sampling in Sanitary Investigations of Large Bodies of Water, (In Russian),
W76-09928 5A

KRISHNAMURTHI, N.
Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colorado,
W76-09761 2F

KRUL, J. M.
The Relationship Between Dissimilatory Nitrate Reduction and Oxygen Uptake by Cells of an Alcaligenes Strain in Flocs and in Suspension and by Activated Sludge Flocs,
W76-09686 5D

KRUYT, D.
A Probabilistic Model of the Oil and Gas Discovery Process,
W76-09604 6A

KUCHERENKO, M. I.
Marine Soil Pollution and Self-Purification, (In Russian),
W76-09789 5A

KUTUZOVA, R. S.
Iron-Manganese Microorganisms Studied by Overgrowing Technique, (In Russian),
W76-09813 5A

KUZNETSOV, M. S.
Method of Evaluating the Effectiveness of Techniques for Increasing the Resistance of Soils to Erosion, (In Russian),
W76-09805 4D

KUZNETSOV, S. I.
Method of Biological Purification of Industrial Effluents from Chromates and Bichromates,
W76-09856 5D

KUZYCHEVA, T. Y.
Effectiveness of Water Utilization by Plants, (In Ukranian),
W76-09809 2D

LABOUREUR, P.
Biodegradability and Process for Biological Purification of Waste Water (La Biodegradabilite et Les Procedes D'Epuration Biologique Des Effluents),
W76-09693 5D

LACOMBE, D.
Balanidae as Pollution Indicators in the Bay of Guanabara, (In Portuguese),
W76-09823 5A

LAL, V. B.
Design of Water Resources Project with Inadequate Data in India - General and Particular Case Studies,
W76-09621 4A

LANSFORD, R. R.
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

LANZA, G. R.
Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

LAPIDOT, M.
Potential of Radiation Sterilization in Solid Waste Treatment, A Status Report,
W76-09555 5D

Recent Advances in the Treatment of Solid Wastes,
W76-09553 5D

LAUER, G. J.
Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

LAWRENCE, A. W.
Least Cost Design of Activated Sludge Systems,
W76-09638 5D

LECLERC, H.
The Microbiological Pollution of North Sea and English Channel Shore, (In French),
W76-09657 5C

LEE, D. R.
A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

LEE, M. T.
A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

LEENDERTSE, J. J.
Modeling of Three-Dimensional Flows in Estuaries,
W76-09977 2L

LEGERON, J. P.
Development of a Measurement Method for the Total Activity Rate of Activated Sludge (Contribution a La Mise Au Point D'une Methode De Mesure Du Taux D'Activite Totale Des Boues Activees),
W76-09695 5D

LEIGH, T. F.
Planting Pattern, Plant Population, Irrigation, and Insect Interactions in Cotton.
W76-09998 3F

LEMKE, H. S.
Viruses and Ionizing Radiation in Respect to Waste-Water Treatment,
W76-09520 5D

LENNOX, W. C.
Numerical Simulation of Waste Movement in Steady Groundwater Flow Systems,
W76-09564 5B

LERMAN, S.
Environmental Quality Research, First Annual Report,
W76-09654 5C

LESSEL, T.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

LEWIS, J. W.
St. Lawrence Seaway: A New Goal of Year-Round Navigation,
W76-09942 2C

LEWIS, N. F.
Scope for Utilizing Gamma Radiation for Microbiological Control of Sewage Waste-Water in India,
W76-09526 5D

LEXZOZYNSKI, W.
Dissolved Oxygen Analyzer T-01 Analyzer. A Simple Apparatus for Electrochemical Determination of Dissolved Oxygen in Water (Tlenomierz T-01 uproszczony przyrzad elektrochemicznego oznaczania tleunu roxpuszczomego w roztworach wodnych),
W76-09688 5A

LI, E. C. C.
Technique Alternatives for a Package Stabilization Plant,
W76-09705 5D

LIM, H. C.
Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

LIN, H-A.
Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

LINDLEY, R. W. JR.
Municipal Storm Water Management Programs,
W76-09751 4A

LINES, R. W.
Laboratory Evaluation of the Coulter On-Line Particle Monitor,
W76-09699 5A

LINSLEY, R. K.
Hydrology for Engineers, Second Edition,
W76-09661 8B

LISS, P. S.
Removal of Dissolved Boron and Silicon During Estuarine Mixing of Sea and River Waters,
W76-09725 2K

LIU, S-K.
Modeling of Three-Dimensional Flows in Estuaries,
W76-09977 2L

LIVINGSTON, R. K.
Appraisal of Water Resources of Northwestern El Paso County, Colorado,
W76-09828 2E

LOCASCIO, S. J.
Efficiency of Irrigation Methods for Strawberries,
W76-09897 3F

LOGLIO, G.
A Simple Physicochemical Method of Detecting Traces of Surfactants in Water,
W76-09927 5A

LOKEN, P. A.
Process and Apparatus for the Incineration of Aqueous Sewage Sludge,
W76-09428 5E

LONGENBAUGH, R. A.
Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colorado,
W76-09761 2F

LOWE, H.
Gamma Irradiation for Sewage Treatment at US Army Facilities,
W76-09525 5D

LOWE, H. N.
Synergistic Effects of Irradiation of Waste-Water.
W76-09524 5D

LUMB, A. M.
Remedial Measures for Urban Flood Peak Reduction,
W76-09736 2E

LUND, E.
Public Health Aspects of Waste-Water Treatment,
W76-09516 5D

LYNCH, J. A.
Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

Municipal Watershed Management: What are the Opportunities,
W76-09472 4D

Watershed Response to Partial Area Applications of Simulated Rainfall,
W76-09467 2A

LYSOGOROVA, I. K.
Study of the Effect of Iron on the Human Body and Living Conditions, (In Russian),
W76-09803 5C

MAC CONNELL, W. P.
The Modified Fernow Frost Gage,
W76-09880 7B

MACHEMEHL, J. L.
River Delta Computer Simulation Model (Simudelt),
W76-09954 2L

MADDOCK, T. JR.
A Primer on Floodplain Dynamics,
W76-09831 2E

MADIN, L. P.
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

MADSEN, O. S.
Energy Dissipation on a Rough Slope,
W76-09582 8B

Wave Motions in an Offshore Harbor,
W76-09947 8B

MAGETTE, W. L.
Estimating Selected Parameters for the Kentucky Watershed Model from Watershed Characteristics,
W76-09852 2A

MAHMOOD, K.
Modeling Sediment Transport in Hydraulic Structures,
W76-09975 2J

MALK, J. M.
Economic Analysis of Effluent Guidelines: Fertilizer Industry,
W76-09777 5G

MALNATI, R. L.
Use of High-Power Electron Beam Radiation for the Treatment of Municipal and Industrial Wastes,
W76-09537 5D

MANDEL, S.
The Over-Exploitation of Groundwater Resources in Dry Regions,
W76-09479 4B

MANDEV, A.
Relationship of Heavy Rainfall to Soil Erosion in View of its Forecasting, (In Bulgarian),
W76-09807 2J

MARCUSE, W.
Coupled Energy System-Economic Models,
W76-09605 6A

MARINO, M. A.
On the Capacity-Expansion of Desalination Plants and Storage Tanks,
W76-09618 3A

MARKOVIC, V. M.
Radiation Chemical Destruction of Phenol in Oxygenated Aqueous Solutions,
W76-09530 5D

MARKS, D. H.
A Flood Management Model for Urbanizing River Basins,
W76-09737 4C

MARLOW, K. C.
Modern Techniques of Waste Detection,
W76-09685 5F

MARSHALL, N.
Using a CHN Analyzer to Reduce Carbonate Interference in Particulate Organic Carbon Analyses,
W76-09940 5A

MARSILY, G. D.
Identification of Linear Systems Response by Parametric Programing,
W76-09575 2E

MARTIN, A. D.
The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

MARTIN, E. J.
Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

MARTIN, W. E.
Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-09633 6D

MARTINSON, S.
Laboratory Centrifuge Saves Time and Money,
W76-09704 5D

MASCH, F. D.
Estuarine Ecologic Simulations,
W76-09950 2L

Simulation of Tidal Hydrodynamics - Masonboro Inlet,
W76-09953 8B

MASON, C.
Masonboro Inlet Fixed-Bed Model Evaluation,
W76-09957 8B

MASON, D. G.
Sludge Removal System,
W76-09416 5D

MASSO, C.
The Mercury Content of Industrial Fish Products: Its Relative Variation with the Treatment (Cooking in Salt Water, Pickling and Fish Production), (In Spanish),
W76-09802 5C

MATALAS, N. C.
Effect of Sequence Length n on the Choice of Assumed Distribution of Floods,
W76-09851 4A

Regression Analysis and Parameter Identification,
W76-09824 7A

MATINYAN, N. N.
The Qualitative Organic Matter Composition of Some Marshy Soils of Nizhnevelikoretsk Plain, (In Russian),
W76-09888 2G

MATSUMOTO, M.
The Distribution of Coliforms in Fresh Water, (In Japanese),
W76-09934 5C

MAULL, D. J.
Transverse Forces on Vertical Cylinders in Waves,
W76-09583 8B

MAURIN, J.
Practical Application of the Germicidal Power of Ultraviolet Irradiation to Drinking-water, (In French),
W76-09646 5F

MAY, B. E.
Comparative Effects of Diquat Plus Copper Sulfate on Aquatic Organisms,
W76-09821 5C

MAYER, P. G.
Near-Field Jet Penetration and Reservoir Mixing,
W76-09962 8C

MAZOIT, L. P.
Practical Application of the Germicidal Power of Ultraviolet Irradiation to Drinking-water, (In French),
W76-09646 5F

MCCALL, P. P.
Energy Models and Forecasts: A User's Point of View,
W76-09612 6A

MCCARTHY, M. J.
Particle-Laden Jets with Application to Ocean Dumping,
W76-09959 5B

MCKINNEY, R. JR.
Reverse Osmosis Process Using Crosslinked Aromatic Polyamide Membranes,
W76-09877 3A

MEDINSKII, G. M.
Ecology of Cholera Vibrios, (In Russian),
W76-09409 5C

MEEK, B. D.
Redox Potential in Irrigated Desert Soils as an Indicator of Aeration Status,
W76-09488 2G

MEEKS, D. C.
Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

MEHOUDAR, R.
Drip Level Irrigation,
W76-09870 3F

MEI, C. C.
Hybrid-Element Method for Water Waves,
W76-09945 8B

MEINHOLZ, T. L.
An Application of the Storm Water Management Model,
W76-09738 5D

MEJIA, J. M.
Disaggregation Models in Hydrology Revisited,
W76-09573 2A

MELVIN, P.
Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

MERRILL, E. W.
Biological Effects of High-Energy Electron Irradiation of Municipal Sludge,
W76-09522 5C

Prospects for High-Energy Electron Irradiation of Waste-Water Liquid Residuals,
W76-09538 5D

METCALF, R. L.
Development of Laboratory Model Ecosystems as Early Warning Elements of Environmental Pollution,
W76-09643 5C

MEYER, L. D.
Overview of the Urban Erosion and Sedimentation Processes,
W76-09731 4C

MICIC, O. I.
Radiation Chemical Destruction of Phenol in Oxygenated Aqueous Solutions,
W76-09530 5D

MIDDLETON, A. C.
Least Cost Design of Activated Sludge Systems,
W76-09638 5D

MILETI, D. S.
Landslide Hazard in the United States: A Research Assessment,
W76-09781 6F

MILLEMANN, R. E.
Pathology of Acute Poisoning with the Insecticide Sevin in the Bent-Nosed Clam, Macoma Nasuta,
W76-09649 5C

MIRONOV, O. G.
Marine Soil Pollution and Self-Purification, (In Russian),
W76-09789 5A

MOBERLY, D.
Sioux Falls Restores Four Wells with Collector Pipe,
W76-09510 3B

MOFFA, P. E.
Give Stormwater Pollutants the Spin,
W76-09461 5D

MOLCO, M.
Potential of Radiation Sterilization in Solid Waste Treatment, A Status Report,
W76-09555 5D

MONEIRO, W.
Balanidae as Pollution Indicators in the Bay of Guanabara, (In Portuguese),
W76-09823 5A

MONSER, J. R.
Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

MOOK, W. G.
Chemistry of Dissolved Inorganic Carbon in Estuarine and Coastal Brackish Waters,
W76-09597 2L

MOONEY, H. A.
Drought Adaptations in Two Californian Evergreen Sclerophylls,
W76-09476 2I

MOORE, S. F.
Sampling Network Design for Dispersion Verification,
W76-09961 5B

MOORE, W. A.
Financing Pollution Control Projects in South Carolina Using Tax-Exempt Industrial Revenue Bonds,
W76-09770 5G

MOORE, W. L.
Changes in the Sedimentation Characteristics of an Urbanizing Watershed, Dallas and Collin Counties, Texas,
W76-09745 4C

MORELLI, F. A.
Effects of Petroleum Pollutants on Arctic Microbial Populations,
W76-09909 5C

MORGANSTERN, K. H.
Use of High-Power Electron Beam Radiation for the Treatment of Municipal and Industrial Wastes,
W76-09537 5D

MORLOT, M.
Problems Concerning the Character of Oxidizability of Certain Organic Substances in Water Treated with Ozone (Problemes lies A L'Evolution Du Caractere D'Oxydabilite De Certain Corps Organiques Presents Dans L'Eau Tratee Par L'Ozone),
W76-09692 5D

MORRIS, M-E.
Assessment of Virus Removal by a Multi-Stage Activated Sludge Process,
W76-09676 5D

MORROW, P. A.
Drought Adaptations in Two Californian Evergreen Sclerophylls,
W76-09476 2I

MOSKALEV, Y. I.
Radiation Hazard of Iodine-129, (In Russian),
W76-09788 5B

MOTSCH, H.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

MOUNT, D. I.
The Role of Bioassays in Environmental Research,
W76-09644 5A

MUELLER, J. A.
Waste Treatment Apparatus,
W76-09432 5D

MUHAMMED, S.
Effect of Water Quality and Management Practices on Some Chemical Properties of Soils,
W76-09926 3C

MUIR, L. R.
Numerical Two-Dimensional Flow Model for River Systems,
W76-09964 2E

MUKERJEE, N.
Meteorological Factors and Disease Expressions in Jute,
W76-09931 3F

MUKHOPADHYAYA, S. C.
Operation of Hydrogenerator as Synchronous Condensor,
W76-09637 8C

MULLA, M. S.
Insect Growth Regulators for the Control of Aquatic Midges,
W76-09997 5G

MULTER, R. H.
Some Hard Lessons in Numerical Hydraulics,
W76-09952 8B

MURPHY, C. J.
Combination Providing Safety Berthing, Unloading of Oil, and Conduit Carriage to Refineries on Land, of Large Deep-Sea-Requiring Tankers,
W76-09865 5G

MURRAY, C.
Weed Holds Promise for Pollution Cleanup,
W76-09440 5D

MURTY, T. S.
Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

USSELMAN, H. D.
Gamma Irradiation for Sewage Treatment at US Army Facilities,
W76-09525 5D

Synergistic Effects of Irradiation of Waste-Water.
W76-09524 5D

VERS, J. M.
Efficiency of Irrigation Methods for Strawberries,
W76-09897 3F

KAYAMA, M.
The Cost Assignment of the Cooperative Water Resource Development: A Game Theoretical Approach,
W76-09619 6A

RASIMHAN, V. A.
A Water-Land Use Management Model for the Sevier River Basin Phases I and II,
W76-09844 4A

TH, J. H.
Probability Distributions of Breaking Wave Heights Emphasizing the Utilization of the Jonswap Spectrum,
W76-09721 2L

EBEL, C.
Ozone Provides Alternative for Secondary Effluent Disinfection. Part 1,
W76-09445 5D

Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

EBOLSINE, R.
Is the Separation of Sewers Desirable,
W76-09739 5D

ECE, R. E.
Application of Physical Tidal Models in Harbor and Marina Design,
W76-09984 5B

ELSON, J. W.
Operation and Maintenance of a Deep-Well Water-Level Measurement Device, 'The Iron Horse',
W76-09835 4B

ENADOVIC, M. T.
Radiation Chemical Destruction of Phenol in Oxygenated Aqueous Solutions,
W76-09530 5D

ESTOR, K.
Discussion of Possible Effects Due to Mixing of Radioactive and Thermal Releases to the Atmosphere from Nuclear Power Plants,
W76-09502 5A

EUMAN, S. P.
Identification of Linear Systems Response by Parametric Programing,
W76-09575 2E

IEBER, J. L.
A Review and Analysis of Selected Hydrologic Modeling Concepts,
W76-09718 2E

IELSON, N. E.
The Need for the Use of High-Level Radiation in Water Treatment and in Waste-Water (Sewage) Treatment,
W76-09518 5D

NIKULIN, V. L.
Rotifer Production in Lake Baikal, (In Russian),
W76-09791 5C

NISHITAI, Y.
The Distribution of Coliforms in Fresh Water, (In Japanese),
W76-09934 5C

NOBLE, S.
A Post Construction Survey of Several Man-made Islands Off the Coast of California,
W76-09911 2L

NOICHL, O. J.
Wastewater Treatment System with Controlled Mixing,
W76-09433 5D

NORLAND, R. L.
Insect Growth Regulators for the Control of Aquatic Midges,
W76-09997 5G

NOVOTNY, V.
An Application of the Storm Water Management Model,
W76-09738 5D

NRIAGU, J. O.
Lead Orthophosphates: III. Stabilities of Fluorophyromorphite and Bromopyromorphite at 25 C,
W76-09820 2K

NUZZI, R.
Academic Data-Needs for Environmental Assessments of Offshore Technological Operations,
W76-09914 6G

O'CONNOR, D. J.
The Concentration of Dissolved Solids and River Flow,
W76-09577 5B

O'DEA, S.
Oil in the Arctic,
W76-09902 5C

O'NEILL, H. J.
Ozone Provides Alternative for Secondary Effluent Disinfection. Part 1,
W76-09445 5D

Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

OBRIST, W.
Costs and Hygienic Necessity of Sewage Sludge Pasteurization in Switzerland,
W76-09542 5D

OFFERMANN, B. P.
Practical Aspects of the Pasteurization of Sewage Sludge by Electron Irradiation,
W76-09540 5D

OGER, C.
The Microbiological Pollution of North Sea and English Channel Shore, (In French),
W76-09657 5C

OKANENKO, A. S.
Sugar Beet Photosynthesis and Productivity Cultivated by Irrigated Farming in the Kirgiz SSR, (In Russian),
W76-09810 3F

OLAH, J.
Primary Production in the Frozen Lake Balaton,
W76-09991 5C

OLIVOTTI, R.
A Comparison Between the Efficacy of Submarine Outfall Disposal of Advanced Primary Effluent and Conventional Treatment,
W76-09448 5E

OLLA, B. L.
The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

ONISHI, Y.
Undistorted Movable-Bed Model Study for a River and Power Plant Intake System,
W76-09971 8B

ORBACH, S.
Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume II,
W76-09900 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume III,
W76-09901 5A

OSTERKAMP, W. R.
Variation and Causative Factors of Sediment Yields in the Arkansas River Basin, Kansas,
W76-09839 2J

OTT, G. O.
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

OTTO, G. H.
Water Use Policies and Power Plant Economics,
W76-09776 5G

OUELLET, Y.
Principle of Management of Degenerated Inlets and Estuaries,
W76-09958 8B

PADOVA, R.
Potential of Radiation Sterilization in Solid Waste Treatment, A Status Report,
W76-09555 5D

PAL, D.
The Coanda Effect Oil/Water Separator: A Development Study,
W76-09890 5G

PALMEDO, P. F.
Coupled Energy System-Economic Models,
W76-09605 6A

PANKOW, J. F.
Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

PANZER, H. P.
Cationic Acrylamide-Styrene Copolymers and Flocculation of Sewage Therewith,
W76-09434 5D

PAPADAKIS, J. A.
Isolation of Water Vibrios in Greece, (In French),
W76-09601 5A

PAPOUTSAKIS, G.
Isolation of Water Vibrios in Greece, (In French),
W76-09601 5A

PARISI, V.
Effect of Entrainment in Power Station Cooling Systems Studied Using Periphytic Communities,
W76-09498 5C

PARK, M. J.
An Observation of Water Quality and Red Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

PARKER, D. S.
Sewage Treatment Process,
W76-09422 5D

PARKER, G.
Modeling of Meandering and Braiding in Rivers,
W76-09974 2J

PATEL, B.
Impact of Thermal and Radioactive Effluents on a Tropical Nearshore Ecosystem,
W76-09492 5C

PATEL, R. M.
A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

PATEL, S.
Impact of Thermal and Radioactive Effluents on a Tropical Nearshore Ecosystem,
W76-09492 5C

PATT, R. O.
Characterization of Nitrogen Sources Contaminating Shallow Ground Water in an Arid Basin. Las Vegas Area, Nevada,
W76-09762 5B

PATUREAU, J. P.
Oil in the Arctic,
W76-09902 5C

PAUL, P. E.
Activated Sludge Process with Alum Addition and Heat Treatment,
W76-09456 5D

PAULHUS, J. L. H.
Hydrology for Engineers, Second Edition,
W76-09661 8B

PAVEL'EVA, E. B.
The Role of Microflora in the Productivity of a Salmon Breeding Lake, (In Russian),
W76-09818 5C

PAWLOSKI, B. L.
Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

PEARCE, B. R.
Sampling Network Design for Dispersion Verification,
W76-09961 5B

PEARSON, F. J. JR.
Geochemical and Isotopic Analyses of Waters Associated with the Edwards Limestone Aquifer, Central Texas,
W76-09836 2K

PEARSON, J. G.
Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

PECAR, V.
Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

PECHENOV, V. A.
Sugar Beet Photosynthesis and Productivity Cultivated by Irrigated Farming in the Kirgiz SSR, (In Russian),
W76-09810 3F

PEDLOSKY, J.
Finite-Amplitude Baroclinic Disturbances in Downstream Varying Currents,
W76-09560 2L

PEJLER, B.
On Long-Term Stability of Zooplankton Composition,
W76-09600 5C

PELEG, M.
The Chemistry of Ozone in the Treatment of Water,
W76-09684 5F

PERAINO, J.
Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

PERE, M. J. B.
Effecto De La Temperatura De Aclimatacion Sobre La Proliferacion De Precursores Eritropoyeticos En Carassius Auratus, (The Effect of Acclimation Temperature on Proliferation of Erythropoietic Precursors in Carrassius Auratus and on the Uptake of Tritiated Thymidine in Haematopoietic and Intestinal Tissue),
W76-09509 5C

PERTSOVICH, A. YU.
The Qualitative Organic Matter Composition of Some Marshy Soils of Nizhnevelikoretsk Plain, (In Russian),
W76-09888 2G

PESAVENTO, M.
Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

PETRUSO, S.
Possible use of High-Level Radiation for the Degradation of Some Substances Present in Urban and Industrial Waters,
W76-09533 5D

PHILIP, J. R.
Stability Analysis of Infiltration,
W76-09588 2G

PHILIPPO, A.
The Microbiological Pollution of North Sea and English Channel Shore, (In French),
W76-09657 5C

PHILLIPS, O. M.
Wave Breaking in the Presence of Wind Drift and Swell,
W76-09874 2L

PICCININI, N.
Effects of Gamma Irradiation on the Degradation of Dyes,
W76-09532 5D

PICKENS, J. F.
Numerical Simulation of Waste Movement in Steady Groundwater Flow Systems,
W76-09564 5B

PILGRIM, D. H.
Parameter Optimization for Watershed Models,
W76-09853 2A

PLASS, W. T.
Changes in Water Chemistry Resulting from Surface-Mining of Coal on Four West Virginia Watersheds,
W76-09470 4C

PLODOWSKI, T.
Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

POCHKIN, Y. N.
Technique of Water Sampling in Sanitary Investigations of Large Bodies of Water, (In Russian),
W76-09928 5A

POEPEL, F.
Possibilities and Limits of Extended Waste Water Purification (Moeglichkeiten und Grenzen der Weitergehanded Abwasserreinigung),
W76-09683 5D

POINTON, M. J.
Removal of Dissolved Boron and Silicon During Estuarine Mixing of Sea and River Waters,
W76-09725 2K

POIRE, A.
Principle of Management of Degenerated Inlets and Estuaries,
W76-09958 8I

POLAKOWSKA, E.
The Vegetation of the 'Lukniany Lake' Nature Reserve in the Mazurian Lake District,(In Polish),
W76-09990 5C

POLAKOWSKI, B.
The Vegetation of the 'Lukniany Lake' Nature Reserve in the Mazurian Lake District,(In Polish),
W76-09990 5C

POLISHCHUK, L. R.
Determination of Microquantities of Naphthalene in Environmental Objects, (In Russian),
W76-09620 5A

PORCELLA, D. B.
Ecosystem Modeling,
W76-09645 5C

PORSCH, R.
Method of Operating a Purifying Plant and Tank for Practicing Said Method,
W76-09873 5D

POTASH, M.
Materials Budgets of Lake Champlain,
W76-09756 5B

POUND, C. E.
Costs of Wastewater Treatment by Land Application,
W76-09774 5D

PREFER, E. H.
Polyethylene Pipe Insertion Rehabilitates Old Sewers,
W76-09459 8G

ROBSTEIN, R. F.
New Technologies in Water Purification and Their Application to Arid Lands,
W76-09481 3A

RUDNIKOV, A. D.
Dependence of Pasture Grass Yield on Soil Moisture Level, (In Russian),
W76-09930 4A

ILKKINEN, E.
Purification of Waste Water By Polymer Exchangers (Jatevesien puhdistaminen polymeerivaihtajilla),
W76-09675 5D

IRA, G.
The Hygienic Quality of the Water in a Growing-Finishing Piggery, (In Romanian),
W76-09883 5B

ABE, K. M.
Island Barrier Effects on Sea State as Revealed by a Numerical Wave Model and DMSP Satellite Data,
W76-09559 2L

AGADE, R. K.
Metagame Theory and its Applications to Water Resources,
W76-09847 6A

AJHI, H. N.
On the Capacity-Expansion of Desalination Plants and Storage Tanks,
W76-09618 3A

AMSEY, F. L.
Probability Distributions of Breaking Wave Heights Emphasizing the Utilization of the Jonswap Spectrum,
W76-09721 2L

ATHBUN, R. E.
Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

AUSSER, G. C.
Investment Sequencing, Allocation, and Learning in the Design of Water Resources Systems: An Empirical Application,
W76-09846 6A

AY, M. W.
Sludge Control and Decant System,
W76-09419 5D

AY, W.
Nitrates: What's Happening in Britain,
W76-09451 5D

ECHT, H. L.
Removal of Phosphate from Waste Water,
W76-09458 5D

EED, L. A.
Hydrology and Sedimentation of Bixler Run Basin, Central Pennsylvania,
W76-09830 2J

EED, R. K.
Observations of the California Undercurrent Off Washington and Vancouver Island,
W76-09584 2L

EGULLA, D. F.
Dosimetry at a High-Activity Co60 Waste Treatment Facility,
W76-09547 5D

REICOSKY, D. C.
Crop Response to Chiseling and Irrigation in Soils with a Compact A2 Horizon,
W76-09985 3F

REID, G. W.
The Design of Water Quality Management Projects with Inadequate Data,
W76-09623 5G

REKTORIK, R. J.
Field Drainage with Manifold Well Points,
W76-09586 5G

RELYEA, C. M.
Hydrologic Forecasting for the Ohio River Waterway,
W76-09944 2E

RENDIC, D.
Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

RENGER, M.
Investigations on the Erodibility of a Deeply Plowed Gray-Brown Podzolic Soil from Loess on a Slope by Means of Simulated Rain, (In German),
W76-09917 2J

RETTMAN, P. L.
Geochemical and Isotopic Analyses of Waters Associated with the Edwards Limestone Aquifer, Central Texas,
W76-09836 2K

REYSSAC, J.
Quantitative Aspect of the Phytoplankton of the Bay Du Levrier (Mauritania), (In French),
W76-09987 5C

RHEY, M. S.
Distribution of Ponderosa Pine Forest Densities on the Salt-Verde River Basin,
W76-09477 4A

RICH, L. G.
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

RICHARDSON, E. V.
Mathematical Model of Flow in a Stream-Aquifer System,
W76-09966 2E

RICHEY, E. P.
Application of Physical Tidal Models in Harbor and Marina Design,
W76-09984 5B

ROBB, D. C. N.
St. Lawrence Seaway: A New Goal of Year-Round Navigation,
W76-09942 2C

ROBERTS, F.
Phosphate Removal--Tackling Eutrophication from the Other Side,
W76-09436 5D

ROBINSON, L. R. JR.
Erosion Control During Pipeline Construction,
W76-09743 5G

ROBSON, T. O.
Recent Trends in Weed Control in Freshwater,
W76-09921 4A

RODARTE, L.
Theory of Multiple Leaky Aquifers 1. The Integrodifferential and Differential Equations for Small and Large Values of Time,
W76-09563 2F

RODRIGUEZ-ITURBE, I.
Evaluation of Mean Square Error Involved in Approximating the Areal Average of a Rainfall Event by a Discrete Summation,
W76-09572 2B

ROESEL, H.
Monitoring and Automatic Filter Control of the Dreis-Tiefenback Treatment Plant (Betriebsueberwachung und Automatische Filtersteuerung der Aufbereitungsanlage Dreis-Tiefenbach),
W76-09679 5F

ROGET, J.
Membrane Support-Plates and Fluid Separating Apparatus in which They are Present,
W76-09857 5D

ROHLEDER, H.
Degradation of Persistent Organochlorine Pollutants by Gamma Radiation and its Possible use for Waste-Water Treatment,
W76-09534 5D

ROHRER, D. M.
Effects of Gamma Radiation from Co60 on Dilute Aqueous Solutions of Linear Alkyl Sulfonate Surfactants and other Organic Pollutants,
W76-09531 5D

ROLLER, P. S.
Method and Apparatus for Converting Saline Water to Fresh Water,
W76-09871 3A

Method and Apparatus for the Conversion of an Aqueous Scale-Formed Liquid,
W76-09872 3A

ROMANENKO, V. I.
Method of Biological Purification of Industrial Effluents from Chromates and Bichromates,
W76-09856 5D

ROONEY, JOHN F.
Land Use Changes and Reservoir Development: An Application of Land Use Information Systems,
W76-09905 4A

ROSEPULE, A.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

ROSIVAL, L.
Results of Hygienic and Toxicological Studies of Pesticides in Countries of the Council of Mutual Economic Assistance in 1962-1972, (In Russian),
W76-09884 5G

ROSOPULE, A.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Analytical Studies on Sewage Sludge and Plant Material,
W76-09552 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Results on the Effect of Differently Treated Sewage Sludge on Plants and Soil,
W76-09551 5D

ROSS, I.
Potential of Radiation Sterilization in Solid Waste Treatment, A Status Report,
W76-09555 5D

ROSS, S. L.
Apparatus and Method for Recovering Pure Water from Natural Sources and Industrial Polluted Waste Sources,
W76-09867 5G

ROTTINGHAUS, G. E.
Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

ROUSSELLE, J.
Disaggregation Models in Hydrology Revisited,
W76-09573 2A

ROVEY, C. E. K.
Mathematical Model of Flow in a Stream-Aquifer System,
W76-09966 2E

ROWE, M. L.
Nitrogen in the Subsurface Environment,
W76-09662 5B

ROWE-ROWE, D. T.
Laboratory and Field Tests in the Revival of Fish Affected by Rotenone,
W76-09994 5C

Reaction Times of Certain Freshwater Fishes to a Rotenone-Containing Piscicide,
W76-09993 5C

ROY, P. K.
Effect of an Electric Current on Water Stability of the Structure of Salinized Solonetz, (In Russian),
W76-09804 2G

SAFFERMAN, R. S.
Assessment of Virus Removal by a Multi-Stage Activated Sludge Process,
W76-09676 5D

SAGER, R. A.
Modeling Sediment Movement for Masonboro Inlet,
W76-09956 2L

SAMET, C.
The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

SANDER, F.
Organic Productivity of Inshore and Offshore Waters of Barbados: A Study of the Island Mass Effect,
W76-09938 5C

SARKISOV, R. N.
Comparative Evaluation of Food Plants of the Ararat Cochineal Scale (Porphyrophora Hamelii) (In Russian),
W76-09406 2I

SARKISYAN, S. M.
Comparative Evaluation of Food Plants of the Ararat Cochineal Scale (Porphyrophora Hamelii) (In Russian),
W76-09406 2I

SASAKI, B.
Hydroelectric Power Potential at Corps of Engineers Projects,
W76-09765 6B

SATHAYE, J.
Aqueduct Optimization with Intermediate Storage,
W76-09636 4A

SAUERLENDER, O. H.
Water Authority Rate Making,
W76-09717 6C

SAYRE, W. W.
Undistorted Movable-Bed Model Study for a River and Power Plant Intake System,
W76-09971 8B

SCHERFIG, J.
Environmental Quality Research, First Annual Report,
W76-09654 5C

SCHERLER, A.
Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W76-09413 5D

SCHMIDT-HOLTHAUSEN, H. J.
Some Critical Views of Selected Processes for the Biological Treatment of Sewage,
W76-09457 5D

SCHMIDT, P. W.
Reconnaissance Map Showing Relative Amounts of Soil and Bedrock in the Mountainous Part of the Morrison-Evergreen Quadrangles and Adjoining Areas to the West in Jefferson County, Colorado,
W76-09825 7C

SCHMITZ, J. E.
On Entrainment and Diffusion in a Gulf of Mexico Anticyclonic Ring,
W76-09723 2L

SCHNEIDER, H.
Disinfection of Sludge and Waste-Water by Irradiation with Electrons of Low Accelerating Voltage,
W76-09521 5D

An Electron Accelerator with Electrons of Low-Accelerating Voltage for Irradiating Sewage Sludge and Waste Water,
W76-09539 5D

SCHOFIELD, E. A.
Effects of Petroleum Pollutants on Arctic Microbial Populations,
W76-09909 5C

SCHONBORN, W.
Use of Sewage Sludge as Fodder,
W76-09554 5D

SCHUBERT, G. H.
Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

SCHULTZ, G. A.
Accuracy of Reservoir Inflow Forecasts Based on Radar Rainfall Measurements,
W76-09574 2B

SCHULTZ, H.
Advantages of Numerical Atmospheric Dispersion Calculations for Estimating Dispersal and Combination Effects of Stack Releases from the Nuclear Industry,
W76-09501 5A

SCHURMANN, G.
Dosimetry at a High-Activity Co60 Waste Treatment Facility,
W76-09547 5D

SCHWANTJE, R. S.
Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

SCHWARZ, G.
Possible Future Effects on the Population of the Federal Republic of Germany of Gaseous Radioactive Effluents from Nuclear Facilities,
W76-09499 5A

SCHWARZ, S.
The Effluent Lagoons Greifswald-Ladebow (Das Abwasserteichsystem Greifswald-Ladebow),
W76-09682 5D

SEABERGH, W. C.
Masonboro Inlet Fixed-Bed Model Evaluation,
W76-09957 8B

Modeling Sediment Movement for Masonboro Inlet,
W76-09956 2L

SEDLAK, J. A.
Cationic Acrylamide-Styrene Copolymers and Flocculation of Sewage Therewith,
W76-09434 5D

SEGER, G. V.
Irrigation System Pivot Swivel,
W76-09866 3F

SEKOULOV, I.
Possibilities and Limits of Extended Waste Water Purification (Moeglichkeiten und Grenzen der Weitergehanded Abwasserreinigung),
W76-09683 5D

SELBY, M. J.
The Erodibility of Pumice Soils of the North Island, New Zealand,
W76-09787 4D

SEMTNER, A. J. JR.
A Model for the Thermodynamic Growth of Sea Ice in Numerical Investigations of Climate,
W76-09722 2C

SEMUKHINA, G. V.
Determination of Tetramethylthiuram Disulfide (TMTD) in Water and Air by Colimetry, (In Russian),
W76-09590 5A

SEVUMYAN, A. A.
Comparative Evaluation of Food Plants of the Ararat Cochineal Scale (Porphyrophora Hamelii) (In Russian),
W76-09406 2I

SEXTON, J. R.
Improved Techniques for Water Resource Systems Design,
W76-09624 4A

SHAARAWI, E.
Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

AFFER, R. L.
Sludge Removal System,
W76-09416 5D

AH, D.
Biological Effects of High-Energy Electron Irradiation of Municipal Sludge,
W76-09522 5C

Prospects for High-Energy Electron Irradiation of Waste-Water Liquid Residuals,
W76-09538 5D

AMIR, U.
Optimal Operation of the Pumping Stations in the Kinnereth-Eshkol Section of the National Water Carrier,
W76-09629 4A

ANHOLTZ, V. O.
Estimating Selected Parameters for the Kentucky Watershed Model from Watershed Characteristics,
W76-09852 2A

ARON, S.
A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

ATILOV, I. S.
The Water Supply System of Soil and Nitrogen Loss with Runoff Waters in Nonchernozem Areas, (In Russian),
W76-09794 2G

AW, R. H.
Effect of Different Spring Soil Moisture Levels on Moisture Stress,
W76-09412 3F

EA, T. G.
Wastewater Sludge Utilization and Disposal Costs,
W76-09773 5D

EARIN, K. K.
River Delta Computer Simulation Model (Simudelt),
W76-09954 2L

ELDON, D.
The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

ELEF, G.
Apparatus for Sewage Treatment and Wastewater Reclamation,
W76-09420 5D

Recent Advances in the Treatment of Solid Wastes,
W76-09553 5D

PET, G. I.
Engineering Reclamation, A Most Important Means of Increasing Fish Productivity of Waters, (In Russian),
W76-09800 8I

UFFMAN, O.
Apparatus and Method for Recovering Pure Water from Natural Sources and Industrial Polluted Waste Sources,
W76-09867 5G

ULTZ, D. J.
Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

SHUMAN, M. S.
Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

SIEGEL, N. H.
Marine Sewage Disposal Device,
W76-09418 5D

SILL, B. L.
Physical Model of Discharge in a Two-Layer Stratified Ambient,
W76-09963 8B

SIMMONS, G. M.
Carbon Wastewater Treatment Process,
W76-09441 5D

SIMON, J.
Data on the Disinfection of Liquid Manure by Gamma Irradiation at Baja, Hungary,
W76-09528 5D

The Waste-Water and Sludge Re-Use Project by Gamma Irradiation at Kecskemet, Hungary, Some Approaches and Investigations,
W76-09544 5D

SIMONEIT, B. R.
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. I. Computerized High Resolution Mass Spectrometry and Gas Chromatography-Low Resolution Mass Spectrometry,
W76-09687 5A

SIMONS, D. B.
Mathematical Modeling of Alluvial Channels,
W76-09968 8B

Riverbank Recessions for Power Plant Facilities,
W76-09973 8B

SIMONS, T. J.
Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

Verification of Numerical Models of Lake Ontario, III. Longterm Heat Transports,
W76-09783 2H

SIMS, E.
Laboratory Evaluation of the Coulter On-Line Particle Monitor,
W76-09699 5A

SINGH, V. P.
Sensitivity of Linear and Nonlinear Surface Runoff Models to Input Errors,
W76-09578 2A

SINSKEY, A. J.
Biological Effects of High-Energy Electron Irradiation of Municipal Sludge,
W76-09522 5C

Prospects for High-Energy Electron Irradiation of Waste-Water Liquid Residuals,
W76-09538 5D

Viruses and Ionizing Radiation in Respect to Waste-Water Treatment,
W76-09520 5D

SIRENKO, L. A.
Induced Change of Nitrate Reductase Activity in Microcystis Aeruginosa Kutz. Emend. Elenk, (In Russian),
W76-09816 5C

SIVINSKI, H. D.
Treatment of Sewage Sludge with Combinations of Heat and Ionizing Radiation (Thermoradiation),
W76-09523 5D

SKAGGS, R. W.
Upward Water Movement in Field Cores,
W76-09726 3F

SKJEI, R. E.
Engineering and Ecological Evaluation of Artificial-Island Design, Rincon Island, Punta Gorda, California,
W76-09903 2L

SKRESLET, S.
Water Transport in the Sill Area of Balsfjord North Norway, During Vernal Meltwater Discharge,
W76-09999 2L

SLACK, J. R.
Effect of Sequence Length n on the Choice of Assumed Distribution of Floods,
W76-09851 4A

SLAUGHTER, T. H.
Maryland Chesapeake Bay Beaches - General Distribution and Classification,
W76-09568 2L

The Relationship of the Nearshore Longshore Bar and Sand Waves at Ocean City, Maryland,
W76-09569 2L

SLUKHAI, S. I.
Effectiveness of Water Utilization by Plants, (In Ukranian),
W76-09809 2D

SMALLWOOD, H.
Effluent Detention Ponds Dechlorinate Wastewater,
W76-09678 5D

SMEDILE, E.
Effect of Entrainment in Power Station Cooling Systems Studied Using Periphytic Communities,
W76-09498 5C

Evaluation of the Thermal Effects of a Nuclear Power Plant,
W76-09496 5C

A Site Study of the Multiple Effects of Thermal Releases on the Aquatic Life in an Estuarine Area,
W76-09505 5C

SMITH, A. J.
Aerated Sewerage Disposal,
W76-09415 5D

SMITH, D. H.
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. I. Computerized High Resolution Mass Spectrometry and Gas Chromatography-Low Resolution Mass Spectrometry,
W76-09687 5A

SMITH, D. J.
Organic Sediment Model for Wastewater Outfall,
W76-09951 5B

SMITH, E. J.
Sludge Heat Treatment: Operation and Management,
W76-09708 5D

SMITH, R. G. JR.

SMITH, R. G. JR.
Evaluation of Combined Applications of Ultrafiltration and Complexation Capacity Techniques to Natural Waters,
W76-09690 5A

SMITH, S. E.
Power Generation in Arizona and Its Environmental Implications,
W76-09485 6D

SNIDER, R. H.
Modeling of Wind-Waves with Jonswap Spectra,
W76-09948 8B

SNYDER, J. R.
Sewage Treatment Tank and Tube Settler,
W76-09417 5D

SOKOLAI, A.
Results of Hygienic and Toxicological Studies of Pesticides in Countries of the Council of Mutual Economic Assistance in 1962-1972, (In Russian),
W76-09884 5G

SOLDATOVA, S. S.
Determination of Fluorine in Drinking Water with a Cerium(III)- or Lanthanum Alizarin Complex, (In Russian),
W76-09796 5A

SOLOVYKH, G. N.
Biological Production Processes in the Ural River, (In Russian),
W76-09919 5C

SOMAN, S. D.
Impact of Thermal and Radioactive Effluents on a Tropical Nearshore Ecosystem,
W76-09492 5C

SOMAN, V. K.
Impact of Thermal and Radioactive Effluents on a Tropical Nearshore Ecosystem,
W76-09492 5C

SOMMER, S.
Biological Effects of High-Energy Electron Irradiation of Municipal Sludge,
W76-09522 5C

SOPPER, W. E.
Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

Municipal Watershed Management: What are the Opportunities,
W76-09472 4D

Watershed Response to Partial Area Applications of Simulated Rainfall,
W76-09467 2A

SORENSEN, J. H.
Landslide Hazard in the United States: A Research Assessment,
W76-09781 6F

SOROKIN, Y. I.
The Role of Microflora in the Productivity of a Salmon Breeding Lake, (In Russian),
W76-09818 5C

SPALDING, R. F.
Effects of Land Use and River Seepage on Groundwater Quality in Hall County, Nebraska,
W76-09728 5B

SPENCER, W.
Effects of Management Practices on Water Quality and Quantity: Baltimore, Maryland, Municipal Watersheds,
W76-09464 4D

SPINI, G.
Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

SPOSITO, G.
Volume Changes in Swelling Clays,
W76-09881 2G

STADELMANN, P.
Phosphorus and Nitrogen Cycle on a Transect in Lake Ontario During the International Field Year 1972-1973 (IFYGL),
W76-09594 5C

STAERK, H.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Analytical Studies on Sewage Sludge and Plant Material,
W76-09552 5D

STAFFORD, D. A.
Microbial Aspects of Carbonisation Effluent Treatment,
W76-09712 5D

STALL, J. B.
ILLUDAS - The Illinois Urban Drainage Area Simulator,
W76-09735 2E

STALNAKER, C. B.
Methodologies for the Determination of Stream Resource Flow Requirements: An Assessment,
W76-09666 6G

STAPLES, D. G.
Distribution of Bdellovibrio Bacteriovorus in Sewage Works, River Water, and Sediments,
W76-09698 5A

STEIN, H.
Monitoring and Automatic Filter Control of the Dreis-Tiefenback Treatment Plant (Betriebsueberwachung und Automatische Filtersteuerung der Aufbereitungsanlage Dreis-Tiefenbach),
W76-09679 5F

STENGEL, R. F.
Inductive Cavitator Keeps Filter Gratings Clear of Debris,
W76-09677 5D

STEPANENKO, G. A.
Experimental Effect of Boron on Anticarious Action of Fluorine in Drinking Water, (In Russian),
W76-09885 5F

STEPHENS, D. W.
Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

STERLING, H. J. JR.
Hydrodynamic Separation of Solids from Solid-Liquid Mixtures,
W76-09716 5D

STERN, E.
Domestic Water Filtration Apparatus,
W76-09862 5F

STERN, G.
Methods for Reducing the Infection Hazard of Waste-Water Sludge,
W76-09514 5D

STEVEN, D. M.
Organic Productivity of Inshore and Offshore Waters of Barbados: A Study of the Island Mass Effect,
W76-09938 5C

STEVENS, M. A.
Riverbank Recessions for Power Plant Facilities,
W76-09973 8E

STINNETT, S.
Nitrogen in the Subsurface Environment,
W76-09662 5E

STOCKTON, J. D.
Wastewater Sludge Utilization and Disposal Costs,
W76-09773 5D

STONE, R.
Effluent Detention Ponds Dechlorinate Wastewater,
W76-09678 5D

STORM, P. C.
Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

STREFFER, C.
Interaction Mechanisms of Radioactive, Chemical and Thermal Releases from the Nuclear Industry, Methodology for Considering Co-Operative Effects,
W76-09491 5C

STUBBLEFIELD, T. M.
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

STUDHOLME, A. L.
The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

STURGES, W.
Velocity Observations in the West Passage of Narragansett Bay: A Partially Mixed Estuary,
W76-09561 2L

SUBBARAMAYYA, J.
On The Rainfall and Water Potential of Nepal,
W76-09642 2B

SUBRAMANIAN, V.
Water Chemistry of the St. Lawrence Estuary,
W76-09581 5A

SUESS, A.
Dosimetry at a High-Activity Co60 Waste Treatment Facility,
W76-09547 5E

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Analytical Studies on Sewage Sludge and Plant Material,
W76-09552 5E

Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Results on the Effect of Differently Treated Sewage Sludge on Plants and Soil,
W76-09551 5D

UZUKI, M.
The Cost Assignment of the Cooperative Water Resource Development: A Game Theoretical Approach,
W76-09619 6A

WANK, W. T.
Summary of Municipal Watershed Management Surveys in Eastern United States,
W76-09466 4D

WEET, H. R.
Monitoring Wells,
W76-09558 4B

WIFT, J. H.
Upwelling Near Samalga Pass,
W76-09585 2L

ABASARAN, M. O.
Types and Treatment of Sewage Sludges Practice in the Federal Republic of Germany,
W76-09513 5D

AI, D. Y.
Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

AKAHASI, Y.
Evaluation of Flood Control Under Changing Conditions,
W76-09630 4A

AKAKUWA, S.
Studies on the Metabolism of a Sulfur-Oxidizing Bacterium. VII. Purification and Characterization of Soluble Components Indispensables for Sulfur Oxidation by Thiobacillus Thiooxidans,
W76-09592 5C

AKAYA, K.
Operation of Ozone Treatment Apparatus (Ozone shori sochi no unten),
W76-09713 5F

AKENAKA, H.
The Softening of the Kanto Volcanic Ash Soil, (In Japanese),
W76-09925 2G

AMAS, G.
The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

AMASI, G.
Data on the Disinfection of Liquid Manure by Gamma Irradiation at Baja, Hungary,
W76-09528 5D

ANAKA, A.
The Distribution of Coliforms in Fresh Water, (In Japanese),
W76-09934 5C

TANJI, K. K.
A Three-Dimensional Galerkin Finite Element Solution of Flow Through Multiaquifers in Sutter Basin, California,
W76-09562 2F

TARRER, A. R.
Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

TAUBER, M.
Practical Aspects of the Pasteurization of Sewage Sludge by Electron Irradiation,
W76-09540 5D

TAYLOR, M. R. G.
Objectives and Costs of Advanced Treatment Techniques for Sewage,
W76-09449 5D

TELEK, G.
Using a CHN Analyzer to Reduce Carbonate Interference in Particulate Organic Carbon Analyses,
W76-09940 5A

TEN WOLDE, J. G.
Industrial Experience of Sewage Sludge Processing with Zimpro Installations in the Netherlands,
W76-09709 5D

TERSTRIEP, M. L.
ILLUDAS - The Illinois Urban Drainage Area Simulator,
W76-09735 2E

THAYER, P. M.
Sewage Treatment Aeration Systems,
W76-09423 5D

THOMAS, W. A.
Biological Indicators of Environmental Quality. A Bibliography of Abstracts,
W76-09860 5A

THOMPSON, R. G.
Water Use Policies and Power Plant Economics,
W76-09776 5G

TIKHANOVSKIY, P. A.
Furnace for Thermal Treatment of Liquid Industrial Waste Waters Containing Toxic Organic Impurities (Pech' Dlya Termicheskogo Obezvrezhivaniya Zhidkikh Promyshlennykh Stokov S Toksicheskimi Organicheskimi Primesyami),
W76-09875 5D

TIMKO, E.
Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume II,
W76-09900 5A

Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume III,
W76-09901 5A

TKACHUK, K. S.
Effectiveness of Water Utilization by Plants, (In Ukranian),
W76-09809 2D

TRATNIK, M.
Is the Examination of Drinkable Water and Swimming Pools on Presence of Enteropathogenic E. Coli Necessary, (In German),
W76-09785 5C

TRAUTMAN, M. B.
Re-Evaluation of the Effects of Man-Made Modifications on Gordon Creek Between 1887 and 1973 and Especially as Regards its Fish Fauna,
W76-09407 4C

TRICHOPOULOS, D.
Isolation of Water Vibrios in Greece, (In French),
W76-09601 5A

TRISKO, R. L.
Hydroelectric Power Potential at Corps of Engineers Projects,
W76-09765 6B

Hydroelectric Power Potential at Corps of Engineers Projects. Recommendations and Executive Summary,
W76-09764 6B

TRUESDALE, G. A.
Objectives and Costs of Advanced Treatment Techniques for Sewage,
W76-09449 5D

TRUMP, J. G.
Prospects for High-Energy Electron Irradiation of Waste-Water Liquid Residuals,
W76-09538 5D

TRZILOVA, B.
Presence and Some Properties of Bacteria of the Family Pseudomonadaceae in the River Danube, (In German),
W76-09792 5A

TUCKER, D. L.
Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

TURNER, A. B.
Apparatus for Treating Industrial and Domestic Waste Waters,
W76-09429 5D

TYUL'DYUKOV, V. A.
Dependence of Pasture Grass Yield on Soil Moisture Level, (In Russian),
W76-09930 4A

UDAL'TSOVA, N. I.
Determination of Fluorine in Drinking Water with a Cerium(III)- or Lanthanum Alizarin Complex, (In Russian),
W76-09796 5A

ULANOWICZ, R. E.
Modeling the Chesapeake Bay and Tributaries: a Synopsis,
W76-09587 2L

UNANGST, P. C.
Ozone Provides Alternative for Secondary Effluent Disinfection. Part 1,
W76-09445 5D

Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

UNGAR, I. A.
Salinity Tolerance of Inland Halophytic Vegetation of North America,
W76-09988 3C

UNGER, S. G.
Economic Analysis of Effluent Guidelines: Apple, Citrus and Potato Processing Segments

UNGER, S. G.

of the Canned and Preserved Fruits and Vegetable Industry,
W76-09779 5G

Economic Analysis of Effluent Guidelines: Grain Processing Segment of the Grain Mills Industry,
W76-09775 5G

UNNY, T. E.
Metagame Theory and its Applications to Water Resources,
W76-09847 6A

Numerical Two-Dimensional Flow Model for River Systems,
W76-09964 2E

URBAN, A.
The Waste-Water and Sludge Re-Use Project by Gamma Irradiation at Kecskemet, Hungary, Some Approaches and Investigations,
W76-09544 5D

UTSUMI, T.
Joint USA/Japan Project on Global Systems Analysis and Simulation (GLOSAS) of Energy, Resources, and Environmental (ERE) Systems,
W76-09610 6A

VAINSHTEIN, M. B.
Characteristics of Thionic Bacteria from the Lakes of the Mari ASSR, (In Russian),
W76-09814 5C

VALKOVIC, V.
Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

VALLICELLI, G.
Specifications for Container Facilities by Simulation,
W76-09943 6A

VAN BRAKEL, J.
Anaerobic Treatment of Dilute Waste Waters,
W76-09673 5D

VAN DEN BERG, A. J.
Gamma Irradiation for Sewage Treatment at US Army Facilities,
W76-09525 5D

Synergistic Effects of Irradiation of Waste-Water.
W76-09524 5D

VAN DER GRAFF, J. H. J. M.
Industrial Experience of Sewage Sludge Processing with Zimpro Installations in the Netherlands,
W76-09709 5D

VAN DER MEER, R. R.
Anaerobic Treatment of Dilute Waste Waters,
W76-09673 5D

VAN DER ZWAARD, J. J.
Movable-Bed River-Models,
W76-09969 2E

VAN DERVEER, D.
Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

VAN NOTE, R. H.
A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

VAN WEELE, B.
Management of Flood Control and Drainage in the Urbanizing Zone,
W76-09750 4A

VAN WEERS, A. W.
The Effect of Temperature on the Uptake and Retention of Co 60 and Zn 65 by the Common Shrimp Crangon Crangon (L),
W76-09493 5C

VANDYKE, J. M.
Comparative Effects of Diquat Plus Copper Sulfate on Aquatic Organisms,
W76-09821 5C

VASIL'EVA, G. L.
Rotifer Production in Lake Baikal, (In Russian),
W76-09791 5C

VASIL'EVA, M. I.
The Role of Microflora in the Productivity of a Salmon Breeding Lake, (In Russian),
W76-09818 5C

VASILENKO, I. Y.
Radiation Hazard of Iodine-129, (In Russian),
W76-09788 5B

VASSILIADIS, P.
Isolation of Water Vibrios in Greece, (In French),
W76-09601 5A

VASTANO, A. C.
On Entrainment and Diffusion in a Gulf of Mexico Anticyclonic Ring,
W76-09723 2L

VERCELLI, G. L.
Is the Separation of Sewers Desirable,
W76-09739 5D

VERLEGER, P. K. JR.
The Use of Econometrics to Project Energy Demands,
W76-09611 6A

VERPLANCKE, H.
Comparative Study in Measuring Fluid Surface Tension and Fluid Content with the Aid of Electrical Resistance Elements 'In Situ' and in the Laboratory, (In Flemish),
W76-09923 2G

VERRETTE, J-L.
Principle of Management of Degenerated Inlets and Estuaries,
W76-09958 8B

VIUM, M. P.
River and Estuary Modeling with the Siva System,
W76-09982 2A

VOELZ, E.
Advantages of Numerical Atmospheric Dispersion Calculations for Estimating Dispersal and Combination Effects of Stack Releases from the Nuclear Industry,
W76-09501 5A

VOGEL, W. G.
Requirements and Use of Fertilizer, Lime, and Mulch for Vegetating Acid Mine Spoils,
W76-09469 4D

VOHRA, K. G.
Synergistic Effects of Atmospheric Releases of Radioactive Gases and SO2 in Inducing Nucleation in the Atmosphere,
W76-09500 5A

VOLLNER, L.
Degradation of Persistent Organochlorine Pollutants by Gamma Radiation and its Possible use for Waste-Water Treatment,
W76-09534 5D

VON EUW, H. M.
Synergistic Effects of Airborne Emissions from Nuclear Power Plants,
W76-09503 5A

VOOGT, J.
Hydrodynamic Transport Phenomena in Estuaries and Coastal Waters: Scope of Mathematical Models,
W76-09980 5B

VRENGDENHIL, C. B.
Hydrodynamic Transport Phenomena in Estuaries and Coastal Waters: Scope of Mathematical Models,
W76-09980 5B

VYAS, Y. K.
Wave Motions in an Offshore Harbor,
W76-09947 8B

WALKER, J. D.
Microbial Degradation of Model Petroleum at Low Temperatures,
W76-09648 5C

WALLACE, A.
Contribution of Salts to the Water Potential of Woody Plants,
W76-09691 3C

WALLIS, J. R.
Effect of Sequence Length n on the Choice of Assumed Distribution of Floods,
W76-09851 4A

WALSH, P. D.
Investigations into the Yield of an Existing Surface Reservoir and Aquifer System,
W76-09631 3B

WALTER, M. F.
A Review and Analysis of Selected Hydrologic Modeling Concepts,
W76-09718 2E

WARD, T. D.
Sludge Control and Decant System,
W76-09419 5D

WARREN, I. R.
Systems Modeling of Stratified Fluids,
W76-09976 8B

WATSON, C. B.
Role of the Underwriter in Tax Exempt Financing for Industrial Expansion and Pollution Control,
W76-09768 5G

WEBER, J.
Maximum Information Obtainable from Inadequate Design Data: from Multivariate to Bayesian Methods,
W76-09625 4A

WEIGMANN, G.
On the Ecology of Collembola and Oribatids in a Landsea Transition Zone (Collembola, Insecta-Oribatei, Acari) (In German),
W76-09635 2L

WEIR, J. E. JR.
Operation and Maintenance of a Deep-Well Water-Level Measurement Device, 'The Iron Horse',
W76-09835 4B

EISBERG, R. H.
Velocity Observations in the West Passage of Narragansett Bay: A Partially Mixed Estuary,
W76-09561 2L

EISEL, G. F.
Concentration of Heavy Metals in Sediments of a Hydroelectric Impoundment,
W76-09755 5A

EISZ, R. N.
A Linear Programming Model for Use in Guiding Urban Floodplain Management,
W76-09849 6F

ELLS, L. G.
Upward Water Movement in Field Cores,
W76-09726 3F

HITE, E. L.
Role of Carbonate Rocks in Modifying Flood Flow Behavior,
W76-09784 2A

HITE, L. C.
Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

HITE, M. J. D.
Increasing the Capacity of Sedimentation Tanks by Means of Sloping Plates,
W76-09706 5D

HITE, S. C.
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

HITE, S. M.
Energy Dissipation on a Rough Slope,
W76-09582 8B

HITEHEAD, C. R.
Sludge Heat Treatment: Operation and Management,
W76-09708 5D

HITEHEAD, R. E. S.
Exploration Rock Geochemistry-Detection of Trace Element Halo at Heath Steele Mines (N. B., Canada) by Discriminant Analysis,
W76-09473 2K

IEBE, P. H.
Acid-Iron Waste as a Factor Affecting the Distribution and Abundance of Zooplankton in the New York Bight: I. Laboratory Studies on the Effects of Acid Waste on Copepods,
W76-09700 5C

ILCOX, W. H.
Biological Indicators of Environmental Quality. A Bibliography of Abstracts,
W76-09860 5A

ILDMAN, R. B.
Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

ILDMAN, W. C.
Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

ILEN, B. O.
The Modified Fernow Frost Gage,
W76-09880 7B

WILHELM, J. G.
Discussion of Possible Effects Due to Mixing of Radioactive and Thermal Releases to the Atmosphere from Nuclear Power Plants,
W76-09502 5A

WILKERSON, A. L.
Septic Tank System,
W76-09426 5D

WILLIS, C. E.
A Floodplain Management Framework with Structural and Non-Structural Measures,
W76-09754 6F

Investment Sequencing, Allocation, and Learning in the Design of Water Resources Systems: An Empirical Application,
W76-09846 6A

WILLIS, R.
Optimal Ground Water Quality Management: Well Injection of Waste Waters,
W76-09511 5D

WISSMAN, D. J.
Economic Analysis of Effluent Guidelines: Apple, Citrus and Potato Processing Segments of the Canned and Preserved Fruits and Vegetable Industry,
W76-09779 5G

WIZIGMANN, I.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Bacterial and Parasitological Studies AfterIrradiation.
W76-09548 5D

WJOLVERTON, M. W.
Economic Analysis of Effluent Guidelines: Grain Processing Segment of the Grain Mills Industry,
W76-09775 5G

WOLFE, S.
Oil in the Arctic,
W76-09902 5C

WOLLUM, A. G.
Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

WOLMAN, M. G.
Water System Behavior: Determinants in an Arid Region,
W76-09483 4A

WOOD, D. J.
Hydrodynamic Separation of Solids from Solid-Liquid Mixtures,
W76-09716 5D

WOOD, J. M.
Metabolic Cycles for Toxic Elements in Aqueous Systems,
W76-09933 5C

WOOD, L. B.
The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

WOODBRIDGE, D. D.
Gamma Irradiation for Sewage Treatment at US Army Facilities,
W76-09525 5D

Synergistic Effects of Irradiation of Waste-Water.
W76-09524 5D

WOOLHISER, D. A.
Sensitivity of Linear and Nonlinear Surface Runoff Models to Input Errors,
W76-09578 2A

WRIGHT, J. W.
The Wind Drift and Wave Breaking,
W76-09724 2L

WRIGHT, K. A.
Biological Effects of High-Energy Electron Irradiation of Municipal Sludge,
W76-09522 5C

Prospects for High-Energy Electron Irradiation of Waste-Water Liquid Residuals,
W76-09538 5D

WRIGHT, N. G.
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

WUNEKE, C. D.
Advantages of Numerical Atmospheric Dispersion Calculations for Estimating Dispersal and Combination Effects of Stack Releases from the Nuclear Industry,
W76-09501 5A

WURSCHING, F.
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Bacterial and Parasitological Studies AfterIrradiation.
W76-09548 5D

YAKOVLEVA, G. P.
Isolation of Salmonella from Sewage and Surface Waters, (In Russian),
W76-09411 5A

YAMAGUCHI, H.
Surveys on Radiation-Resistant Asporogenic Bacteria in Natural Environments,
W76-09519 5C

YANG, H. C.
On the Extermination of Polyclads: Calcium Hypochlorite (CaOC12) Treatment in the Period of High Water Temperature, (In Korean),
W76-09801 5C

YANO, K.
Surveys on Radiation-Resistant Asporogenic Bacteria in Natural Environments,
W76-09519 5C

YEH, W. W-G.
A Proposed Algorithm for the Solution of the Large-Scale Inverse Problem in Groundwater,
W76-09850 2F

YORKE, T. H.
Storm-Period Variables Affecting Sediment Transport from Urban Construction Areas,
W76-09840 2J

Ten Years of Experience with Automatic Pumping-Sediment Samplers,
W76-09843 7B

Urban-Area Sediment Yield--Effects of Construction-Site Conditions and Sediment-Control Methods,
W76-09841 4D

YOSHINAKA, T.
Surveys on Radiation-Resistant Asporogenic Bacteria in Natural Environments,
W76-09519 5C

ZAMANMURAD, KH.
Evaporation from Highly Saline Soils in an Experimental Plot in the Turkmen SSR, (In Russian),
W76-09887 2D

ZAMARAEV, A. G.
The Water Supply System of Soil and Nitrogen Loss with Runoff Waters in Nonchernozem Areas, (In Russian),
W76-09794 2G

ZANZALARI, D.
Effect of Different Spring Soil Moisture Levels on Moisture Stress,
W76-09412 3F

ZARUBIN, G. P.
Study of the Effect of Iron on the Human Body and Living Conditions, (In Russian),
W76-09803 5C

ZIELINSKI, J.
Dissolved Oxygen Analyzer T-01 Analyzer. A Simple Apparatus for Electrochemical Determination of Dissolved Oxygen in Water (Tlenomierz T-01 uproszczony przyrzad elektrochemicznego oznaczania tleunu roxpuszczomego w roztworach wodnych),
W76-09688 5A

ZINTEL, G. V.
Ozone Provides Alternative for Secondary Effluent Disinfection. Part 1,
W76-09445 5D

Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

ZOHAR, Y.
Effects of Flooding and of Irrigation Water Salinity on Eucalyptus Camaldulensis Dehn. From Three Seed Sources,
W76-09664 3C

ZUBARIK, I.
Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

ZWOELFER, H.
Possibilities and Limitations in Biological Control of Weeds,
W76-09920 4A

ORGANIZATIONAL INDEX

AEROJET ELECTROSYSTEMS CO., AZUSA, CALIF.
Development of a Prototype Airborne Oil Surveillance System, Final Report,
W76-09898 5A

AFFORESTN. EROSION CONTROL EXPERIMENTAL STATION, SANDANSKI (BULGARIA).
Relationship of Heavy Rainfall to Soil Erosion in View of its Forecasting, (In Bulgarian),
W76-09807 2J

AGRICULTURAL RESEARCH COUNCIL, KIDLINGTON (ENGLAND). WEED RESEARCH ORGANIZATION.
Recent Trends in Weed Control in Freshwater,
W76-09921 4A

AGRICULTURAL RESEARCH SERVICE, FLORENCE, S. C. COASTAL PLAINS SOIL AND WATER CONSERVATION RESEARCH CENTER.
Crop Response to Chiseling and Irrigation in Soils with a Compact A2 Horizon,
W76-09985 3F

AGRICULTURAL RESEARCH SERVICE, OXFORD, MISS. SEDIMENTATION LAB.
Overview of the Urban Erosion and Sedimentation Processes,
W76-09731 4C

AGRICULTURAL RESEARCH SERVICE, WESLACO, TEX.
Field Drainage with Manifold Well Points,
W76-09586 5G

AGRICULTURAL UNIV., WAGENINGEN (NETHERLANDS). DEPT. OF MICROBIOLOGY.
The Relationship Between Dissimilatory Nitrate Reduction and Oxygen Uptake by Cells of an Alcaligenes Strain in Flocs and in Suspension and by Activated Sludge Flocs,
W76-09686 5D

AIR PRODUCTS AND CHEMICALS, INC., ALLENTOWN, PA. (ASSIGNEE).
Wastewater Treatment System with Controlled Mixing,
W76-09433 5D

AKADEMIA ROLNICZO-TECHNICZNA, OLSZTYN-KORTOWO (POLAND). INST. OF PLANT BIOLOGY.
The Vegetation of the 'Lukniany Lake' Nature Reserve in the Mazurian Lake District,(In Polish),
W76-09990 5C

AKADEMIYA NAUK ARMYANSKOI SSR, EREVAN. INSTITUT ZOOLOGY.
Comparative Evaluation of Food Plants of the Ararat Cochineal Scale (Porphyrophora Hamelii) (In Russian),
W76-09406 2I

AKADEMIYA NAUK SSSR, BOROK. INST. OF BIOLOGY INLAND WATERS.
The Role of Microflora in the Productivity of a Salmon Breeding Lake, (In Russian),
W76-09818 5C

AKADEMIYA NAUK SSSR, LENINGRAD. INSTITUTE OF LAKES KEEPING.
Iron-Manganese Microorganisms Studied by Overgrowing Technique, (In Russian),
W76-09813 5A

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT MIKROBIOLOGII.
'Toxic' or 'Poisonous' Water, (In Russian),
W76-09932 5C

AKADEMIYA NAUK URSR, KIEV. INSTITUT FIZIOLOGII RASTENII AND AGROKHIMII.
Effectiveness of Water Utilization by Plants, (In Ukranian),
W76-09809 2D

AKADEMIYA NAUK URSR, KIEV. INSTYTUT HIDROBIOLOGII.
Effect of Heated Water Discharge of Thermal and Nuclear Power Plants on Invertebrates of Cooling Ponds, (In Russian),
W76-09811 5C

AKZO RESEARCH LAB., ARNHEM (NETHERLANDS).
Methods for Measurement of Biodegradability of Chemical Compounds,
W76-09599 5C

ALABAMA UNIVERSITY, UNIVERSITY. DEPARTMENT OF CHEMICAL ENGINEERING.
Hydrodynamic and Material Transport Model for Mobile Bay, Alabama,
W76-09983 5B

ALBERTA UNIV., EDMONTON. DEPT. OF CIVIL ENGINEERING.
Modeling of Meandering and Braiding in Rivers,
W76-09974 2J

ALFRED P. SLOAN SCHOOL OF MANAGEMENT, CAMBRIDGE, CAMBRIDGE MASS.
A Probabilistic Model of the Oil and Gas Discovery Process,
W76-09604 6A

ALLGEMEINE ELEKTRICITAETS-GESELLSCHAFT, AEG-TELEFUNKEN, HAMBURG (WEST GERMANY).
Practical Aspects of the Pasteurization of Sewage Sludge by Electron Irradiation,
W76-09540 5D

AMERICAN COLLOID CO., SKOKIE, ILL. (ASSIGNEE).
Method and Composition for Preventing Water Contaminated with Industrial Waste from Seeping Through Soil Containing Said Water,
W76-09858 5G

AMERICAN CYANAMID CO., STAMFORD, CONN. (ASSIGNEE).
Cationic Acrylamide-Styrene Copolymers and Flocculation of Sewage Therewith,
W76-09434 5D

AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK.
Symposium on Modeling Techniques, Volume I.
W76-09941 2A

ANDHRA UNIV., WALTAIR (INDIA). DEPT. OF METEOROLOGY AND OCEANOGRAPHY.
On The Rainfall and Water Potential of Nepal,
W76-09642 2B

AQUEONICS, INC., LOS ALTOS, CALIF.
The Need for the Use of High-Level Radiation in Water Treatment and in Waste-Water (Sewage) Treatment,
W76-09518 5D

ARCTEC, INC., COLUMBIA, MD.
St. Lawrence Seaway: A New Goal of Year-Round Navigation,
W76-09942 2C

ARIZONA UNIV., TUCSON.
Arizona Energy: A Framework for Decision.
W76-09484 6D

ARIZONA UNIV., TUCSON. COLLEGE OF ENGINEERING, ENGINEERING EXPERIMENT STATION.
Power Generation in Arizona and Its Environmental Implications,
W76-09485 6D

ARIZONA UNIV., TUCSON. DEPT. OF AGRICULTURAL ECONOMICS.
Cost of Producing Crops in the Irrigated Southwest, Part II: New Mexico,
W76-09475 3F

Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-09633 6D

A Linear Programming Model for Use in Guiding Urban Floodplain Management,
W76-09849 6F

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Identification of Linear Systems Response by Parametric Programing,
W76-09575 2E

ARIZONA UNIV., TUCSON. DEPT. OF MANAGEMENT.
Maximum Information Obtainable from Inadequate Design Data: from Multivariate to Bayesian Methods,
W76-09625 4A

ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.
Distribution of Ponderosa Pine Forest Densities on the Salt-Verde River Basin,
W76-09477 4A

ARMY ENGINEER DISTRICT, LOUISVILLE, KY.
Relationship of Rational and Unit Graph Methods in Retention Basin Design,
W76-09732 4C

ARMY ENGINEER DISTRICT, SAN FRANCISCO, CALIF.
Results of Salinity Tests on the San Francisco Bay-Delta Hydraulic Model,
W76-09978 2L

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Modeling Sediment Movement for Masonboro Inlet,
W76-09956 2L

Masonboro Inlet Fixed-Bed Model Evaluation,
W76-09957 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. HYDRAULICS LAB.
Some Hard Lessons in Numerical Hydraulics,
W76-09952 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. RIVER REGULATION BRANCH.
Physical Modeling Techniques Used in River Models,
W76-09972 2E

ARMY FACILITIES ENGINEERING SUPPORT AGENCY, FORT BELVOIR, VA. RESEARCH AND TECHNOLOGY DIV.
Gamma Irradiation for Sewage Treatment at US Army Facilities,
W76-09525 5D

ASSOCIATION EURATOM-ITAL, WAGENINGEN (NETHERLANDS).
Effects of Gamma Radiation at Pilot Plant Level Compared with the Effects of Pasteurization on the Dewatering of Sewage Sludge,
W76-09550 5D

ATHENS UNIV. (GREECE). CHAIRE HYGIENE EPIDEMIOLOGY.
Isolation of Water Vibrios in Greece, (In French),
W76-09601 5A

ATOMIC ENERGY COMMISSION, WASHINGTON, D. C.
Considerations in the Public Acceptance of Sewage Sludge Irradiation Systems,
W76-09543 5D

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL (ENGLAND).
Radiation Treatment of Wastes, A Review,
W76-09517 5D

AUBURN UNIV., ALABAMA. DEPT. OF CHEMICAL ENGINEERING.
Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

AUCKLAND UNIV., (NEW ZEALAND).
Microbial Reactions in Facultative Oxidation Ponds -- I. The Anaerobic Nature of Oxidation Pond Sediments,
W76-09435 5D

AUCKLAND UNIV., (NEW ZEALAND). DEPT. OF CIVIL ENGINEERING.
Wastewater Treatment in New Zealand,
W76-09670 5D

AUSTRALIAN NATIONAL UNIV., CANBERRA. DEPT. OF ENVIRONMENTAL BIOLOGY; AND AUSTRALIAN NATIONAL UNIV., CANBERRA. RESEARCH SCHOOL OF BIOLOGICAL SCIENCES.
Drought Adaptations in Two Californian Evergreen Sclerophylls,
W76-09476 2I

AUSTRALIAN NATIONAL UNIVERSITY, CANBERRA, DEPARTMENT OF DEMOGRAPHY.
The Sahelian Drought and Its Demographic Implications,
W76-09486 6G

BADISCHE ANILIN- UND SODA-FABRIK A. G., LUDWIGSHAFEN AM RHEIN (WEST GERMANY). LANDWIRTSCHAFTLICHE VERSUCHSSTATION.
The Leaching Behavior of Different Nitrogen Sources in Lysimeter Experiments, (In German),
W76-09793 2G

BALFOUR (D.) AND SONS, LONDON (ENGLAND).
Objectives and Costs of Advanced Treatment Techniques for Sewage,
W76-09449 5D

BATELLE-INSTITUT E.V., FRANKFURT AM MAIN, (WEST GERMANY).
Use of Sewage Sludge as Fodder,
W76-09554 5D

BATTELLE MEMORIAL INST., RICHLAND, WASH.
Undistorted Movable-Bed Model Study for a River and Power Plant Intake System,
W76-09971 8B

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH. WATER AND LAND RESOURCE DEPT.
Steady-State Method of Measuring Unsaturated Hydraulic Conductivity,
W76-09924 2G

BAYERISCHE LANDESANSTALT FUER BODENKULTUR PFLANZENBAU UND PFLANZENSCHUTZ, MUNICH (WEST GERMANY).
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Results on the Effect of Differently Treated Sewage Sludge on Plants and Soil,
W76-09551 5D

BEAS DESIGNS ORGANIZATION, NANGAL (INDIA).
Construction Planning of a Hydro Power Station,
W76-09616 8C

BECHTEL, INC., SAN FRANCISCO, CALIF. ENVIRONMENTAL WATER PROJECTS DEPT.
A Guide to the Selection of Cost-Effective Wastewater Treatment Systems,
W76-09772 5D

BELLAIRS RESEARCH INST., ST. JAMES (BARBADOS).
Organic Productivity of Inshore and Offshore Waters of Barbados: A Study of the Island Mass Effect,
W76-09938 5C

BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA).
Synergistic Effects of Atmospheric Releases of Radioactive Gases and SO2 in Inducing Nucleation in the Atmosphere,
W76-09500 5A

BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA). BIOCHEMISTRY AND FOOD TECHNOLOGY DIV.
Scope for Utilizing Gamma Radiation for Microbiological Control of Sewage Waste-Water in India,
W76-09526 5D

BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA). HEALTH PHYSICS DIV.
Impact of Thermal and Radioactive Effluents on a Tropical Nearshore Ecosystem,
W76-09492 5C

BHARAT HEAVY ELECTRICALS LTD., HARDWAR (INDIA).
Operation of Hydrogenerator as Synchronous Condensor,
W76-09637 8C

BIO-KINETICS INC., SAN RAFAEL, CALIF. (ASSIGNEE).
Waste Purification System,
W76-09431 5D

BIOLOGO-GEOGRAFICHESKII NAUCHNO-ISSLEDOVATELSKII INSTITUT, IRKUTSK (USSR).
Rotifer Production in Lake Baikal, (In Russian),
W76-09791 5C

BLUME (JOHN A.) AND ASSOCIATES RESEARCH DIV., SAN FRANCISCO, CALIF.
Engineering and Ecological Evaluation of Artificial-Island Design, Rincon Island, Punta Gorda, California,
W76-09903 2L

BME INSTITUTE FOR WATER RESOURCES AND HYDRAULICS, BUDAPEST (HUNGARY).
Hydrologic Systems Analysis Model for Generating Runoff Time Series (Hidrologiai) Rendszervizsgalati Modell Vizhozamidoser Eloallitasara (II. RESZ),
W76-09557 2A

BROOKHAVEN NATIONAL LAB. UPTON, N.Y. ENERGY SYSTEMS ANALYSIS GROUP.
Energy Projections--Relationship to Policy Issues,
W76-09603 6A

Coupled Energy System-Economic Models,
W76-09605 6A

CAEN UNIV. (FRANCE). LABORATOIRE DE PHYSIOLOGIE VEGETALE.
Salinity Tolerance of Inland Halophytic Vegetation of North America,
W76-09988 3C

CALIF. STATE COLL., ROHNERT PARK.
Volume Changes in Swelling Clays,
W76-09881 2G

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, SACRAMENTO.
Laboratory Centrifuge Saves Time and Money,
W76-09704 5D

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Energy Modeling and Forecasting.
W76-09602 6A

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.; AND CALIFORNIA ENERGY AND ENVIRONMENT DIV.
Aqueduct Optimization with Intermediate Storage,
W76-09636 4A

CALIFORNIA UNIV., BERKELEY. SPACE SCIENCES LAB.
Application of Real-Time Mass Spectrometric Techniques to Environmental Organic Geochemistry. I. Computerized High Resolution Mass Spectrometry and Gas Chromatography-Low Resolution Mass Spectrometry,
W76-09687 5A

CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND ENGINEERING.
A Three-Dimensional Galerkin Finite Element Solution of Flow Through Multiaquifers in Sutter Basin, California,
W76-09562 2F

On the Capacity-Expansion of Desalination Plants and Storage Tanks,
W76-09618 3A

'ALIFORNIA UNIV., DAVIS. DEPT. OF OOLOGY.
Underwater Observations of Gelatinous Zooplankton: Sampling Problems, Feeding Biology, Land Behavior,
W76-09598 5C

'ALIFORNIA UNIV., IRVINE.
Environmental Quality Research, First Annual Report,
W76-09654 5C

'ALIFORNIA UNIV., LOS ANGELES. DEPT. OF ENGINEERING SYSTEMS.
A Proposed Algorithm for the Solution of the Large-Scale Inverse Problem in Groundwater,
W76-09850 2F

'ALIFORNIA UNIV., LOS ANGELES. LAB. OF NUCLEAR MEDICINE AND RADIATION BIOLOGY.
Contribution of Salts to the Water Potential of Woody Plants,
W76-09691 3C

'ALIFORNIA UNIV., RIVERSIDE. DEPT. OF ENTOMOLOGY.
Insect Growth Regulators for the Control of Aquatic Midges,
W76-09997 5G

Planting Pattern, Plant Population, Irrigation, and Insect Interactions in Cotton.
W76-09998 3F

CALIFORNIA UNIV., SANTA BARBARA, MARINE SCIENCE INST.
Oil Spill and Oil Pollution Reports, November 1974 - February 1975,
W76-09896 5A

CAMBRIDGE UNIV. (ENGLAND). DEPT. OF ENGINEERING.
Transverse Forces on Vertical Cylinders in Waves,
W76-09583 8B

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Verification of Numerical Models of Lake Ontario, III. Longterm Heat Transports,
W76-09783 2H

Lead Orthophosphates: III. Stabilities of Fluorophyromorphite and Bromopyromorphite at 25 C,
W76-09820 2K

Operational Model for Predicting the Movement of Oil in Canadian Navigable Waters,
W76-09908 5B

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO). APPLIED LIMNOLOGY AND PHYSICAL PROCESSES SECTION.
Phosphorus and Nitrogen Cycle on a Transect in Lake Ontario During the International Field Year 1972-1973 (IFYGL),
W76-09594 5C

CANADA CENTRE FOR REMOTE SENSING, OTTAWA (CANADA), DATA ACQUISITION DIV.
Airborne Detection and Mapping of Oil Spills, Grand Bahamas,
W76-09891 5A

CENTRAL CONTRA COSTA SANITARY DISTRICT, WALNUT CREEK, CALIF. (ASSIGNEE).
Sewage Treatment Process,
W76-09422 5D

CENTRAL GROUND WATER BOARD, NAGPUR (INDIA).
Influence of Hydraulic Trough and Lateral Joints on the Groundwater Potential of the Massive Trap Unit at Tanoria in Shajapur District (MP),
W76-09614 4B

CHICAGO BRIDGE AND IRON CO., PLAINFIELD, ILL. MARINE RESEARCH AND DEVELOPMENT.
Modeling of Wind-Waves with Jonswap Spectra,
W76-09948 8B

CHICAGO UNIV., ILL. DEPT. OF THE GEOPHYSICAL SCIENCES.
Finite-Amplitude Baroclinic Disturbances in Downstream Varying Currents,
W76-09560 2L

CHILE UNIV., VINA DEL MAR. DEPARTAMENTO DE OCEANOLOGIA.
Studies of Phytoplankton Ecology in the Bay of Valparaiso: II. Phytoplankton 1970-1971, (In Spanish),
W76-09408 5A

CLEMSON UNIV., S.C. DEPT. OF ECONOMICS.
Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries.
W76-09766 5G

The Pollution Control Bond,
W76-09771 5G

CLINTON BOGERT ASSOCIATES, FORT LEE, N. J.
Combined Sewage Overflows - Frequency, Environmental Effects, and a Corrective Program,
W76-09741 5D

CLYDE RIVER PURIFICATION BOARD, GLASGOW(SCOTLAND).
Steroids in Effluents,
W76-09696 5A

COAST GUARD RESERVE, WASHINGTON, D.C. OFFICE OF RESEARCH AND DEVELOPMENT.
Coast Guard's Response to Spilled Oil,
W76-09915 5A

COAST GUARD, WASHINGTON, D.C. OFFICE OF MARINE ENVIRONMENT AND SYSTEMS.
Recommended Procedure for Developing Deepwater Ports Design Criteria,
W76-09907 5G

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colorado,
W76-09761 2F

Mathematical Modeling of Alluvial Channels,
W76-09968 8B

Riverbank Recessions for Power Plant Facilities,
W76-09973 8B

Modeling Sediment Transport in Hydraulic Structures,
W76-09975 2J

COLORADO UNIV., BOULDER. INST., OF BEHAVIORAL SCIENCE.
Landslide Hazard in the United States: A Research Assessment,
W76-09781 6F

COLORADO UNIV., DENVER.
Runoff Frequency Procedure for Synthetic Hydrograph Development,
W76-09733 2A

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA), DIV. OF ENVIRONMENTAL MECHANICS.
Stability Analysis of Infiltration,
W76-09588 2G

CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
Sedimentation Rates and Sediment Thickness in Lake Champlain,
W76-09759 2J

CORNELL UNIV., ITHACA, N. Y. DEPT. OF ENVIRONMENTAL ENGINEERING.
Least Cost Design of Activated Sludge Systems,
W76-09638 5D

CORNELL UNIV., ITHACA, N. Y. SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Optimal Ground Water Quality Management: Well Injection of Waste Waters,
W76-09511 5D

DAICEL LTD., OSAKA (JAPAN). (ASSIGNEE).
Supported Semi-Permeable Membranes,
W76-09863 3A

Semipermeable Membrane and Process for the Preparation Thereof,
W76-09864 3A

DAMES AND MOORE, LOS ANGELES, CALIF.
A Post Construction Survey of Several Man-made Islands Off the Coast of California,
W76-09911 2L

DANISH HYDRAULIC INST., COPENHAGEN. COMPUTATIONAL HYDRAULICS CENTER.
Systems Modeling of Stratified Fluids,
W76-09976 8B

DANISH HYDRAULIC INST., COPENHAGEN. COMPUTATIONAL HYDRAULICS CENTRE.
River and Estuary Modeling with the Siva System,
W76-09982 2A

DATA RESOURCES, INC., CAMBRIDGE, MASS.
Energy Policy and Economic Growth,
W76-09606 6A

DATA RESOURCES, INC., LEXINGTON, MASS.
The Use of Econometrics to Project Energy Demands,
W76-09611 6A

DEGREMONT, RUEIL-MALMAISON (FRANCE). (ASSIGNEE).
Apparatus for Treating Industrial and Domestic Waste Waters,
W76-09429 5D

DELAWARE UNIV., NEWARK. DEPT. OF CIVIL ENGINEERING AND MARINE STUDIES.
Particle-Laden Jets with Application to Ocean Dumping,
W76-09959 5B

DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.
Reverse Osmosis Process Using Crosslinked Aromatic Polyamide Membranes,
W76-09877 3A

DEPT. OF THE INTERIOR, WASHINGTON, D. C.
Preparation of Reverse Osmosis Membranes by Complete Evaporation of the Solvent System,
W76-09876 3A

DEVELOPMENT PLANNING AND RESEARCH ASSOCIATES, INC., MANHATTAN, KANS.
Economic Analysis of Effluent Guidelines: Grain Processing Segment of the Grain Mills Industry,
W76-09775 5G

Economic Analysis of Effluent Guidelines: Fertilizer Industry,
W76-09777 5G

Economic Analysis of Effluent Guidelines: Apple, Citrus and Potato Processing Segments of the Canned and Preserved Fruits and Vegetable Industry,
W76-09779 5G

DIVISION OF BIOMEDICAL AND ENVIRONMENTAL RESEARCH (USERDA), WASHINGTON, D. C.
Alternative High-Level Radiation Sources for Sewage and Waste-Water Treatment,
W76-09536 5D

DOW CHEMICAL U. S. A., MIDLAND, MICH. WASTE CONTROL DIV.
Organic Contaminants of Water,
W76-09689 5A

DUKE POWER CO., CHARLOTTE, N. C.
Physical Model of Discharge in a Two-Layer Stratified Ambient,
W76-09963 8B

DURHAM UNIV. (ENGLAND). DEPT. OF BOTANY.
An Assessment of Possible Pollution Effects Over a Century of the Benthic Marine Algae of Co. Durham, England,
W76-09595 5C

DYNEK CORP., PORT CHESTER, N.Y. (ASSIGNEE).
Domestic Water Filtration Apparatus,
W76-09862 5F

EAST CENTRAL OKLAHOMA STATE UNIV., ADA. SCHOOL OF ENVIRONMENTAL SCIENCE.
Nitrogen in the Subsurface Environment,
W76-09662 5B

EAST WORCESTERSHIRE WATERWORKS CO., BROMSGROVE (ENGLAND).
Modern Techniques of Waste Detection,
W76-09685 5F

EASTERN KENTUCKY UNIV., RICHMOND. DEPT. OF BIOLOGICAL SCIENCES.
Additional Observations on the Effects of Strip Mining on Small-Stream Fishes in East-Central Kentucky,
W76-09468 5C

ECODYNE CORP., LINCOLNSHIRE, ILL. (ASSIGNEE).
Sludge Removal System,
W76-09416 5D

ECOLE POLYTECHNIQUE DE MONTREAL (QUEBEC).
Disaggregation Models in Hydrology Revisited,
W76-09573 2A

ECOLOTROL, INC., BETHPAGE, N. Y. (ASSIGNEE).
Waste Treatment Apparatus,
W76-09432 5D

EDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND). INST. FOR AQUATIC SCIENCES AND WATER POLLUTION CONTROL.
Aqueous Radiation Chemistry in Relation to Waste Treatment, An Introductory Review,
W76-09529 5D

Comparison of the Chemical Effects of Oxone and of Irradiation on Organic Impurities in Water,
W76-09535 5D

Costs and Hygienic Necessity of Sewage Sludge Pasteurization in Switzerland,
W76-09542 5D

EDGEWOOD ARSENAL, ABERDEEN PROVING GROUND, MD. BIOMEDICAL LAB.
Effects of Discharge from a Dredge Spoils Site on Carroll Island, Maryland,
W76-09647 5C

EIDGENOESSISCHE ANSTALT FUER WASSERVERSORGUNG, ABWASSERREINIGUNG UND GEWAESSERSCHUTZ, ZURICH (SWITZERLAND).
Sedimentation and Phosphorus Balance in Lake Lucerne (Horw Bay) and in the Rotsee, (In German),
W76-09790 5C

EIDGENOESSISCHES INSTITUT FUER REAKTORFORSCHUNG, WUERENLINGEN (SWITZERLAND).
Fission Product Gamma-Ray Sources as an Alternative to Cobalt-60 Sources for Sewage Sludge Sterilization,
W76-09541 5D

ELKEM-SPIGERVERKET A/S, OSLO (NORWAY). (ASSIGNEE).
Apparatus for Purification of Industrial Waste Water,
W76-09861 5D

ENERGY AND RESEARCH AND DEVELOPMENT ADMINISTRATION, WASHINGTON, D. C.
Characteristics of Coastal Circulation Affecting the Transport and Dispersion of Material Released from the Nuclear Industry,
W76-09504 5C

ENTE NAZIONALE PER L'ENERGIA ELETTRICA, MILAN (ITALY).
A Site Study of the Multiple Effects of Thermal Releases on the Aquatic Life in an Estuarine Area,
W76-09505 5C

ENTE NAZIONALE PER L'ENERGIA ELETTRICA, ROME, ITALY.
Evaluation of the Thermal Effects of a Nuclear Power Plant,
W76-09496 5C

Effect of Entrainment in Power Station Cooling Systems Studied Using Periphytic Communities,
W76-09498 5C

ENVIREX INC., MILWAUKEE, WIS. ENVIRONMENTAL SCIENCES DIV.
An Application of the Storm Water Management Model,
W76-09738 5D

ENVIRONMENTAL IMPACT CENTER, INC., NEWTON, MASS.
Secondary Effects of Public Investments in Highways and Sewers.
W76-09778 5G

ENVIRONMENTAL PREDICTION RESEARCH FACILITY, MONTEREY, CALIF.
Island Barrier Effects on Sea State as Revealed by a Numerical Wave Model and DMSP Satellite Data,
W76-09559 2L

ENVIRONMENTAL PROTECTION AGENCY, ATHENS, GA. SURVEILLANCE AND ANALYSIS DIV.
Application of Water Quality Models to Finger Fill Canals,
W76-09981 5B

ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO.
Plankton Analysis Training Manual.
W76-09782 5C

ENVIRONMENTAL PROTECTION AGENCY, MONTGOMERY COUNTY, MD. STORM WATER MANAGEMENT SECTION.
Watershed Management and Sediment Control in Montgomery County,
W76-09748 4D

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF PLANNING AND EVALUATION.
Economic Analysis of Effluent Guidelines: Insulation Fiberglass Industry.
W76-09780 5G

ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO).
Urban Drainage Studies,
W76-09402 5B

ENVIRONMENTAL QUALITY SYSTEMS, INC., ROCKVILLE, MD.
Preliminary Design of a Comprehensive Waste Oil Processing Facility,
W76-09894 5D

EXXON CORP., NEW YORK. CORPORATE PLANNING DEPT.
Energy Models and Forecasts: A User's Point of View,
W76-09612 6A

FLORENCE UNIV. (ITALY). DEPT. OF PHYSICAL CHEMISTRY.
A Simple Physicochemical Method of Detecting Traces of Surfactants in Water,
W76-09927 5A

FLORIDA INST. OF TECH., MELBOURNE.
Effects of Gamma Radiation from Co60 on Dilute Aqueous Solutions of Linear Alkyl Sulfonate Surfactants and other Organic Pollutants,
W76-09531 5D

FLORIDA INST. OF TECH., MELBOURNE. UNIV. CENTER FOR POLLUTION RESEARCH.
Synergistic Effects of Irradiation of Waste-Water.
W76-09524 5D

LORIDA STATE GAME AND FRESH WATER SH COMMISSION, EUSTIS. EUSTIS SHERIES RESEARCH LAB.
Comparative Effects of Diquat Plus Copper Sulfate on Aquatic Organisms,
W76-09821 5C

LORIDA UNIV., GAINESVILLE. DEPT. OF GRICULTURAL ENGINEERING.
Efficiency of Irrigation Methods for Strawberries,
W76-09897 3F

OREST SERVICE (USDA), BEREA, KY. ORTHEAST FOREST EXPERIMENT ATION.
Changes in Water Chemistry Resulting from Surface-Mining of Coal on Four West Virginia Watersheds,
W76-09470 4C

OREST SERVICE (USDA), BEREA, ORTHEASTERN FOREST EXPERIMENT ATION.
Requirements and Use of Fertilizer, Lime, and Mulch for Vegetating Acid Mine Spoils,
W76-09469 4D

OSTER WHEELER JOHN BROWN BOILERS TD., LONDON (ENGLAND). (ASSIGNEE).
Waste Treatment Plants,
W76-09427 5E

OUNDATION FOR OCEAN RESEARCH, SAN EGO, CALIF.
Anisotropic Sand Transport in Tidal Inlets,
W76-09955 2L

REEPORT PUBLIC WORKS, N. Y.
Polyethylene Pipe Insertion Rehabilitates Old Sewers,
W76-09459 8G

ANNETT FLEMING CORDDRY AND ARPENTER, INC., HARRISBURG, PA.
Activated Sludge Process with Alum Addition and Heat Treatment,
W76-09456 5D

ANNETT, FLEMING, CORDDRY AND ARPENTER, INC., HARRISBURG, PA. OLLUTION CONTROL DIV.
New York Takes Another Giant Step,
W76-09710 5D

ATES (W. E.) AND ASSOCIATES, INC., AIRFAX, VA.
Wastewater Sludge Utilization and Disposal Costs,
W76-09773 5D

EALER (SAUL), LOS ANGELES, CALIF. SSIGNEE).
Water Treatment Process and Apparatus,
W76-09855 5D

ELLSCHAFT FUER STRAHLEN- UND MWELTFORSCHUNG M.B.H., NEUHERBERG EI MUNICH (WEST GERMANY). INSTITUT UER STRAHLENSCHUTZ.
Dosimetry at a High-Activity Co60 Waste Treatment Facility,
W76-09547 5D

ENERAL SIGNAL CORP., ROCHESTER, N. Y. SSIGNEE).
Stabilization of Waste Material,
W76-09425 5D

EOLOGICAL SURVEY, AUSTIN, TEX.
Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1974,
W76-09829 7C

GEOLOGICAL SURVEY, BALTIMORE. MARYLAND
Research and Investigation of Geology, Mineral, and Water Resources of Maryland.
W76-09565 4A

Differentiation of Serpentinitic from Non-Serpentinitic Ultramafic Rocks in ERTS-1 MSS Imagery,
W76-09566 4A

Observation of Linear Features in the Maryland Piedmont as Shown on ERTS-1 MSS Imagery and Aircraft Support Photography,
W76-09567 4A

Maryland Chesapeake Bay Beaches - General Distribution and Classification,
W76-09568 2L

The Relationship of the Nearshore Longshore Bar and Sand Waves at Ocean City, Maryland,
W76-09569 2L

Linear Distribution of the High Marsh Vegetation Communities of the Lower Eastern Shore and its Geological Significance,
W76-09570 2L

GEOLOGICAL SURVEY, BAY SAINT LOUIS, MISS.
Determination, Storage, and Preservation of Low Molecular Weight Hydrocarbon Gases in Aqueous Solution,
W76-09834 2K

GEOLOGICAL SURVEY, CHEYENNE, WYO.
Water-Resources Investigations of the U.S. Geological Survey in the Major Coal and Oil Shale Areas of Wyoming, 1975-76,
W76-09833 4A

GEOLOGICAL SURVEY, COLO.
Cenozoic Deposits of Southeastern New Mexico and an Outline of the History of Evaporite Dissolution,
W76-09837 2J

GEOLOGICAL SURVEY, DENVER, COLO.
Appraisal of Water Resources of Northwestern El Paso County, Colorado,
W76-09828 2E

Operation and Maintenance of a Deep-Well Water-Level Measurement Device, 'The Iron Horse',
W76-09835 4B

GEOLOGICAL SURVEY, HARRISBURG, PA.
Hydrology and Sedimentation of Bixler Run Basin, Central Pennsylvania,
W76-09830 2J

GEOLOGICAL SURVEY, LAWRENCE, KANS.
Variation and Causative Factors of Sediment Yields in the Arkansas River Basin, Kansas,
W76-09839 2J

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Proposed Revision to the Modified Einstein Method of Computing Total Sediment Discharge,
W76-09842 2J

GEOLOGICAL SURVEY, PARKVILLE, MD.
Storm-Period Variables Affecting Sediment Transport from Urban Construction Areas,
W76-09840 2J

Urban-Area Sediment Yield--Effects of Construction-Site Conditions and Sediment-Control Methods,
W76-09841 4D

Ten Years of Experience with Automatic Pumping-Sediment Samplers,
W76-09843 7B

GEOLOGICAL SURVEY, RESTON, VA.
Regression Analysis and Parameter Identification,
W76-09824 7A

Reconnaissance Map Showing Relative Amounts of Soil and Bedrock in the Mountainous Part of the Morrison-Evergreen Quadrangles and Adjoining Areas to the West in Jefferson County, Colorado,
W76-09825 7C

Hydrologic Unit Map--1974, State of Alaska,
W76-09826 7C

Hydrologic Unit Map--1974, State of Oregon,
W76-09827 7C

A Primer on Floodplain Dynamics,
W76-09831 2E

Geochemical and Isotopic Analyses of Waters Associated with the Edwards Limestone Aquifer, Central Texas,
W76-09836 2K

National Conference of District Chiefs, Albuquerque, New Mexico, September 28-October 3, 1975--Proceedings,
W76-09838 2A

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH.
Report of Water Levels in Selected Observation Wells in Utah--April 1976,
W76-09832 4B

GEOLOGICAL SURVEY, WASHINGTON, D. C.
Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W76-09622 4A

GEORGIA INST. OF TECH. ATLANTA. SCHOOL OF CIVIL ENGINEERING.
Remedial Measures for Urban Flood Peak Reduction,
W76-09736 2E

GEORGIA INST. OF TECHNOLOGY, ATLANTA.
Near-Field Jet Penetration and Reservoir Mixing,
W76-09962 8C

GESELLSCHAFT FUER STRAHLEN- UND UMWELTFORSCHUNG M.B.H., NEUHERBERG BEI MUNICH (WEST GERMANY). INSTITUT FUER OKOLOGISCHE CHEMIE.
Degradation of Persistent Organochlorine Pollutants by Gamma Radiation and its Possible use for Waste-Water Treatment,
W76-09534 5D

GILBERT ASSOCIATES, INC., READING, PA.
Sediment Deposition Model for Tarbela Reservoir,
W76-09970 2J

GOETTINGEN UNIV. (WEST GERMANY). INSTITUT FUER PFLANZENBAU UND PFLANZENZUECHTUNG.
Total Porosity and Pore Size Distribution in Untilled and Tilled Loess Soils, (In German),
W76-09939 2G

GOSUDARSTVENNYI MEDITSINSKII INSTITUT, ORENBURG (USSR).
Biological Production Processes in the Ural River, (In Russian),
W76-09919 5C

GREATER LONDON COUNCIL (ENGLAND).
The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

GRONINGEN RIJKSUNIVERSITEIT (NETHERLANDS). ENVIRONMENTAL ISOTOPES LAB.
Chemistry of Dissolved Inorganic Carbon in Estuarine and Coastal Brackish Waters,
W76-09597 2L

GULF OIL CANADA LTD., CALGARY (ALBERTA).
An Environmental Research Program for Drilling in the Canadian Beaufort Sea,
W76-09912 5G

HARSCO CORP., HARRISBURG, PA. (ASSIGNEE).
Sludge Control and Decant System,
W76-09419 5D

HARVARD UNIV., BOSTON, MASS. GRADUATE SCHOOL OF BUSINESS ADMINISTRATION.
Investment Sequencing, Allocation, and Learning in the Design of Water Resources Systems: An Empirical Application,
W76-09846 6A

HARVARD UNIV., CAMBRIDGE, MASS. BIOLOGICAL LABS.
Acid-Iron Waste as a Factor Affecting the Distribution and Abundance of Zooplankton in the New York Bight: I. Laboratory Studies on the Effects of Acid Waste on Copepods,
W76-09700 5C

HAWAII INST. OF GEOPHYSICS, HONOLULU; AND HAWAII UNIV., HONOLULU. DEPT. OF OCEANOGRAPHY.
The Role of Vertical Motion in the Heat Budget of the Upper Northeastern Pacific Ocean,
W76-09720 2L

HEBREW UNIV., JERUSALEM (ISRAEL); AND YISSUM RESEARCH DEVELOPMENT CO., JERUSALEM (ISRAEL). (ASSIGNEE).
Apparatus for Sewage Treatment and Wastewater Reclamation,
W76-09420 5D

HEBREW UNIV., JERUSALEM (ISRAEL). GRADUATE SCHOOL OF APPLIED SCIENCE AND TECHNOLOGY.
The Over-Exploitation of Groundwater Resources in Dry Regions,
W76-09479 4B

The Chemistry of Ozone in the Treatment of Water,
W76-09684 5F

HEBREW UNIV., REHOVOTH (ISRAEL). FACULTY OF AGRICULTURE.
Water Conservation in Arid-Zone Soils,
W76-09478 3B

Micro-Climate Effects on Water Use Efficiency by Plants in an Arid Climate,
W76-09480 3B

Water Utilization and Soil Salinity: Control in Arid Zone Agriculture,
W76-09482 3C

HOUSTON UNIV., TEX.
Water Use Policies and Power Plant Economics,
W76-09776 5G

HYDROLOGIC ENGINEERING CENTER. DAVIS, CALIF.
Use of the Computer Program 'STORM' for Analysis of the Quantity and Quality of Urban Storm Water Runoff,
W76-09740 5B

HYDROMATION FILTER CO., LIVONIA, MICH. (ASSIGNEE).
Method and Apparatus for Rejuvenating a Bed of Granular Filter Medium,
W76-09424 5D

HYDRONAUTICS, INC., LAUREL, MD.
Development of a Batchwise In-situ Regeneration Type Separator to Remove Oil from Oil-Water Suspensions,
W76-09895 5G

HYDROTECHNIC CORP., NEW YORK.
Is the Separation of Sewers Desirable,
W76-09739 5D

IBARAKI UNIV., MITO (JAPAN). FACULTY OF AGRICULTURE.
Environmental Pollution by Cadmium and Zinc Discharged from a Braun Tube Factory, (In Japanese)
W76-09405 5B

IBM THOMAS J WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N. Y.
Effect of Sequence Length n on the Choice of Assumed Distribution of Floods,
W76-09851 4A

ICHTHYOL. ASSOC., BERWICK, PA. ICTHYOLOGICAL ASSOCIATES, INC., BERWICK, PA.
Calculation of Water Temperatures in Clear Lake, Iowa,
W76-09879 5B

ILLINOIS STATE WATER SURVEY, URBANA.
A Procedure for Estimating Off-Site Sediment Damage Costs and an Empirical Test,
W76-09632 4A

The Distribution of Heavy Rainfall in a Major Urban Area,
W76-09734 2B

ILLUDAS - The Illinois Urban Drainage Area Simulator,
W76-09735 2E

ILLINOIS UNIV. AT URBANA-CHAMPAIGN.
Development of Laboratory Model Ecosystems as Early Warning Elements of Environmental Pollution,
W76-09643 5C

IMPERIAL VALLEY CONSERVATION RESEARCH CENTER, BRAWLEY, CALIFORNIA.
Redox Potential in Irrigated Desert Soils as an Indicator of Aeration Status,
W76-09488 2G

INDUSTRIAL ENVIRONMENTAL RESEARCH LAB., CINCINNATI, OHIO.
Assessment of Virus Removal by a Multi-Stage Activated Sludge Process,
W76-09676 5D

INSTITUT FUR ANGEWANDTE HYGIENE, MUNICH (WEST GERMANY).
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Bacterial and Parasitological Studies AfterIrradiation.
W76-09548 5D

INSTITUT FUR MEDIZINISCHE STRAHLENPHYSIK UND STRAHLENBIOLOGIE, KLINIKUM UNIVERSITATS, ESSEN, FEDERAL REPUBLIC OF GERMANY.
Interaction Mechanisms of Radioactive, Chemical and Thermal Releases from the Nuclear Industry, Methodology for Considering Co-Operative Effects,
W76-09491 5C

INSTITUT PASTEUR, LILLE (FRANCE). LABORATOIRE D'HYDROBIOLOGIE.
The Microbiological Pollution of North Sea and English Channel Shore, (In French),
W76-09657 5C

INSTITUT PASTEUR, PARIS (FRANCE). MEDICAL VIROLOGY LAB.
Practical Application of the Germicidal Power of Ultraviolet Irradiation to Drinking-water, (In French),
W76-09646 5F

INSTITUT ROYAL METEOROLOGIQUE DE BELGIQUE, BRUSSELS. HYDROLOGY SECTION.
Conceptual Hydrological Model for an Averaged-Sized Catchment Area, I. Concepts and Relationships,
W76-09579 2A

Conceptual Hydrological Model for an Average-Sized Catchment Area, II. Estimate of Parameters, Validity of Model, Application,
W76-09580 2A

INSTITUT., RUDJER BOSKOVIC, ZAGREB (YUGOSLAVIA).
Trace-Element Analysis Using X-Ray Emission Spectroscopy,
W76-09697 5A

INSTITUT ZA NUKLEARNE NAUKE BORIS KIDRIC, BELGRADE (YUGOSLAVIA).
Radiation Chemical Destruction of Phenol in Oxygenated Aqueous Solutions,
W76-09530 5D

INSTITUTE FOR WATER RESOURCES (ARMY), FORT BELVOIR, VA.
Hydroelectric Power Potential at Corps of Engineers Projects. Recommendations and Executive Summary,
W76-09764 6B

Hydroelectric Power Potential at Corps of Engineers Projects,
W76-09765 6B

INSTITUTE OF BIOLOGY OF THE SOUTHERN SEAS, SEVASTOPOL (USSR).
Marine Soil Pollution and Self-Purification, (In Russian),
W76-09789 5A

INSTITUTO ESPANOL DE OCEANOGRAFIE, MADRID (SPAIN).
The Mercury Content of Industrial Fish Products: Its Relative Variation with the Treatment (Cooking in Salt Water, Pickling and Fish Production), (In Spanish),
W76-09802 5C

INSTITUTO OSWALDO CRUZ, RIO DE JANEIRO (BRAZIL).
Balanidae as Pollution Indicators in the Bay of Guanabara, (In Portuguese),
W76-09823 5A

INSTITUTUL AGRONOMIC DR. PETRU GROZA, CLUJ (RUMANIA).
The Hygienic Quality of the Water in a Growing-Finishing Piggery, (In Romanian),
W76-09883 5B

INSTITUTUL DE MEDICINA SI FARMACIE, BUCHAREST (RUMANIA).
The Action of Some Pollutants on the Growth of Daphnia Magna Strauss, (In French),
W76-09937 5C

INSTITUTUL DE STUDII SI CERCETARI PEDOLOGIE, BUCHAREST (RUMANIA).
Studies on the Relationships Between Moisture and Suction in Some Soils of the Tisa Plain, (In Rumanian),
W76-10000 2G

INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA (AUSTRIA).
Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment,
W76-09490 5C

Cost Effectiveness of Release Prevention Controls for Tritium and Krypton-85,
W76-09506 5G

Radiation for a Clean Environment.
W76-09512 5D

INTERNATIONAL HYDROLOGICAL DECADE, NEW DELHI (INDIA). INDIAN NATIONAL COMMITTEE.
Design of Water Resources Project with Inadequate Data in India - General and Particular Case Studies,
W76-09621 4A

INTERNATIONAL PURIFICATION SYSTEMS, INC., ATLANTA, GA.
Pilot Plant Experience in the Treatment of Industrial and Municipal Waste-Water by Means of Radiation-Induced Oxidation,
W76-09545 5D

INTERSTATE SECURITIES CORP., CHARLOTTE, S.C.
Role of the Underwriter in Tax Exempt Financing for Industrial Expansion and Pollution Control,
W76-09768 5G

IOWA STATE UNIV., AMES. DEPT. OF BOTANY AND PLANT PATHOLOGY.
Improving Water Quality by control of Algae: Cellular and Extracellular Blue-Green Algal Polysaccharides,
W76-09760 5G

IOWA UNIV., IOWA CITY. DEPT. OF ECONOMICS.
Physical and Economic Aspects Associated with Runoff from Urban Growth: A Methodological Approach,
W76-09749 4C

IOWA UNIV., IOWA CITY. INST. OF HYDRAULIC RESEARCH.
Longitudinal Dispersion Coefficients for Streams,
W76-09589 5B

IRRIGATION AND POWER RESEARCH STATION, AMRITSAR (INDIA).
Scope of Tidal Power from Indian Estuaries,
W76-09639 2L

ISRAEL ATOMIC ENERGY COMMISSION, YAVNE. SOREQ NUCLEAR RESEARCH CENTRE.
Potential of Radiation Sterilization in Solid Waste Treatment, A Status Report,
W76-09555 5D

ISTITUTO DI CHIMICA GENERALE E INORGANICA PAVIA (ITALY). LABORATORIO CHIMICA ANALITICA.
Oscillopolarographic Determination of Cyanide in Waste Electroplating Industrial Effluents,
W76-09822 5A

JAPAN GLOSAS PROJECT COMMITTEE, TOKYO.
Joint USA/Japan Project on Global Systems Analysis and Simulation (GLOSAS) of Energy, Resources, and Environmental (ERE) Systems,
W76-09610 6A

JET AERATION CO., CLEVELAND, OHIO. (ASSIGNEE).
Sewage Treatment Tank and Tube Settler,
W76-09417 5D

JET PROPULSION LAB., PASADENA, CALIF.
Carbon Wastewater Treatment Process,
W76-09441 5D

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF EARTH AND PLANETARY SCIENCES.
Wave Breaking in the Presence of Wind Drift and Swell,
W76-09874 2L

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF GEOGRAPHY AND ENVIRONMENTAL ENGINEERING.
Water System Behavior: Determinants in an Arid Region,
W76-09483 4A

Environmental Responses to Thermal Discharges from the Chesterfield Station, James River, Virginia,
W76-09652 5C

JUNTA ENERGIA NUCLEAR, MADRID (SPAIN). DIVISION OF QUIMICA.
Effecto De La Temperatura De Aclimatacion Sobre La Proliferacion De Precursores Eritropoyeticos En Carassius Auratus, (The Effect of Acclimation Temperature on Proliferation of Erythropoietic Precursors in Carrassius Auratus and on the Uptake of Tritiated Thymidine in Haematopoietic and Intestinal Tissue),
W76-09509 5C

JUTE AGRICULTURAL RESEARCH INST., BARRACKPORE (INDIA). MYCOLOGY AND PLANT PATHOLOGY DIV.
Meteorological Factors and Disease Expressions in Jute,
W76-09931 3F

KAGOSHIMA UNIV. (JAPAN). LAB OF MARINE BOTANY AND ENVIRONMENTAL SCIENCES.
The Heavy Metal Concentrations in the Waters Along the Coast of Fukuyama, (In Japanese),
W76-09815 5A

KARLSRUHE UNIV. (WEST GERMANY). INSTITUT FUER WASSERBAU III.
Accuracy of Reservoir Inflow Forecasts Based on Radar Rainfall Measurements,
W76-09574 2B

KAZAN INST. OF POSTGRADUATE MEDICINE (USSR).
Technique of Water Sampling in Sanitary Investigations of Large Bodies of Water, (In Russian),
W76-09928 5A

KAZANSKII GOSUDARSTVENNYI MEDITSINSKII INSTITUT (USSR).
Hygienic Standardization of Flotation Reagent BB-2 and its Components as Industrial Contaminants of Water Bodies, (In Russian),
W76-09886 5B

KENTUCKY UNIV. LEXINGTON, COLL. OF ENGINEERING.
National Symposium on Urban Rainfall and Runoff and Sediment Control,
W76-09729 4C

KENTUCKY UNIV., LEXINGTON. DEPT. OF AGRICULTURAL ENGINEERING.
Upward Water Movement in Field Cores,
W76-09726 3F

Overview of Rainfall-Runoff Process in Urban Areas,
W76-09730 2A

KENTUCKY WATER RESOURCES RESEARCH INST., LEXINGTON.
Hydrodynamic Separation of Solids from Solid-Liquid Mixtures,
W76-09716 5D

KERNFORSCHUNGSANLAGE JULICH, AACHEN, FEDERAL REPUBLIC OF GERMANY.
Possible Future Effects on the Population of the Federal Republic of Germany of Gaseous Radioactive Effluents from Nuclear Facilities,
W76-09499 5A

KERNFORSCHUNGSZENTRUM, KARLSRUHE (WEST GERMANY).
Discussion of Possible Effects Due to Mixing of Radioactive and Thermal Releases to the Atmosphere from Nuclear Power Plants,
W76-09502 5A

KIEL UNIV. (WEST GERMANY). ZOOLOGISCHES INSTITUT.
On the Ecology of Collembola and Oribatids in a Landsea Transition Zone (Collembola, Insecta-Oribatei, Acari) (In German),
W76-09635 2L

KIEV INST. OF NUTRITIONAL HYGIENE (USSR).
Determination of Microquantities of Naphthalene in Environmental Objects, (In Russian),
W76-09620 5A

KIEV MEDICAL PREPARATORY PLANT (USSR).
Gas-Liquid Chromatographic Determination of Butyl Acetate, Butanol and Acetone Present Together in Waste Waters, (In Russian),
W76-09929 5A

KIEV STATE UNIV. (USSR).
Induced Change of Nitrate Reductase Activity in Microcystis Aeruginosa Kutz. Emend. Elenk, (In Russian),
W76-09816 5C

KIRGHIZ STATE UNIV., FRUNZE (USSR).
Sugar Beet Photosynthesis and Productivity Cultivated by Irrigated Farming in the Kirgiz SSR, (In Russian),
W76-09810 3F

KOEHLER-DAYTON, INC., NEW BRITAIN, CONN. (ASSIGNEE).
Sewage Treatment System,
W76-09854 5D

KYOTO UNIV., (JAPAN). FACULTY OF ENGINEERING.
Radiation Recycling Process of Waste Poly(Tetrafluorethylene) Scrap,
W76-09556 5D

LA FRANCE INDUSTRIES, S.C.
The Industrial Revenue Bond for Pollution Control: One Company's Perspective,
W76-09769 5G

LABORATOIRE DE RADIOECOLOGIE MARINE, CENTRE DE LA HAGUE, CHERBOURG, FRANCE, DEPARTEMENT DE PROTECTION.
Influence De La Temperature Sur La Contamination D'Especes Marines Par Le Fer-59, (Influence of Temperature on the Contamination of Marine Species by Iron-59),
W76-09494 5C

LABORATORIO NATIONAL DE HIDRAULICA, CARACAS (VENEZUELA).
Experience with a Small Scale, Highly Distorted Fixed Bed Model of the Lago Maracaibo Estuary,
W76-09979 2L

LANCASHIRE RIVER AUTHORITY (ENGLAND).
Investigations into the Yield of an Existing Surface Reservoir and Aquifer System,
W76-09631 3B

LANDESUNTERSUCHUNGSAMT FUER DAS GESUNDHEITSWESEN SUDBAYERN, MUNICH (WEST GERMANY).
Experience with a Pilot Plant for the Irradiation of Sewage Sludge, Experiments on the Inactivation of Viruses in Sewage Sludge after Radiation Treatment,
W76-09549 5D

LANGLEY HILL QUARRY, WOODSIDE, CALIF. (ASSIGNEE).
Sewage Septic System for a Plurality of Drain Fields,
W76-09430 5D

LAS CRUCES WATER QUALITY LAB., N. MEX.
How to Build a Better Bench Sheet,
W76-09701 5D

LAVAL UNIV., QUEBEC. DEPT. OF CIVIL ENGINEERING.
Principle of Management of Degenerated Inlets and Estuaries,
W76-09958 8B

LEIPZIG UNIV. (EAST GERMANY). BEREICH PFLANZENPHYSIOLOGISCHE MIKROBIOLOGIE.
The Effect of Silicon Oils on the Water Loss of Hordeum Vulgare L, (In German),
W76-09806 3B

LENINGRAD STATE MEDICAL INST. OF SANITATION AND HYGIENE.
Sanitary Inspection of Surface Waters Polluted with Aromatic Amino and Nitro-Compounds, (In Russian),
W76-09798 5A

LENINGRAD STATE PEDAGOGICAL INST. (USSR). DEPT. OF BOTANY.
Effect of Excess Soil Moisture on the Content of Phosphorus Compounds in Barley, (In Russian),
W76-09913 3F

LENINGRAD STATE UNIV. (USSR).
The Qualitative Organic Matter Composition of Some Marshy Soils of Nizhnevelikoretsk Plain, (In Russian),
W76-09888 2G

LIEGE UNIV. (BELGIUM). DEPT. OF BOTANY.
The Aquatic and Subaquatic Bryophytic Vegetation of the Belgian Part of the River Sambre, Related to Ecological Conditions and Water Pollution, (In French),
W76-09986 5C

LINDLEY AND SONS, INC., HINSDALE, ILL.
Municipal Storm Water Management Programs,
W76-09751 4A

LOTHIAN REGIONAL COUNCIL (SCOTLAND).
Development of Edinburgh's Sewage Disposal Scheme,
W76-09707 5D

LOUGHBOROUGH UNIV. OF TECHNOLOGY (ENGLAND). DEPT. OF CIVIL ENGINEERING.
A Study of Rotating-Disc Treatment Units Operating at Different Temperatures,
W76-09674 5D

LOUISVILLE UNIV., DEPT. OF BIOLOGY.
Effects of Petroleum Pollutants on Arctic Microbial Populations,
W76-09909 5C

LOUVAIN UNIV. (BELGIUM). LABORATOIRE D'ECOLOGIE VEGETALE.
Hydratability as a Parameter of Plant Water Potential, (In French),
W76-09918 2I

LYON-1 UNIV., VILLEURBANNE (FRANCE). DEPARTEMENT DE BIOLOGIE ANIMAUX ET ZOOLOGIE.
Changes in the Population of Cladocera and Copepoda in Three Fishponds of the Dombes, (In French),
W76-09995 2I

MAGYAR TUDOMANYOS AKADEMIA, TIHANY. BIOLOGICAL RESEARCH INST.
Primary Production in the Frozen Lake Balaton,
W76-09991 5C

The Primary Production of Phytoplankton in Lake Balaton April-September 1972,
W76-09992 5C

MANHATTAN COLL., BRONX, N. Y. DEPT. OF CIVIL ENGINEERING.
The Concentration of Dissolved Solids and River Flow,
W76-09577 5B

MARCONSULT, INC., SANTA MONICA, CALIF.
Development of a Boat and Helicopter Deployable Oil Slick Sampler,
W76-09892 5A

MARYLAND GEOLOGICAL SURVEY, BALTIMORE.
Visual Observation of the Suspended Sediments and Nearshore Ice Signatures in Chesapeake Bay,
W76-09571 2L

MARYLAND UNIV., COLLEGE PARK. DEPT. OF MICROBIOLOGY.
Microbial Degradation of Model Petroleum at Low Temperatures,
W76-09648 5C

MARYLAND UNIV., SOLOMONS. CHESAPEAKE BIOLOGICAL LAB.
Modeling the Chesapeake Bay and Tributaries: a Synopsis,
W76-09587 2L

MASSACHUSETTS INST. OF TECH. CAMBRIDGE.
Biological Effects of High-Energy Electron Irradiation of Municipal Sludge,
W76-09522 5C

Prospects for High-Energy Electron Irradiation of Waste-Water Liquid Residuals,
W76-09538 5D

Oil in the Arctic,
W76-09902 5C

MASSACHUSETTS INST. OF TECH. CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
A Flood Management Model for Urbanizing River Basins,
W76-09737 4C

Hybrid-Element Method for Water Waves,
W76-09945 8B

Sampling Network Design for Dispersion Verification,
W76-09961 5B

MASSACHUSETTS INST. OF TECH., CAMBRIDGE DEPT. OF CIVIL ENGINEERING; AND MASSACHUSETTS INST. OF TECH., CAMBRIDGE. RALPH M. PARSONS LAB. FOR WATER RESOURCES AND HYDRODYNAMICS.
Energy Dissipation on a Rough Slope,
W76-09582 8B

Wave Motions in an Offshore Harbor,
W76-09947 8B

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF MECHANICAL ENGINEERING.
New Technologies in Water Purification and Their Application to Arid Lands,
W76-09481 3A

MASSACHUSETTS INST. OF TECH. CAMBRIDGE. ENERGY LAB.
Energy Systems: Modeling and Policy Planning,
W76-09608 6A

Energy Consumption and Fuel Choice by Residential and Commercial Consumers in the United States,
W76-09609 6A

Temperature Predictions for Offshore Power Plants,
W76-09960 5B

ASSACHUSETTS INSTITUTE OF ECHNOLOGY, CAMBRIDGE, ASSACHUSETTS, DEPARTMENT OF UTRITUTION AND FOOD SCIENCE.
Viruses and Ionizing Radiation in Respect to Waste-Water Treatment,
W76-09520 5D

ASSACHUSETTS UNIV., AMHERST. DEPT. F FORESTRY AND WILDLIFE ANAGEMENT.
The Modified Fernow Frost Gage,
W76-09880 7B

ASSACHUSETTS UNIV., AMHERST. WATER ESOURCES RESEARCH CENTER.
A Floodplain Management Framework with Structural and Non-Structural Measures,
W76-09754 6F

CGILL UNIV., MONTREAL (QUEBEC). ARINE SCIENCES CENTRE.
Water Chemistry of the St. Lawrence Estuary,
W76-09581 5A

CMASTER UNIV., HAMILTON (ONTARIO). EPT. OF BIOLOGY.
Dependence of the Level of Nitrogenase Activity on the Water Content of the Thallus in Peltigera Canina, P. Evansiana, P. Polydactyla, and P. Praetextata,
W76-09916 5A

IEDITSINSKII INSTITUT, KIEV (USSR).
Experimental Effect of Boron on Anticarious Action of Fluorine in Drinking Water, (In Russian),
W76-09885 5F

IEKOROTH WATER CO. LTD., (ISRAEL). ESEARCH AND DESALTING DIV.; AND ECHNION - ISRAEL INST. OF TECH., HAIFA.
Optimal Operation of the Pumping Stations in the Kinnereth-Eshkol Section of the National Water Carrier,
W76-09629 4A

IENZEL AND CO., STUTTGART (WEST ERMANY). (ASSIGNEE).
Method of Operating a Purifying Plant and Tank for Practicing Said Method,
W76-09873 5D

IETCALF AND EDDY, INC., PALO ALTO, ALIF.
Costs of Wastewater Treatment by Land Application,
W76-09774 5D

IICHIGAN STATE UNIVERSITY, EAST ANSING. DEPT. OF GEOLOGY.
Gravity Geophysics for Groundwater Exploration in Glaciated Areas,
W76-09758 4B

IICHIGAN TECHNOLOGICAL UNIV., OUGHTON. DEPT. OF CIVIL ENGINEERING.
Effects of Shock Temperature on Biological Systems,
W76-09660 5C

MIDWEST RESEARCH INST. KANSAS CITY, MO.
Substitute Chemical Program - Initial Scientific and Minieconomic Review of Captan.
W76-09651 5C

MIKROBIOLOGIE INSTITUT MEDICAL FAKULTETI, LJUBLJANA (YUGOSLAVIA).
Is the Examination of Drinkable Water and Swimming Pools on Presence of Enteropathogenic E. Coli Necessary, (In German),
W76-09785 5C

MINNESOTA UNIV., MINNEAPOLIS. DEPT. OF GEOGRAPHY.
The Contribution of a Water Information System for Environmental Planning in Minnesota,
W76-09753 6G

MINNESOTA UNIV., ST. PAUL. DEPT. OF AGRICULTURAL AND APPLIED ECONOMICS.
Irrigation Systems in Taiwan: Management of a Decentralized Public Enterprise,
W76-09848 3F

MINNESOTA UNIV., ST. PAUL. FRESHWATER BIOLOGICAL RESEARCH FOUNDATION.
Metabolic Cycles for Toxic Elements in Aqueous Systems,
W76-09933 5C

MONTANA UNIV., MISSOULA, DEPT. OF ZOOLOGY.
Concentration of Heavy Metals in Sediments of a Hydroelectric Impoundment,
W76-09755 5A

MONTPELLIER-2 UNIV. (FRANCE). LABORATOIRE DE GENIE CHIMIQUE.
Development of a Measurement Method for the Total Activity Rate of Activated Sludge (Contribution a La Mise Au Point D'une Methode De Mesure Du Taux D'Activite Totale Des Boues Activees),
W76-09695 5D

MOSCOW STATE UNIV. (USSR). DEPT. OF SOIL PHYSICS AND RECLAMATION.
Effect of an Electric Current on Water Stability of the Structure of Salinized Solonetz, (In Russian),
W76-09804 2G

Method of Evaluating the Effectiveness of Techniques for Increasing the Resistance of Soils to Erosion, (In Russian),
W76-09805 4D

MOSKOVSKAYA SELSKOKHOZYAISTVENNAYA AKADEMIYA (USSR).
The Water Supply System of Soil and Nitrogen Loss with Runoff Waters in Nonchernozem Areas, (In Russian),
W76-09794 2G

Dependence of Pasture Grass Yield on Soil Moisture Level, (In Russian),
W76-09930 4A

MOSKOVSKII GOSUDARSTVENNYI MEDITSINSKII INSTITUT (I) (USSR).
Hygienic Standardization of Tin Dibutyl Diisooctylthioglycolate in Water Bodies, (In Russian),
W76-09797 5C

MOSKOVSKII GOSUDARSTVENNYI MEDITSINSKII INSTITUT (I) (USSR). DEPT. OF GENERAL HYGIENE.
Isolation of Salmonella from Sewage and Surface Waters, (In Russian),
W76-09411 5A

MOTOR-COLUMBUS CONSULTING ENGINEERS INC., BADEN (SWITZERLAND).
Synergistic Effects of Airborne Emissions from Nuclear Power Plants,
W76-09503 5A

MUNICH UNIV. (WEST GERMANY). INSTITUT FUER TIERPHYSIOLOGIE.
Pesticide and PCB Residue in Organs of Wild Animals as Indicators of Environmental Contamination, (In German),
W76-09922 5A

MUNICIPAL ENVIRONMENTAL RESEARCH LAB., EDISON, N.J. STORM AND COMBINED SEWER SECTION.
Give Stormwater Pollutants the Spin,
W76-09461 5D

MUSEUM NATIONAL D'HISTOIRE NATURELLE, PARIS (FRANCE). LABORATOIRE DES PECHES OUTRE-MER.
Quantitative Aspect of the Phytoplankton of the Bay Du Levrier (Mauritania), (In French),
W76-09987 5C

MYRENS VERKSTED A/S, OSLO (NORWAY). (ASSIGNEE).
Process and Apparatus for the Incineration of Aqueous Sewage Sludge,
W76-09428 5E

NAGOYA UNIV. (JAPAN). BIOLOGICAL INST.
Studies on the Metabolism of a Sulfur-Oxidizing Bacterium. VII. Purification and Characterization of Soluble Components Indispensables for Sulfur Oxidation by Thiobacillus Thiooxidans,
W76-09592 5C

NATAL PARKS BOARD, PIETERMARITZBURG, (SOUTH AFRICA).
Laboratory and Field Tests in the Revival of Fish Affected by Rotenone,
W76-09994 5C

NATIONAL ACADEMY OF SCIENCES, WASHINGTON, D. C.
Assessing Potential Ocean Pollutants,
W76-09889 5G

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, MOFFETT FIELD, CALIF. AMES RESEARCH CENTER.
Physiologic Responses to Water Immersion in Man: A Compendium of Research,
W76-09655 10C

NATIONAL COMMISSION ON WATER QUALITY, WASHINGTON, D. C.
Report to the Congress by the National Commission on Water Quality,
W76-09663 5G

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. ADVANCED WASTE TREATMENT RESEARCH LAB.
Methods for Reducing the Infection Hazard of Waste-Water Sludge,
W76-09514 5D

NATIONAL INST. FOR WATER RESEARCH, PRETORIA (SOUTH AFRICA).
Current Technology and Advances in True Re-Use of Effluents,
W76-09515 5D

NATIONAL MARINE FISHERIES SERVICE, HIGHLANDS, N. J. SANDY HOOK LAB.
The Effect of Temperature on the Behavior of Marine Fishes, a Comparison Among Atlantic Mackerel, Scomber Scombrus, Bluefish, Pomatomus Saltatrix, and Tautog, Tautoga Onitis,
W76-09507 5C

A Description of Atlantic Mackerel, Scomber Scombrus, Eggs and Early Larvae,
W76-09656 2I

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SEATTLE, WASH., PACIFIC MARINE ENVIRONMENTAL LAB.
Observations of the California Undercurrent Off Washington and Vancouver Island,
W76-09584 2L

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, TIBURON, CALIF. MARINE MINERALS TECHNOLOGY CENTER.
Environmental Impact Study of Offshore Sand and Gravel Mining,
W76-09910 6G

NATIONAL WATER QUALITY LAB., DULUTH, MINN.
The Role of Bioassays in Environmental Research,
W76-09644 5A

NATIONAL WEATHER SERVICE, CINCINNATI, OHIO. RIVER FORECAST CENTER.
Effect of Different Spring Soil Moisture Levels on Moisture Stress,
W76-09412 3F

Hydrologic Forecasting for the Ohio River Waterway,
W76-09944 2E

NATIONAL WEATHER SERVICE, SACRAMENTO, CALIF. RIVER FORECAST CENTER.
Forecasts for the Sacremento River System,
W76-09967 2E

NATL. PARKS BOARD, PIETERMARITZBURG, S. AFR.
Reaction Times of Certain Freshwater Fishes to a Rotenone-Containing Piscicide,
W76-09993 5C

NAVAL RESEARCH LAB., WASHINGTON, D.C. OCEAN SCIENCES DIV.
The Wind Drift and Wave Breaking,
W76-09724 2L

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, ANNAPOLID, MD.
Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume III,
W76-09901 5A

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, ANNAPOLIS, MD.
Determining the Concentration of Oil in Water Samples by Infrared Spectrophotometry. Phase II. Interlaboratory Study. Volume II,
W76-09900 5A

NAVY CIVIL ENGINEERING LAB., PORT HUENEME, CALIF.
The Coanda Effect Oil/Water Separator: A Development Study,
W76-09890 5G

NEBRASKA UNIV., LINCOLN. INST. OF AGRICULTURE; AND NEBRASKA UNIV., LINCOLN. DIV. OF NATURAL RESOURCES, CONSERVATION AND SURVEY.
Effects of Land Use and River Seepage on Groundwater Quality in Hall County, Nebraska,
W76-09728 5B

NEVADA UNIV., RENO. CENTER FOR WATER RESOURCES RESEARCH; AND NEVADA UNIV., RENO. DESERT RESEARCH INST.
Characterization of Nitrogen Sources Contaminating Shallow Ground Water in an Arid Basin. Las Vegas Area, Nevada,
W76-09762 5B

NEW BRUNSWICK UNIV., FREDERICTON, DEPT. OF GEOLOGY.
Exploration Rock Geochemistry-Detection of Trace Element Halo at Heath Steele Mines (N. B., Canada) by Discriminant Analysis,
W76-09473 2K

NEW MEXICO INST. OF MINING AND TECHNOLOGY, SOCORRO.
Sensitivity of Linear and Nonlinear Surface Runoff Models to Input Errors,
W76-09578 2A

NEW SOUTH WALES UNIV., KENSINGTON, AUSTRALIA. SCHOOL OF CIVIL ENGINEERING.
Parameter Optimization for Watershed Models,
W76-09853 2A

NEW YORK OCEAN SCIENCE LAB., MONTAUK.
Academic Data-Needs for Environmental Assessments of Offshore Technological Operations,
W76-09914 6G

NEW YORK STATE COLL. OF AGRICULTURE AND LIFE SCIENCES, ITHACA. DEPT. OF AGRICULTURAL ENGINEERING.
A Review and Analysis of Selected Hydrologic Modeling Concepts,
W76-09718 2E

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY.
NEPA and a State's Role in Water Resources Management,
W76-09627 6E

NEW YORK UNIV., MEDICAL CENTER, N. Y. INST. OF ENVIRONMENTAL MEDICINE.
Biological Effects of Simulated Discharge Plume Entrainment at Indianpoint Nuclear Power Station, Hudson River Estuary, USA,
W76-09497 5C

NIEDERSAECHSISCHE LANDESINSTITUT MARSCHEN UND WURTENFORSCH., WILHELMSHAVEN (WEST GERMANY).
The Algal Population of Duemmer Lake in the Years 1970/71, (In German),
W76-09812 5C

NIEDERSAECHSISCHES LANDESAMT FUER BODENFORSCHUNG, HANOVER (WEST GERMANY).
Investigations on the Erodibility of a Deeply Plowed Gray-Brown Podzolic Soil from Loess on a Slope by Means of Simulated Rain, (In German),
W76-09917 2J

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF CIVIL ENGINEERING.
River Delta Computer Simulation Model (Simudelt),
W76-09954 2L

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF SOIL SCIENCE.
Effect of Thinning on the Foliage and Forest Floor Properties of Ponderosa Pine Stands,
W76-09474 4A

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
Sensors for Continuous Monitoring of Toxic Ions, Nutrients, and Dissolved Gases in Water,
W76-09906 5A

NORTHEASTERN FOREST EXPERIMENT STATION, PENNINGTON, N.J.
Effects of Management Practices on Water Quality and Quantity: Baltimore, Maryland, Municipal Watersheds,
W76-09464 4D

Effects of Management Practices on Water Quality and Quantity: Newark, New Jersey, Municipal Watersheds,
W76-09465 4D

Watershed Response to Partial Area Applications of Simulated Rainfall,
W76-09467 2A

Forest Management Practices as Related to Nutrient Leaching and Water Quality,
W76-09471 4C

Municipal Watershed Management: What are the Opportunities,
W76-09472 4D

NORTHEASTERN UNIV., BOSTON, MASS. DEPT. OF CIVIL ENGINEERING.
Anaerobic Treatment of Leachate with High Sodium Concentrations,
W76-09641 5D

NUCLEAR REGULATORY COMMISSION, WASHINGTON, D.C. HYDROLOGIC ENGINEERING SECTION.
Two-Dimensional Model of Flow Toward Intakes,
W76-09965 2E

OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE-MER, N'DJAMENA (CHAD). DEPT. OF HYDROBIOLOGY.
Phytoplankton of the Saline Waters of Kanem (Chad): X. Conclusions, (In French),
W76-09596 2H

OHIO STATE UNIV., COLUMBUS.
Re-Evaluation of the Effects of Man-Made Modifications on Gordon Creek Between 1887 and 1973 and Especially as Regards its Fish Fauna,
W76-09407 4C

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF GEOGRAPHY.
Land Use Changes and Reservoir Development: An Application of Land Use Information Systems,
W76-09905 4A

OKLAHOMA UNIV., NORMAN.
The Design of Water Quality Management Projects with Inadequate Data,
W76-09623 5G

OREGON COLL. OF EDUCATION, MONMOUTH.
Cycling of Fe55 and Zn65 in Columbia River Carp Following Reactor Shutdown,
W76-09508 5C

OREGON STATE ENGINEER'S OFFICE, SALEM.
Monitoring Wells,
W76-09558 4B

OREGON STATE UNIV., CORVALLIS.
Probability Distributions of Breaking Wave Heights Emphasizing the Utilization of the Jonswap Spectrum,
W76-09721 2L

OREGON STATE UNIV., CORVALLIS. DEPT. OF CIVIL ENGINEERING.
Mathematical Model of Flow in a Stream-Aquifer System,
W76-09966 2E

OREGON STATE UNIV., NEWPORT. MARINE SCIENCE CENTER.
Pathology of Acute Poisoning with the Insecticide Sevin in the Bent-Nosed Clam, Macoma Nasuta,
W76-09649 5C

PACIFIC GAS AND ELECTRIC CO., SAN FRANCISCO, CALIF.
Energy Models and Forecasts: A User's Point of View,
W76-09613 6A

PACIFIC NORTHWEST ENVIRONMENTAL RESEARCH LAB., NEWPORT, OREG. MARINE SCIENCE CENTER.
Species Composition and Diversity of Polychaetes in the New York Bight,
W76-09650 5C

PALERMO UNIV., ITALY, ISTITUTO DI APPLICAZIONI E IMPIANTI NUCLEARI.
Possible use of High-Level Radiation for the Degradation of Some Substances Present in Urban and Industrial Waters,
W76-09533 5D

PARSON, BRINKERHOFF, QUADE AND DOUGLAS, INC., NEW YORK. (ASSIGNEE).
Combination Providing Safety Berthing, Unloading of Oil, and Conduit Carriage to Refineries on Land, of Large Deep-Sea-Requiring Tankers,
W76-09865 5G

PARSONS, BRINCKERHOFF, QUADE AND DOUGLAS, INC., NEW YORK.
Evaluation and Control of Soil Erosion in Urbanizing Watersheds,
W76-09742 4D

Management of Flood Control and Drainage in the Urbanizing Zone,
W76-09750 4A

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF ECONOMICS.
Water Authority Rate Making,
W76-09717 6C

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. INST. FOR RESEARCH ON LAND AND WATER RESOURCES.
Role of Carbonate Rocks in Modifying Flood Flow Behavior,
W76-09784 2A

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. SCHOOL OF FOREST RESOURCES.
Effects of Management Practices on Water Quality and Quantity: Penn State Experimental Watersheds,
W76-09463 4D

PERVOMAISK CHEMICAL PLANT (USSR).
Determination of Tetramethylthiuram Disulfide (TMTD) in Water and Air by Colimetry, (In Russian),
W76-09590 5A

PETERBOROUGH SEWAGE DIV. (ENGLAND).
Sludge Heat Treatment: Operation and Management,
W76-09708 5D

PHYLAXIA VACCINE AND FEEDSTUFF-PRODUCING ENTERPRISE, BUDAPEST (HUNGARY).
The Waste-Water and Sludge Re-Use Project by Gamma Irradiation at Kecskemet, Hungary, Some Approaches and Investigations,
W76-09544 5D

PLANUNGS-UND BETRIEBSBURE DES ABWASSERVERBANDES AMPERGRUPPE, EICHENAU (WEST GERMANY).
Experience with a Pilot Plant for the Irradiation of Sewage Sludge; Design, Operation Experience and Cost Calculations After 18 Months of Continuous Running,
W76-09546 5D

POERTNER (HERBERT G.), BOLINGBROOK, ILL.
Urban Stormwater Management--Problems, Solutions and Impact: A Summary of Interviews,
W76-09752 4C

POLITECNICO DI TORINO (ITALY). INSTITUTO DI CHIMICA INDUSTRIALE.
Effects of Gamma Irradiation on the Degradation of Dyes,
W76-09532 5D

POLYARNYI NAUCHNO-ISSLEDOVATELSKII I PROEKTNYI INSTITUT MORSKOGO RYNOGO KHOZYAISTVA I OKEANOGRAFII, MURMANSK (USSR).
Concentration of Cesium-137 in Aquatic Organisms, Water and Bottom Deposits of Water Bodies with a Different Mineral Compositions of the Water, (In Russian),
W76-09410 5C

POLYMER-PHYSIK G.M.B.H., CO., KG., TUEBINGEN (WEST GERMANY).
Disinfection of Sludge and Waste-Water by Irradiation with Electrons of Low Accelerating Voltage,
W76-09521 5D

An Electron Accelerator with Electrons of Low-Accelerating Voltage for Irradiating Sewage Sludge and Waste Water,
W76-09539 5D

PORTSMOUTH POLYTECHNIC (ENGLAND). DEPT OF BIOLOGICAL SCIENCES.
The Eradication of the Seaweed Sargassum Muticum from Britain,
W76-09989 5G

PUERTO RICO UNIV., MAYAQUEZ. DEPT. OF CIVIL ENGINEERING.
Evaluation of Mean Square Error Involved in Approximating the Areal Average of a Rainfall Event by a Discrete Summation,
W76-09572 2B

PUSAN FISHERIES COLL. (REPUBLIC OF KOREA).
An Observation of Water Quality and Red Water in Still Water Fish Ponds, (In Korean),
W76-09799 5C

RADIATION DYNAMICS, INC., WESTBURY, N. Y.
Use of High-Power Electron Beam Radiation for the Treatment of Municipal and Industrial Wastes,
W76-09537 5D

RAND CORP., SANTA MONICA, CALIF.
Diagnostic Model Study of Mixed-Layer Depths in the Summer North Pacific,
W76-09719 2L

Modeling of Three-Dimensional Flows in Estuaries,
W76-09977 2L

RAND CORP., SANTA MONICA, CALIF. CLIMATE DYNAMICS PROGRAM.
A Model for the Thermodynamic Growth of Sea Ice in Numerical Investigations of Climate,
W76-09722 2C

RAYMOND TECHNICAL FACILITIES INC., NEW YORK.
Concept Analysis: Offshore Breakwater-Oil Storage System,
W76-09904 8A

REACTOR CENTRUM NEDERLAND, PETTEN, N. H., THE NETHERLANDS.
The Effect of Temperature on the Uptake and Retention of Co 60 and Zn 65 by the Common Shrimp Crangon Crangon (L),
W76-09493 5C

READING UNIV. (ENGLAND). DEPT. OF ZOOLOGY.
Generation Time, Length of Life, Instar Duration and Frequency of Moulting, and their Relationship to Temperature in Eight Species of Cladocera from the River Thames, Reading,
W76-09658 5C

The Relationship Between Temperature and Duration of Egg Development in Some Epiphytic Cladocera and Copepoda from the River Thames, Reading, with a Discussion of Temperature Functions,
W76-09659 5C

REG. CENT., MANDAPAM CAMP, TAMIL NADU, INDIA, CENT. MAR. FISH. RES. INST.
Experiments on the Culture of the Large Snake-Head Ophicephalus Marulius (Hamilton),
W76-09487 8I

RESEARCH INST. OF PUBLIC WATER SUPPLY WATER PURIFICATION, MOSCOW (USSR).
Determination of Fluorine in Drinking Water with a Cerium(III)- or Lanthanum Alizarin Complex, (In Russian),
W76-09796 5A

RHODE ISLAND UNIV., KINGSTON. DEPT. OF RESOURCE ECONOMICS.
Offshore Petroleum and New England - A Study of the Regional Economic Consequences of Potential Offshore Oil and Gas Development,
W76-09893 6B

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Velocity Observations in the West Passage of Narragansett Bay: A Partially Mixed Estuary,
W76-09561 2L

Using a CHN Analyzer to Reduce Carbonate Interference in Particulate Organic Carbon Analyses,
W76-09940 5A

RHONE-POULENC, S.A., PARIS (FRANCE). (ASSIGNEE).
Membrane Support-Plates and Fluid Separating Apparatus in which They are Present,
W76-09857 5D

ROCKWELL INTERNATIONAL CORP., EL SEGUNDO, CALIF. (ASSIGNEE).
Removal of Phosphate from Waste Water,
W76-09458 5D

ROSTOV-ON-DON STATE UNIV. (USSR).
Bottom Deposits of the Kuban Deltaic Limans, (In Russian),
W76-09935 2L

ROYAL VETERINARY AND AGRICULTURAL COLL., COPENHAGEN (DENMARK). DEPT. OF VETERINARY VIROLOGY AND IMMUNOLOGY.
Public Health Aspects of Waste-Water Treatment,
W76-09516 5D

SANDIA LABS., ALBUQUERQUE, N. MEX.
Treatment of Sewage Sludge with Combinations of Heat and Ionizing Radiation (Thermoradiation),
W76-09523 5D

SHIMANE UNIV., MATSUE (JAPAN). FACULTY OF AGRICULTURE.
The Distribution of Coliforms in Fresh Water, (In Japanese),
W76-09934 5C

SIMON-HARTLEY LTD., STOKE-ON-TRENT, (ENGLAND).
Development of a Continuous Inclined Sand Bed Filter,
W76-09668 5D

SINKLER, GIBBS, SIMON AND GUERARD, CHARLESTON, S.C.
Presentation Concerning Pollution Control Facilities Revenue Bonds,
W76-09767 5G

SIOUX FALLS WATER DEPT. S. DAK.
Sioux Falls Restores Four Wells with Collector Pipe,
W76-09510 3B

SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
Evaluation of Combined Applications of Ultrafiltration and Complexation Capacity Techniques to Natural Waters,
W76-09690 5A

SLOVENSKA AKADEMIE VIED, BRATISLAVA CZECHOSLOVAKIA). LIMNOBIOLOGISCHES INSTITUT.
Presence and Some Properties of Bacteria of the Family Pseudomonadaceae in the River Danube, (In German),
W76-09792 5A

SOIL CONSERVATION SERVICE, COLLEGE PARK, MD.
Predicting Sediment Yield in Urban Areas,
W76-09746 4D

SOUTH CAROLINA DEPT. OF HEALTH AND ENVIRONMENTAL CONTROL, COLUMBIA.
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards,
W76-09703 5D

SOUTHEASTERN AREA STATE AND PRIVATE FORESTRY, ATLANTA, GA.
Summary of Municipal Watershed Management Surveys in Eastern United States,
W76-09466 4D

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT, EL SEGUNDO, CALIF.
Coastal Water Research Project. Annual Report for the Year Ended 30 June 1975,
W76-09899 5B

SPRING MILLS, GRACE, S.C.
Financing Pollution Control Projects in South Carolina Using Tax-Exempt Industrial Revenue Bonds,
W76-09770 5G

STAATLICHES MUSEUM FUER NATURKUNDE, LUDWIGSBURG (WEST GERMANY).
Possibilities and Limitations in Biological Control of Weeds,
W76-09920 4A

STANFORD UNIV., CALIF.
Hydrology for Engineers, Second Edition,
W76-09661 8B

STATE UNIV. OF NEW YORK AT BUFFALO. DEPT. OF CIVIL ENGINEERING.
The Influence of Urbanization on Stream Channel Behavior,
W76-09744 4C

STAVROPOL TERRITORIAL MEDICAL INST. (USSR).
Hygienic Assessment of Changes in Mineral Water Properties During its Treatment for Use in Internal Balneotherapeutic Procedures, (In Russian),
W76-09795 5C

STONE (RALPH) AND CO., INC., LOS ANGELES, CALIF.
Effluent Detention Ponds Dechlorinate Wastewater,
W76-09678 5D

STUTTGART UNIV. (WEST GERMANY). INSTITUT FUER SIEDLUNGSWASSERBAU UND WASSERGUETEWIRTSCHAFT.
Possibilities and Limits of Extended Waste Water Purification (Moeglichkeiten und Grenzen der Weitergehanded Abwasserreinigung),
W76-09683 5D

STUTTGART UNIV. (WEST GERMANY). INSTITUT FUER SIEDLUNGSWASSERBAU UND WASSERGUTE-WIRTSCHAFT.
Types and Treatment of Sewage Sludges Practice in the Federal Republic of Germany,
W76-09513 5D

SWEDISH ENVIRONMENT PROTECTION BOARD, STOCKHOLM, SWEDEN.
Swedish Studies on Combination Effects of Thermal Discharges in the Aquatic Environment, Some Aspects of Power Plant Siting Policy,
W76-09495 5C

TECHNION-ISRAEL INST. OF TECH., HAIFA.
Recent Advances in the Treatment of Solid Wastes,
W76-09553 5D

TECHNION - ISRAEL INST. OF TECH., HAIFA. LOWDERMILK FACULTY OF AGRICULTURAL ENGINEERING.
The Cost-Effectiveness of Water Resources Systems Considering Inadequate Hydrological Data,
W76-09626 6A

A Combined Model for Operating Irrigated Agricultural Systems Under Uncertainties,
W76-09634 3F

TECHNISCHE HOCHSCHULE, HANOVER (WEST GERMANY). FRANZIUS-INSTITUT FUER GRUND UND WASSERBAU.
Large Wave Channel for 'Full Scale-Modeling' of Wave Dynamics in Surf Zones,
W76-09946 8B

TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS). LAB. OF CHEMICAL ENGINEERING.
Anaerobic Treatment of Dilute Waste Waters,
W76-09673 5D

TECHNISCHE UNIVERSITAET, HANOVER (WEST GERMANY).
Advantages of Numerical Atmospheric Dispersion Calculations for Estimating Dispersal and Combination Effects of Stack Releases from the Nuclear Industry,
W76-09501 5A

TECHNISCHE UNIVERSITAET, MUNICH (WEST GERMANY). INSTITUT FUER RADIOCHEMIE. BAYERISCHE LANDESANSTALT FUER BODENKULTUR, PFLANZENSCHUTZ, MUNICH (WEST GERMANY).
Experience with a Pilot Plant for the Irradiation of Sewage Sludge. Analytical Studies on Sewage Sludge and Plant Material,
W76-09552 5D

TETRA TECH, INC., LAFAYETTE, CALIF.
Organic Sediment Model for Wastewater Outfall,
W76-09951 5B

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF OCEANOGRAPHY.
On Entrainment and Diffusion in a Gulf of Mexico Anticyclonic Ring,
W76-09723 2L

EXAS DEPT. OF COMMUNITY AFFAIRS, USTIN.
Changes in the Sedimentation Characteristics of an Urbanizing Watershed, Dallas and Collin Counties, Texas,
W76-09745 4C

EXAS DEPT. OF HEALTH RESOURCES, USTIN. DIV. OF WASTEWATER ECHNOLOGY AND SURVEILLANCE.
Who Says Sewage Treatment Plants Have to be Ugly,
W76-09437 5D

EXAS UNIV. AT ARLINGTON, DEPT. OF VIL ENGINEERING.
Nitrification Studies of Ship Channel Waters,
W76-09453 5D

HAMES WATER AUTHORITY, LONDON NGLAND).
Nitrates: What's Happening in Britain,
W76-09451 5D

HE RESEARCH GROUP, INC., ATLANTA, A.
Legal Approaches to Control Runoff and Sedimentation: A Case Study of Georgia,
W76-09747 4D

HETFORD CORP., ANN ARBOR, MICH. SSIGNEE).
Sanitary Waste Treatment Plant,
W76-09414 5D

OKYO INST. OF TECH. (JAPAN).
The Cost Assignment of the Cooperative Water Resource Development: A Game Theoretical Approach,
W76-09619 6A

OKYO UNIV. (JAPAN). DEPT. OF GRICULTURAL ENGINEERING.
The Softening of the Kanto Volcanic Ash Soil, (In Japanese),
W76-09925 2G

OKYO UNIV. (JAPAN). DEPT. OF CIVIL NGINEERING.
Evaluation of Flood Control Under Changing Conditions,
W76-09630 4A

OKYO UNIV. (JAPAN). LAB. OF RADIATION ENETICS.
Surveys on Radiation-Resistant Asporogenic Bacteria in Natural Environments,
W76-09519 5C

RIESTE UNIV. (ITALY). ISTITUTO DI DRAULICA E COSTRUZIONI IDRAULICHE.
A Comparison Between the Efficacy of Submarine Outfall Disposal of Advanced Primary Effluent and Conventional Treatment,
W76-09448 5E

ROMSOE MUSEUM (NORWAY). DEPT. OF ORWAY.
Feeding Habits of the Population of Whitefish (Coregonus Lavaretus (L.)) in Haugatjern: A Eutrophic Norwegian Lake,
W76-09882 2H

ROMSOE UNIV. (NORWAY). INST. OF IOLOGY AND GEOLOGY.
Water Transport in the Sill Area of Balsfjord North Norway, During Vernal Meltwater Discharge,
W76-09999 2L

TULANE UNIV., NEW ORLEANS, LA. NEWCOMB COLL.
Interstitial Protozoa and Algae of Louisiana Salt Marshes,
W76-09593 5C

UKRAINIAN RESEARCH INST. OF THE FISH INDUSTRY, KIEV (USSR).
Engineering Reclamation, A Most Important Means of Increasing Fish Productivity of Waters, (In Russian),
W76-09800 8I

UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, MEXICO CITY. INSTITUTO DE INGENIERIA.
Theory of Multiple Leaky Aquifers 1. The Integrodifferential and Differential Equations for Small and Large Values of Time,
W76-09563 2F

UNIVERSITY COLL., CARDIFF (WALES). DEPT. OF MICROBIOLOGY.
Microbial Aspects of Carbonisation Effluent Treatment,
W76-09712 5D

UNIVERSITY OF EAST ANGLIA, NORWICH (ENGLAND). SCHOOL OF ENVIRONMENTAL SCIENCES.
Removal of Dissolved Boron and Silicon During Estuarine Mixing of Sea and River Waters,
W76-09725 2K

UNIVERSITY OF OXFORD, OXFORD, ENGLAND, SOIL SCIENCE LABORATORY.
A Quantitative Analysis of the Factors Affecting Plant Nutrient Uptake from Some Soils,
W76-09489 2G

UNIVERSITY OF WALES INST. OF SCIENCE AND TECHNOLOGY, CARDIFF. DEPT. OF APPLIED BIOLOGY.
Distribution of Bdellovibrio Bacteriovorus in Sewage Works, River Water, and Sediments,
W76-09698 5A

UPPSALA UNIV. (SWEDEN). DEPT. OF HYDROLOGY; AND UPPSALA UNIV. (SWEDEN). DEPT. OF PHYSICAL GEOGRAPHY.
Nuclear Techniques in Hydrological Studies,
W76-09996 2F

UPPSALA UNIV. (SWEDEN). INST. OF LIMNOLOGY.
On Long-Term Stability of Zooplankton Composition,
W76-09600 5C

USTAV HYGIENY, BRATISLAVA (CZECHOSLOVAKIA).
Results of Hygienic and Toxicological Studies of Pesticides in Countries of the Council of Mutual Economic Assistance in 1962-1972, (In Russian),
W76-09884 5G

UTAH STATE UNIV., LOGAN.
Ecosystem Modeling,
W76-09645 5C

A Water-Land Use Management Model for the Sevier River Basin Phases I and II,
W76-09844 4A

Development of a Dynamic Programming Model for the Regionalization and Staging of Wastewater Treatment Plants,
W76-09845 5D

UTAH STATE UNIV., LOGAN. DEPT. OF WILDLIFE SCIENCE.
Methodologies for the Determination of Stream Resource Flow Requirements: An Assessment,
W76-09666 6G

UTTAR PRADESH IRRIGATION DEPT., LUCKNOW (INDIA).
Flood Problems in Uttar Pradesh,
W76-09640 4A

UTTAR PRADESH IRRIGATION RESEARCH INST., ROORKEE (INDIA).
Howell Bunger Valves as Irrigation Outlets,
W76-09615 3F

VERMONT UNIV., BURLINGTON. DEPT. OF GEOLOGY.
Sediment Properties, Lake Champlain: 1971-1975,
W76-09763 5B

VERMONT UNIV., BURLINGTON. DEPT. OF ZOOLOGY.
Materials Budgets of Lake Champlain,
W76-09756 5A

VETERINARY SCIENCES UNIV., BUDAPEST (HUNGARY).
Data on the Disinfection of Liquid Manure by Gamma Irradiation at Baja, Hungary,
W76-09528 5D

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
An Assessment of Estuarine and Nearshore Marine Environments,
W76-09665 6G

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY.
A Screening Bioassay Using Daphnia Pulex for Refinery Wastes Discharged into Freshwater,
W76-09653 5A

VIRGINIA STATE WATER CONTROL BOARD, RICHMOND.
Estimating Selected Parameters for the Kentucky Watershed Model from Watershed Characteristics,
W76-09852 2A

VOLCANI INST. OF AGRICULTURAL RESEARCH, ILANOT (ISRAEL). FORESTRY DIV.
Effects of Flooding and of Irrigation Water Salinity on Eucalyptus Camaldulensis Dehn. From Three Seed Sources,
W76-09664 3C

WAIKATO UNIV., HAMILTON (NEW ZEALAND). DEPT. OF EARTH SCIENCES.
The Erodibility of Pumice Soils of the North Island, New Zealand,
W76-09787 4D

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
Application of Physical Tidal Models in Harbor and Marina Design,
W76-09984 5B

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Upwelling Near Samalga Pass,
W76-09585 2L

WATER POLLUTION CONTROL CORP., MILWAUKEE, WIS. (ASSIGNEE).
Sewage Treatment Aeration Systems,
W76-09423 5D

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
Effects of Storm Discharges on River Water Quality,
W76-09401 5B

Increasing the Capacity of Sedimentation Tanks by Means of Sloping Plates,
W76-09706 5D

WATER RESOURCES BOARD, READING (ENGLAND).
Improved Techniques for Water Resource Systems Design,
W76-09624 4A

WATER RESOURCES ENGINEERS, INC., AUSTIN, TEX.
Estuarine Ecologic Simulations,
W76-09950 2L

Simulation of Tidal Hydrodynamics - Masonboro Inlet,
W76-09953 8B

WATER RESOURCES ENGINEERS, WALNUT CREEK, CALIF.
Use of Mathematical Models in the Palo Alto Marshland Rehabilitation Project,
W76-09949 8B

WATERLOO UNIV. (ONTARIO). DEPT. OF EARTH SCIENCES.
Numerical Simulation of Waste Movement in Steady Groundwater Flow Systems,
W76-09564 5B

WATERLOO UNIV. (ONTARIO). DEPT. OF SYSTEMS DESIGN.
Numerical Two-Dimensional Flow Model for River Systems,
W76-09964 2E

WATERLOO UNIVERSITY (ONTARIO). DEPT. OF CIVIL ENGINEERING.
Metagame Theory and its Applications to Water Resources,
W76-09847 6A

WATERLOOPKUNDIG LABORATORIUM, DELFT (NETHERLANDS).
Origin, Effect and Suppression of Secondary Waves,
W76-09878 2J

Movable-Bed River-Models,
W76-09969 2E

Hydrodynamic Transport Phenomena in Estuaries and Coastal Waters: Scope of Mathematical Models,
W76-09980 5B

WELSBACH OZONE SYSTEMS CORP., PHILADELPHIA, PA.
Ozone Provides Alternative for Secondary Effluent Disinfection Part 2,
W76-09715 5D

WELSBACH OZONE SYSTEMS CORPORATION, PHILADELPHIA, PA.
Ozone Provides Alternative for Secondary Effluent Disinfection. Part 1,
W76-09445 5D

WELSH SCHOOL OF PHARMACY, CARDIFF.
Laboratory Evaluation of the Coulter On-Line Particle Monitor,
W76-09699 5A

WEST PAKISTAN AGRICULTURAL UNIV., LYALLPUR. DEPT. OF SOIL SCIENCES.
Effect of Water Quality and Management Practices on Some Chemical Properties of Soils,
W76-09926 3C

WESTON (ROY F.), INC., HOUSTON, TEX.
How Many Sewer Leaks Can You Afford.
W76-09404 8G

WHARTON SCHOOL OF FINANCE AND COMMERCE, PHILADELPHIA, PA. DEPT. OF ECONOMICS.
Methdological Issues in the Econometric Estimation of Energy Demand Elasticities,
W76-09607 6A

WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.
An Underwater Temperature-Depth Data Collection Device,
W76-09727 2H

WITTEVEEN AND BOS., DEVENTER (NETHERLANDS).
Industrial Experience of Sewage Sludge Processing with Zimpro Installations in the Netherlands,
W76-09709 5D

WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST.
Hydrology of the Madison Formation and its Potential use for Water Supply for Energy Development,
W76-09757 2F

YALE UNIV. NEW HAVEN, CONN.
An Economist's View of the Oceans,
W76-09617 6E

YULE, JORDAN AND ASSOCIATES, CAMP HILL, PA.
Erosion Control During Pipeline Construction,
W76-09743 5G

ZURICH UNIV. (SWITZERLAND). VETERINARY BACTERIOLOGICAL INST.
Sanitary Effect of Gamma Irradiation on Sewage Sludge,
W76-09527 5D

ACCESSION NUMBER INDEX

W76-09401 5B
W76-09402 5B
W76-09403 8G
W76-09404 8G
W76-09405 5B
W76-09406 2I
W76-09407 4C
W76-09408 5A
W76-09409 5C
W76-09410 5C
W76-09411 5A
W76-09412 3F
W76-09413 5D
W76-09414 5D
W76-09415 5D
W76-09416 5D
W76-09417 5D
W76-09418 5D
W76-09419 5D
W76-09420 5D
W76-09421 5D
W76-09422 5D
W76-09423 5D
W76-09424 5D
W76-09425 5D
W76-09426 5D
W76-09427 5E
W76-09428 5E
W76-09429 5D
W76-09430 5D
W76-09431 5D
W76-09432 5D
W76-09433 5D
W76-09434 5D
W76-09435 5D
W76-09436 5D
W76-09437 5D
W76-09438 5F
W76-09439 5D
W76-09440 5D
W76-09441 5D
W76-09442 5D
W76-09443 5D
W76-09444 5D
W76-09445 5D
W76-09446 5G
W76-09447 5D
W76-09448 5E
W76-09449 5D
W76-09450 5D
W76-09451 5D
W76-09452 5D
W76-09453 5D
W76-09454 5D
W76-09455 5D
W76-09456 5D
W76-09457 5D
W76-09458 5D
W76-09459 8G
W76-09460 8G
W76-09461 5D
W76-09462 8G
W76-09463 4D
W76-09464 4D
W76-09465 4D
W76-09466 4D
W76-09467 2A
W76-09468 5C
W76-09469 4D
W76-09470 4C
W76-09471 4C
W76-09472 4D
W76-09473 2K
W76-09474 4A
W76-09475 3F
W76-09476 2I
W76-09477 4A
W76-09478 3B
W76-09479 4B
W76-09480 3B
W76-09481 3A
W76-09482 3C
W76-09483 4A
W76-09484 6D
W76-09485 6D
W76-09486 6G
W76-09487 8I
W76-09488 2G
W76-09489 2G
W76-09490 5C
W76-09491 5C
W76-09492 5C
W76-09493 5C
W76-09494 5C
W76-09495 5C
W76-09496 5C
W76-09497 5C
W76-09498 5C
W76-09499 5A
W76-09500 5A
W76-09501 5A
W76-09502 5A
W76-09503 5A
W76-09504 5C
W76-09505 5C
W76-09506 5G
W76-09507 5C
W76-09508 5C
W76-09509 5C
W76-09510 3B
W76-09511 5D
W76-09512 5D
W76-09513 5D
W76-09514 5D
W76-09515 5D
W76-09516 5D
W76-09517 5D
W76-09518 5D
W76-09519 5C
W76-09520 5D
W76-09521 5D
W76-09522 5C
W76-09523 5D
W76-09524 5D
W76-09525 5D
W76-09526 5D
W76-09527 5D
W76-09528 5D
W76-09529 5D
W76-09530 5D
W76-09531 5D
W76-09532 5D
W76-09533 5D
W76-09534 5D
W76-09535 5D
W76-09536 5D
W76-09537 5D
W76-09538 5D
W76-09539 5D
W76-09540 5D
W76-09541 5D
W76-09542 5D
W76-09543 5D
W76-09544 5D
W76-09545 5D
W76-09546 5D
W76-09547 5D
W76-09548 5D
W76-09549 5D
W76-09550 5D
W76-09551 5D
W76-09552 5D
W76-09553 5D
W76-09554 5D
W76-09555 5D
W76-09556 5D
W76-09557 2A
W76-09558 4B
W76-09559 2L
W76-09560 2L
W76-09561 2L
W76-09562 2F
W76-09563 2F
W76-09564 5B
W76-09565 4A
W76-09566 4A
W76-09567 4A
W76-09568 2L
W76-09569 2L
W76-09570 2L
W76-09571 2L
W76-09572 2B
W76-09573 2A
W76-09574 2B
W76-09575 2E
W76-09576 5C
W76-09577 5B
W76-09578 2A
W76-09579 2A
W76-09580 2A
W76-09581 5A
W76-09582 8B
W76-09583 8B
W76-09584 2L
W76-09585 2L
W76-09586 5G
W76-09587 2L
W76-09588 2G
W76-09589 5B
W76-09590 5A
W76-09591 5A
W76-09592 5C
W76-09593 5C
W76-09594 5C
W76-09595 5C
W76-09596 2H
W76-09597 2L
W76-09598 5C
W76-09599 5C
W76-09600 5C
W76-09601 5A
W76-09602 6A
W76-09603 6A
W76-09604 6A
W76-09605 6A
W76-09606 6A
W76-09607 6A
W76-09608 6A
W76-09609 6A
W76-09610 6A
W76-09611 6A
W76-09612 6A
W76-09613 6A
W76-09614 4B
W76-09615 3F
W76-09616 8C
W76-09617 6E
W76-09618 3A
W76-09619 6A
W76-09620 5A
W76-09621 4A
W76-09622 4A
W76-09623 5G
W76-09624 4A
W76-09625 4A
W76-09626 6A
W76-09627 6E
W76-09628 5D
W76-09629 4A
W76-09630 4A
W76-09631 3B
W76-09632 4A
W76-09633 6D
W76-09634 3F
W76-09635 2L
W76-09636 4A
W76-09637 8C
W76-09638 5D
W76-09639 2L
W76-09640 4A
W76-09641 5D
W76-09642 2B
W76-09643 5C
W76-09644 5A
W76-09645 5C
W76-09646 5F
W76-09647 5C
W76-09648 5C
W76-09649 5C
W76-09650 5C
W76-09651 5C
W76-09652 5C
W76-09653 5A
W76-09654 5C
W76-09655 10C
W76-09656 2I
W76-09657 5C
W76-09658 5C
W76-09659 5C
W76-09660 5C
W76-09661 8B
W76-09662 5B
W76-09663 5G
W76-09664 3C
W76-09665 6G
W76-09666 6G
W76-09667 5D
W76-09668 5D
W76-09669 5D
W76-09670 5D
W76-09671 5D
W76-09672 5D
W76-09673 5D
W76-09674 5D
W76-09675 5D
W76-09676 5D
W76-09677 5D
W76-09678 5D
W76-09679 5F
W76-09680 8C
W76-09681 5D
W76-09682 5D
W76-09683 5D
W76-09684 5F
W76-09685 5F
W76-09686 5D
W76-09687 5A
W76-09688 5A
W76-09689 5A
W76-09690 5A
W76-09691 3C
W76-09692 5D
W76-09693 5D
W76-09694 5A
W76-09695 5D
W76-09696 5A
W76-09697 5A
W76-09698 5A
W76-09699 5A
W76-09700 5C
W76-09701 5D
W76-09702 5A
W76-09703 5D
W76-09704 5D
W76-09705 5D
W76-09706 5D
W76-09707 5D
W76-09708 5D
W76-09709 5D
W76-09710 5D
W76-09711 5D
W76-09712 5D

W76-09713	5F
W76-09714	5A
W76-09715	5D
W76-09716	5D
W76-09717	6C
W76-09718	2E
W76-09719	2L
W76-09720	2L
W76-09721	2L
W76-09722	2C
W76-09723	2L
W76-09724	2L
W76-09725	2K
W76-09726	3F
W76-09727	2H
W76-09728	5B
W76-09729	4C
W76-09730	2A
W76-09731	4C
W76-09732	4C
W76-09733	2A
W76-09734	2B
W76-09735	2E
W76-09736	2E
W76-09737	4C
W76-09738	5D
W76-09739	5D
W76-09740	5B
W76-09741	5D
W76-09742	4D
W76-09743	5G
W76-09744	4C
W76-09745	4C
W76-09746	4D
W76-09747	4D
W76-09748	4D
W76-09749	4C
W76-09750	4A
W76-09751	4A
W76-09752	4C
W76-09753	6G
W76-09754	6F
W76-09755	5A
W76-09756	5A
W76-09757	2F
W76-09758	4B
W76-09759	2J
W76-09760	5G
W76-09761	2F
W76-09762	5B
W76-09763	5B
W76-09764	6B
W76-09765	6B
W76-09766	5G
W76-09767	5G
W76-09768	5G
W76-09769	5G
W76-09770	5G
W76-09771	5G
W76-09772	5D
W76-09773	5D
W76-09774	5D
W76-09775	5G
W76-09776	5G
W76-09777	5G
W76-09778	5G
W76-09779	5G
W76-09780	5G
W76-09781	6F
W76-09782	5C
W76-09783	2H
W76-09784	2A
W76-09785	5C
W76-09786	5B
W76-09787	4D
W76-09788	5B
W76-09789	5A
W76-09790	5C
W76-09791	5C
W76-09792	5A
W76-09793	2G
W76-09794	2G
W76-09795	5C
W76-09796	5A
W76-09797	5C
W76-09798	5A
W76-09799	5C
W76-09800	8I
W76-09801	5C
W76-09802	5C
W76-09803	5C
W76-09804	2G
W76-09805	4D
W76-09806	3B
W76-09807	2J
W76-09808	2G
W76-09809	2D
W76-09810	3F
W76-09811	5C
W76-09812	5C
W76-09813	5A
W76-09814	5C
W76-09815	5A
W76-09816	5C
W76-09817	2I
W76-09818	5C
W76-09819	5C
W76-09820	2K
W76-09821	5C
W76-09822	5A
W76-09823	5A
W76-09824	7A
W76-09825	7C
W76-09826	7C
W76-09827	7C
W76-09828	2E
W76-09829	7C
W76-09830	2J
W76-09831	2E
W76-09832	4B
W76-09833	4A
W76-09834	2K
W76-09835	4B
W76-09836	2K
W76-09837	2J
W76-09838	2A
W76-09839	2J
W76-09840	2J
W76-09841	4D
W76-09842	2J
W76-09843	7B
W76-09844	4A
W76-09845	5D
W76-09846	6A
W76-09847	6A
W76-09848	3F
W76-09849	6F
W76-09850	2F
W76-09851	4A
W76-09852	2A
W76-09853	2A
W76-09854	5D
W76-09855	5D
W76-09856	5D
W76-09857	5D
W76-09858	5G
W76-09859	5D
W76-09860	5A
W76-09861	5D
W76-09862	5F
W76-09863	3A
W76-09864	3A
W76-09865	5G
W76-09866	3F
W76-09867	5G
W76-09868	3F
W76-09869	3F
W76-09870	3F
W76-09871	3A
W76-09872	3A
W76-09873	5D
W76-09874	2L
W76-09875	5D
W76-09876	3A
W76-09877	3A
W76-09878	2J
W76-09879	5B
W76-09880	7B
W76-09881	2G
W76-09882	2H
W76-09883	5B
W76-09884	5G
W76-09885	5F
W76-09886	5B
W76-09887	2D
W76-09888	2G
W76-09889	5G
W76-09890	5G
W76-09891	5A
W76-09892	5A
W76-09893	6B
W76-09894	5D
W76-09895	5G
W76-09896	5A
W76-09897	3F
W76-09898	5A
W76-09899	5B
W76-09900	5A
W76-09901	5A
W76-09902	5C
W76-09903	2L
W76-09904	8A
W76-09905	4A
W76-09906	5A
W76-09907	5G
W76-09908	5B
W76-09909	5C
W76-09910	6G
W76-09911	2L
W76-09912	5G
W76-09913	3F
W76-09914	6G
W76-09915	5A
W76-09916	5A
W76-09917	2J
W76-09918	2I
W76-09919	5C
W76-09920	4A
W76-09921	4A
W76-09922	5A
W76-09923	2G
W76-09924	2G
W76-09925	2G
W76-09926	3C
W76-09927	5A
W76-09928	5A
W76-09929	5A
W76-09930	4A
W76-09931	3F
W76-09932	5C
W76-09933	5C
W76-09934	5C
W76-09935	2L
W76-09936	6G
W76-09937	5C
W76-09938	5C
W76-09939	2G
W76-09940	5A
W76-09941	2A
W76-09942	2C
W76-09943	6A
W76-09944	2E
W76-09945	8B
W76-09946	8B
W76-09947	8B
W76-09948	8B
W76-09949	8B
W76-09950	2L
W76-09951	5B
W76-09952	8B
W76-09953	8B
W76-09954	2L
W76-09955	2L
W76-09956	2L
W76-09957	8B
W76-09958	8B
W76-09959	5B
W76-09960	5B
W76-09961	5B
W76-09962	8C
W76-09963	8B
W76-09964	2E
W76-09965	2E
W76-09966	2E
W76-09967	2E
W76-09968	8B
W76-09969	2E
W76-09970	2J
W76-09971	8B
W76-09972	2E
W76-09973	8B
W76-09974	2J
W76-09975	2J
W76-09976	8B
W76-09977	2L
W76-09978	2L
W76-09979	2L
W76-09980	5B
W76-09981	5B
W76-09982	2A
W76-09983	5B
W76-09984	5B
W76-09985	3F
W76-09986	5C
W76-09987	5C
W76-09988	3C
W76-09989	5G
W76-09990	5C
W76-09991	5C
W76-09992	5C
W76-09993	5C
W76-09994	5C
W76-09995	2I
W76-09996	2F
W76-09997	5G
W76-09998	3F
W76-09999	2L
W76-10000	2G

ABSTRACT SOURCES

OURCE	ACCESSION NUMBER	TOTAL
. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W76-09985	1
Cornell University, Policy Models for Water Resources Systems	W76-09602--09619 09621--09634 09636--09642 09844--09853	49
ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W76-09490--09509 09512--09556 09656 09658--09660	69
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W76-09401--09404 09413--09462 09557 09667--09690 09692--09699 09701--09715	102
Illinois State Water Survey, Hydrology	W76-09558--09575 09577--09589 09719--09724 09726--09752 09783--09784 09941--09984	110
National Water Well Association, Water Well Construction Technology	W76-09510--09511 09661--09663	5
University of Arizona, Arid Land Water Resources	W76-09474--09475 09477--09486 09488--09489 09664	15
University of Wisconsin, Eutrophication	W76-09592--09595 09597--09600 09782	9

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE (CONTINUED)		
University of Wisconsin, Water Resources Economics	W76-09764--09780	17
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W76-09716--09718 09753--09763 09905--09906	16
C. OTHER		
BioSciences Information Service	W76-09405--09412 09476, 09487 09576 09590--09591 09596, 09601 09620, 09635 09646, 09657 09691, 09700 09725 09785--09823 09860 09879--09888 09897 09916--09940 09986--10000	113
Biological Consultant and Information Services (Effects of Pollutants on Aquatic Life)	W76-09643--09645 09647--09655	12
Fish and Wildlife Service	W76-09665--09666	2
Forest Service (USDA)	W76-09463--09472	10
Ocean Engineering Information Service (Patents)	W76-09854--09859 09861--09878	24
Ocean Engineering Information Service (Outer Continental Shelf)	W76-09889--09896 09898--09904 09907--09915	24
U. S. Geological Survey	W76-09824--09843	20
Vanderbilt University, Metals Pollution	W76-09473	1

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976-210-951/30

Document is the property of the Department of Defense

LIBRARY U. OF I. URBANA-CHAMPAIGN

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.

- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
OFFICIAL BUSINESS
PRINTED MATTER

AN EQUAL OPPORTUNITY EMPLOYER

John Littlewood
Documents Division
220 D Library
Champaign, Ill. 61820

016.33391
Se48

of the

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 19
OCTOBER 1, 1976

W76-10001 -- W76-10404
CODEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

SELECTED WATER RESOURCES ABSTRACTS (SWRA) is available to Federal agencies and their contractors or grantees in water resources research upon request, citing contract or grant number and sponsoring agency. Write: Manager, Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior, Washington, DC 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from NTIS, 5285 Port Royal Road, Springfield, VA 22161. Annual subscription rates are: SWRA Journal only, $75 ($95 foreign); Journal and Annual Indexes, $100 ($125 foreign); Indexes only, $50 ($65 foreign).

Some documents abstracted in this journal can be purchased from NTIS at prices shown in the entry; prices subject to change. Other documents are available from originating organizations or authors as indicated in the citation.

LIBRARY U. S. D. I. ENDANA-SAMOA

SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 19
OCTOBER 1, 1976

W76-10001 -- W76-10404

e Secretary of the U.S. Department of the Interior has de-
mined that the publication of this periodical is necessary in the
nsaction of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

LIBRARY U.S. DEPT. OF COMMERCE

2. WATER CYCLE

2A. General

INTERNATIONAL SURVEY ON EXISTING WATER RECHARGE FACILITIES.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 4B.
W76-10085

MODELS FOR EVALUATION OF HAZARDOUS WASTES,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5B.
W76-10190

MINERAL CYCLING IN SOUTHEASTERN ECOSYSTEMS.
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5C.
W76-10266

COMPARISON OF HYDRAULIC AND NUMERICAL TIDAL MODELS,
Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-10446

CANADIAN PARTICIPATION IN THE INTERNATIONAL HYDROLOGICAL DECADE, FINAL REPORT, (VOLUME 2), RESEARCH REPORTS.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
Research Reports, Inland Waters Directorate, Environment Canada, Ottawa, Canada, 240 p, append.

Descriptors: *International Hydrological Decade, *Canada, *Research and development, *Programs, Hydrology, Surface runoff, Groundwater, Lakes, Geomorphology, Snow, Ice, Glaciers, Water quality, Surface waters, Meteorology, Education, Soils, Publications, Information exchange.
Identifiers: *Research projects, International Cooperation.

The International Hydrological Decade (IHD) 1965-1974, was launched by the General Conference of UNESCO at its 13th session to promote international cooperation in research and studies, and the training of specialists, in scientific hydrology. Promotion of collaboration in advancing hydrological research techniques, disseminating hydrological data and planning hydrological installations were features of the IHD program. Highlights of research projects conducted in Canada under the IHD program are outlined. (Environment Canada).
W76-10489

2C. Snow, Ice, and Frost

BIOLOGICAL TREATMENT PROCESS IN COLD CLIMATES,
CH2M/Hill, Corvallis, Oreg. Wastewater Reclamation.
For primary bibliographic entry see Field 5D.
W76-10222

INFORMATION BOOKLET FOR ICEREF, THE BIBLIOGRAPHY OF CANADIAN GLACIERS, GLACIER INVENTORY NOTE NO. 8,
Department of the Environment, Ottawa (Canada). Inland Waters Directorate.
C. S. L. Ommanney, and J. W. Clarkson.
Report Series No. 27, 1973, 123 p.

Descriptors: *Glaciers, *Bibliographies, Ice, Snow, Avalanches, Permafrost, Geomorphology, Sea ice, Lake ice, Icebergs, Water temperature, Depth, Measurement, Water balance, *Canada.
Identifiers: Weighting factors, Ice crystals, Atmospheric ice, Ground ice, River ice, Energy balance, Glacier fluctuations.

A description is presented of the procedures to be followed in listing references, for inclusion in ICEREF, the Bibliography of Canadian Glaciers, by author, date, title and source. A list of the Index Concepts or key words, used to describe the references, is given. Retrieval and sorting are possible on all or any of these Index Concepts so that bibliographies may be prepared for a single author, for a glacier, for a region or for a particular subject matter; restrictions may be imposed by the use of weighting factors. Samples of the output obtained, based on some 400 entries to date, are given. The Monitor List, a mirror image of the punched card input, is used for cross-referencing and corrections. The General Index demonstrates the sorting capabilities available. The Thesaurus contains all the Index Concepts used, and, thus, is an indication of the approved vocabulary. Part (1) describes the various parts of the Data Sheet and gives instructions for coding and the use of weighting factors. Part (2) contains an updated version of the Thesaurus. Part (3) lists the American Society for Testing and Materials (ASTM) CODEN for most of the journals likely to be searched. Part (4) contains a complete list of all Canadian Glacier names, their inventory number, if available, and their location, as well as the names of glaciers from several other countries. A list of glacier types has been appended to Part (4) to aid coders in the comparison of other glacier classifications with that recommended by UNESCO/IASH for the glacier inventory. (Environment Canada)
W76-10494

APPROACH TO GLACIER MASS-BALANCE ANALYSIS UTILIZING TERRAIN CHARACTERIZATION,
Department of the Environment, Ottawa (Canada). Inland Waters Directorate.
G. J. Young.
Water Resources Branch, Scientific Series No. 60, 1976, 34 p. 11 fig., 41 ref., 2 tab.

Descriptors: *Glaciers, *Measurement, *Mass, Water resources, Maps, Hydrology, Snow, Basins, Depth snowmelt, Data, Snowpacks, Ablation, Methodology, *Canada, Terrain analysis, Computer programs.
Identifiers: Terrain, Snow accumulation, Data analysis, *Glacier mass-balance analysis.

A description is presented of a method currently being used to produce accumulation, ablation, and net balance maps as part of the mass balance studies on selected glaciers in Western Canada. The method uses associations between snow depth and terrain geometry to extrapolate the measurements made at sampling locations to unvisited parts of the glacier. The grid square technique has proved very efficient for computer manipulation of data bases and for calculations and tabulations of results. The rationale behind the method and instructions for implementation, including a program listing, are presented. Although the system has been developed for Canadian Cordilleran conditions, the approach could be used with equal success on glaciers with substantially different surface geometry characteristics. (Environment Canada)
W76-10499

2D. Evaporation and Transpiration

DIFFUSION AND MASS FLOW OF NITRATE-NITROGEN TO PLANT ROOTS,
Kentucky Agricultural Experiment Station, Lexington. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-10182

A MODEL OF WATER CONTENT AND EVAPORATION FOR HARDWOOD LEAF LITTER,
Western Carolina Univ., Cullowhee, N.C. Dept. of Biology.
A. Moore, and W. T. Swank.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, p 58-69. 3 fig, 1 tab, 21 ref, (CONF-740513).

Descriptors: *Evaporation, *Model studies, *Hydrologic aspects, Litter, Deciduous forests, North Carolina.
Identifiers: *Forest litter, Coweeta Watershed(NC).

A predictive model of water content and evaporative losses in the litter of a mixed deciduous forest is described. The model uses readily obtainable data on total daily incoming solar radiation, rainfall, mean daytime temperature, and mean daytime relative humidity. The model also requires data on site latitude, slope, and aspect; initial litter accumulation; annual quantity and timing of leaf fall; and transmission of solar radiation through the canopy. Three hydrologic compartments are defined--atmosphere, litter, and soil--and one biomass compartment--the litter dry weight. Only two of the intercompartmental flows are modeled--evaporation from litter to atmosphere and drainage from litter to soil. Evaporation rates are calculated from a modified Penman formula but are limited by the vapor conductivity of the litter. The model incorporates throughfall and litter-decay functions. Model performance was tested against independent data collected at the Coweeta Hydrologic Laboratory, North Carolina. The simulated evaporation over 8- and 12-day periods in summer and winter agreed with measured evaporation to within 13%. Daily values of litter water content were usually within the error limits of experimental data. Simulated evaporation and litter water content over an 80-day period also showed good agreement with experimental data. (See also W76-10266) (Auen-Wisconsin)
W76-10270

WATER EXPENDITURE ON TRANSPIRATION BY PLANTS COMMUNITIES DOMINANT IN EASTERN KARA KUM, (IN RUSSIAN),
P. D. Gunin, and V. P. Dedkov.
'Probl Osvoeniya Pustyn'. 3, p 58-61, 1974.

Descriptors: *Transpiration, Plant populations, *Desert plants, *Shrubs, Seasonal, *Evapotranspiration.
Identifiers: Ephedra-strobilacea, Haloxylon-aphyllum, Haloxylon-persicum, *USSR(Kara Kum).

Observations were made on the intensity of transpiration of the dominant desert shrubs (USSR). Haloxylon persicum, H. aphyllum and Ephedra strobilacea show the most intense transpiration. The rate of evapotranspiration was calculated with respect to total night transpiration. In Haloxylon aphyllum communities, the intensity of transpiration in summer exceeds that in H. persicum communities, 1895 m3/ha and 237 m3/ha, respectively.--Copyright 1975, Biological Abstracts, Inc.
W76-10341

2E. Streamflow and Runoff

INTERPRETATION OF INTERNAL TRACER EXPERIMENTS AND LOCAL SOJOURN TIME DISTRIBUTIONS,
City Coll., New York. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-10039

SELECTED STREAMFLOW EXPERIENCE GRAPHS FOR SOUTHWESTERN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-10132

PRINCIPLES AND MEASURING TECHNIQUES OF TURBULENCE CHARACTERISTICS IN OPEN-CHANNEL FLOWS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-10134

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-10141

HYDROLOGIC DATA FOR LITTLE ELM CREEK, TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-10144

HYDROLOGIC DATA FOR COW BAYOU, BRAZOS RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-10146

HYDROLOGIC DATA FOR NORTH CREEK TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-10147

HYDROLOGIC UNIT MAP--1974, STATE OF WASHINGTON.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-10150

MINIMIZATION OF CORE REQUIRED IN ROUTING THROUGH A CHANNEL NEWTWORK,
Hydrocomp International, Palo Alto, Calif.
J-J. Heler.
Simulation Network Newsletter, (Hydrocomp), Vol. 7, No. 7, p 1-8, October 1, 1975. 16 fig, 2 ref.

Descriptors: *Analytical techniques, *Computer models, *Data storage and retrieval, Computers, *Simulation analysis, Channel flow, Routing, Reach(Streams).
Identifiers: Tree structures.

A method has been discussed for decreasing the computer core requirement for simulation of channel networks for a simple case of flow routing. Most natural watersheds are arranged in networks, which are arbitrary sets of channels, reservoirs, and diversion points logically connected in a tree structure. The tree structure is divided into reaches which are computational elements receiving inflow and producing outflow. The order of the reaches upstream from a given point does not matter, when using a routing algorithm. For each reach of the network, a routing algorithm assembles the cumulated outflows from all tributaries, computes the local inflows, and computes outflows. Before these computations are made on any reach, they must be made on all of its tributaries. Within this requirement there are several ways to analyze a tree structure, with varying requirements for computer data storage. One such method, 'Theseus traversing', involves starting with the leftmost reach that has no tributaries and proceeding downstream as far as possible, then moving to the next reach to the right with no tributaries and proceeding downstream as far as possible. When the tree structure is properly ordered, this method requires the least computer data storage. The optimum way to order the tributaries is to sort them according to the order. A reach with no tributaries has order 0; a reach with one tributary has order one and other reaches have the same order as their tributary with the highest order or an order higher by one if two tributaries both have the highest order. A formula is given for determining the core requirement in terms of buffers needed to analyze a tree structure with a given number of reaches. These methods are also applicable to quality constitutents and sediment routing, but only in tree structures. (Snyder-FIRL)
W76-10243

2F. Groundwater

CHANGE IN DRAWDOWN CAUSED BY ENLARGING A WELL IN A DOLOMITE AQUIFER,
Geological Survey, Columbus, Ohio. Water Resources Div.
For primary bibliographic entry see Field 4B.
W76-10088

TACOMA'S NORTH FORK WELLS.
For primary bibliographic entry see Field 4B.
W76-10089

ELECTRICAL WATER PROSPECTING.
For primary bibliographic entry see Field 4B.
W76-10090

DIGITAL MODEL FOR SIMULATED EFFECTS OF GROUND-WATER PUMPING IN THE HUECO BOLSON, EL PASO AREA, TEXAS, NEW MEXICO, AND MEXICO,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-10140

NATIONAL WATER DATA STORAGE AND RETRIEVAL SYSTEM: INSTRUCTIONS FOR PREPARATION AND SUBMISSION OF GROUND-WATER DATA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 10D.
W76-10148

MAPS SHOWING GROUND-WATER CONDITIONS IN THE RANEGRAS PLAIN AND BUTLER VALLEY AREAS, YUMA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-10149

ANALOGOUS MODELLING OF AQUIFEROUS SYSTEMS IN COASTAL ZONES,
Akademiya Nauk SSSR, Moscow. Interagency Geophysical Committee.
For primary bibliographic entry see Field 2L.
W76-10455

PROGRAM ESOPH - EXTENDED SOPH, SIMULATION OF TIME-VARIANT PIEZOMETRIC SURFACE IN A CONFINED, LEAKY AQUIFER SUBJECTED TO PUMPING.
Department of the Environment, Ottawa (Canada). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-10498

2G. Water In Soils

PHOSPHORUS DISTRIBUTION FROM SEPTIC TANK EFFLUENT IN COASTAL PLAIN SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-10015

PUDDLING TROPICAL RICE SOILS: 2. EFFECTS OF WATER LOSSES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W76-10118

RESULTS OF INFILTRATION TESTS NEAR SCOTT CITY, WESTERN KANSAS,
Geological Survey, Lawrence, Kans.
J. B. Gillespie, and G. D. Hargadine.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-252 242, $4.00 in paper copy, $2.25 in microfiche. Water-Resources Investigations 76-12, April 1976. 29 p, 22 fig, 5 tab, 18 ref.

Descriptors: *Infiltration rates, *Soils, *Loess, *Infiltrometers, *Kansas, Methodology, Data collections, Soil properties, Soil structure, Hydraulic conductivity, Instrumentation.
Identifiers: Western Kansas, Richfield soil.

The purpose of this investigation was to evaluate the infiltrometer as a reconnaissance tool for estimating long-term infiltration rates of water into the loessial soils of western Kansas. Infiltration rates determined from the different types of ring infiltrometers were not consistent, but the tests showed that substantial quantities of water could infiltrate the Richfield soil. Average daily infiltration rates in the soil ranged from 3 to 5 feet using 22-inch ring infiltrometers; 2.3 feet using a 10-inch ring infiltrometer; and from 1.3 to 2.2 feet using double-ring infiltrometers. By comparison, the average daily infiltration rate in the loess using a 10-inch ring infiltrometer was about 13 feet. Laboratory tests of a soil core indicated that the lowest hydraulic conductivity was in the depth interval from 3.9 to 8.6 inches. Soil in this interval, which coincides with the depth of cultivation, evidently limits the rate of infiltration. Air-permeability tests of the unsaturated zone indicated low hydraulic conductivities of 1.9 and 0.2 feet per day for the depth intervals from 0 to 5 feet and 57 to 75 feet respectively. The conductivity of the lower interval probably would create a perched water table during prolonged infiltration. (Woodard-USGS)
W76-10136

DIFFERENT LEVELS OF SOIL ORGANIC MATTER IN DESERT SOIL AND NITROGEN FERTILIZER ON YIELDS AND MINERAL COMPOSITION OF BARLEY GROWN IN THE SOIL,
California Univ., Los Angeles. Div. of Environmental Biology.
For primary bibliographic entry see Field 3F.
W76-10170

ANOMALOUS DIURNAL PATTERNS OF STEM XYLEM WATER POTENTIALS IN LARREA TRIDENTATA,
New Mexico State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W76-10172

DIFFUSION AND MASS FLOW OF NITRATE-NITROGEN TO PLANT ROOTS,
Kentucky Agricultural Experiment Station, Lexington. Dept. of Agronomy.
R. E. Phillips, T. NaNagara, R. E. Zartman, and J. E. Leggett.
Agronomy Journal, Vol. 68, No. 1, p 63-66, January-February, 1976. 2 fig, 1 tab, 11 ref.

Descriptors: *Soil-water-plant relationships, *Diffusion, *Soil water movement, *Nitrogen, *Nitrates, *Root systems, Transpiration, Nutrient requirements, Model studies, Flow, Moisture content, Absorption, Model studies, Path of pollutants, Corn(Field).
Identifiers: Mass flow, *Nitrate-nitrogen.

A model for estimating nitrate-nitrogen uptake by plant roots is developed and its application discussed. Soil and plant parameters which must be known in order to predict transport by diffusion and mass flow include volumetric soil water content, NO3-N concentration in soil solution, porous diffusion coefficient of soil NO3-N, average soil water macroscopic velocity at the plant root surface, root radius, transpiration rate and plant root length. A previously reported steady-state model for simultaneous mass flow and diffusion is evaluated with reference to measurement of those parameters. The importance of diffusion to mass flow is great when the ratio of transpiration rate to the constant of proportionality relating flux into the plant to NO3-N concentration in soil solution is less than 0.2. (Jahns-Arizona)
W76-10182

YIELD-NUTRIENT ABSORPTION RELATIONSHIPS AS AFFECTED BY ENVIRONMENTAL GROWTH FACTORS,
National Fertilizer Development Center, Muscle Shoals, Ala.
For primary bibliographic entry see Field 2I.
W76-10184

INTERACTION OF WATER POTENTIAL AND TEMPERATURE EFFECTS ON GERMINATION OF THREE SEMI-ARID PLANT SPECIES,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Land Resources Management.
For primary bibliographic entry see Field 2I.
W76-10185

CHARACTERISTICS OF THE ACCUMULATION OF FREE AMINO ACIDS BY SOME NONSPORULATING BACTERIA FROM TYPICAL IRRIGATED SIEROZEM, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-10188

EFFECT OF WATER REGIME ON PRODUCTIVITY OF CULTIVATED PLANTS, (IN BELORUSSIAN),
For primary bibliographic entry see Field 3F.
W76-10189

PERCOLATION TESTS FOR SEPTIC TANK SUITABILITY IN SOUTHERN ARIZONA SOILS,
Arizona Univ., Tuscon. Dept of Soils, Water, and Engineering.
For primary bibliographic entry see Field 5D.
W76-10248

NUMERICAL ANALYSIS OF ONE-DIMENSIONAL WATER INFILTRATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
E. D. H. Cheng.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 184, $4.50 in paper copy, $2.25 in microfiche. Technical Report No. 92, June 1975. 44 p, 14 fig, 28 ref, append. OWRT A-035-HI(1), 14-31-0001-3811, 14-31-0001-4011, 14-31-0001-5011.

Descriptors: *Finite element analysis, *Infiltration, *Hawaii, *Numerical analysis, Equations, *Soil moisture, Moisture content, Model studies, Soil profiles, Diffusivity, Hydraulic conductivity, *Soil water movement.
Identifiers: *Hawaiian Latosols, Continuous System Modeling Program, *Moisture profiles(Soils), *Moisture diffusivity(Soils).

In attempting to numerically solve the nonlinear moisture flow equation, the Galerkin process, which bears a great similarity to direct methods of the calculus of variations, and the Continuous System Modeling Program (CSMP) approach have been employed. In the finite element formulation of the governing equation, systems of nonlinear algebraic equations were developed on the basis of linear two-dimensional triangular element. These nonlinear algebraic equations were solved simultaneously, at each step, by a programmed logic of iterations. In the CSMP approach, Boltzmann's function application and layered soils formulation were employed in obtaining horizontal and vertical moisture profiles. The second and third degrees of polynomial interpretations of moisture diffusivity, D(theta), and hydraulic conductivity K(theta), of the media were conducted. However, it was established that the former representation had only very limited applicability (as far as some Hawaiian soils are concerned) because a second degree polynomial can accurately describe the D(theta) and K(theta) functions only of the wetter portion of the D(theta) and K(theta) vs. moisture content, Theta, curves. The finite element, CSMP, and finite difference solutions were investigated and compared for Wahiawa soils with lateral moisture movement. Vertical moisture profiles for the Molokoi soils and Tantalus silty clay loams were also investigated by means of the finite element method and the CSMP approach, respectively.
W76-10262

FREQUENCY DISTRIBUTIONS OF RADIOCESIUM CONCENTRATIONS IN SOIL AND BIOTA,
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5B.
W76-10273

RADIOCESIUM CYCLING IN VEGETATION AND SOIL,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W76-10296

CERIUM AND COBALT MOVEMENT WITH LITTER LEACHATE IN A FOREST SOIL,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W76-10311

BASE-LINE DATA ON EVERGLADES SOIL-PLANT SYSTEMS: ELEMENTAL COMPOSITION, BIOMASS, AND SOIL DEPTH,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 5C.
W76-10314

EFFECTS OF CLEAR-CUTTING ON NUTRIENT LOSSES IN ASPEN FORESTS ON THREE SOIL TYPES IN MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 4C.
W76-10315

MOBILIZATION OF NUTRIENTS IN SOIL BY ACIDS OF SULFUR AND CHELATING AGENTS,
California Univ., Los Angeles, Lab., of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 5B.
W76-10316

CHANGE OF WATER REGIME AND CONTENT OF MOBILE FORMS OF N, K, MN AND FE IN MEADOW-PEAT SOIL OF THE RAMENSK FLOODPLAIN OF THE MOSCOW RIVER IN CONNECTION WITH AGRICULTURAL USE, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Ovoshchnogo Khozyaistva, Moscow (USSR).
V. A. Shtern.
Biol Nauki (Mosc). 18(3), p 110-116, 1976.

Descriptors: *Soil-water-plant relationships, Groundwater, *Soil moisture, Analysis, Moisture content, Irrigation effects, Nitrogen, Iron, Potassium, Manganese, Fertilizers, *Flood plains.
Identifiers: Ramensk, *Moscow River(USSR).

The groundwater level on fields of the Ramensk Sovkhoz in the floodplain of the Moscow River (USSR) drops by the end of the growing season. The maximum soil mositure content was noted at a high groundwater level and the minimum at a low level. The weather conditions and irrigation cause substantial changes of soil moisture. At maximum soil moisture content the content of N, Fe and K compounds increases, and at a low moisture content it decreases. The use of mineral fertilizer with Mo on the soil increases the content of mobile N, K, Fe and Mn compounds. The content of these elements in the soil depends on the amount of ferrous oxide in the soil and uptake of these elements by plants.--Copyright 1976, Biological Abstracts, Inc.
W76-10477

EFFECT OF TILLAGE ON SOIL STRUCTURE AND PLANT GROWTH UNDER RAIN-FED CONDITIONS,
Indian Agricultural Research Inst., New Delhi.
S. Mallick, and Y. N. Nagarajarao.
Indian J Agric Sci. 42(9), p 827-831, 1972.

Descriptors: *Soil-water-plant relationships, *Soil compaction, Compaction, *Corn(Field), Crops, Analysis, *Cultivation, *Chiselling, *Deep tillage, Farm management, Crop response, Rain water, Loam, *Plant growth.

Under rain-fed conditions on a sandy-loam soil on which maize (Zea mas L.) was grown, chiseling, plowing with a moldboard plow, discing, and plowing with a local (desi) plow were compared for tillage efficiency. The depth-wise root distribution was determined at flowering. The bulk density at various stages of growth, moisture-retention characteristics at flowering, hydraulic conductivity at compacted minimum bulk density, settling percentage and aggregation at harvesting stage were determined. The yield differences were statistically significant. Chiseling gave the highest yield. Positive correlations existed between yield and quantity of roots and also available moisture in the subsoil, both being highest under chiseling. The bulk density very rapidly returned to the original value with heavy showers after plowing. The hydraulic conductivity at compacted minimum bulk density followed the root-distribution pattern. Chiseling increased the settling percentage at lower depth, and the aggregation

decreased. Planting of deep-rooted crops and deep placement of fertilizers help build up stable soil structure in the subsoil.--Copyright 1974, Biological Abstracts, Inc.
W76-10487

2H. Lakes

POPULATION CHARACTERISTICS OF A SPECIES ENSEMBLE OF WATERBOATMEN (CORIXIDAE),
Rochester Univ., N. Y. Dept. of Biology.
C. A. Istock.
Ecology 54(3), p 535-544, 1973.

Descriptors: *Spatial distribution, *Ponds, Michigan, *Temporal distribution, *Growth rates, Breeding.
Identifiers: Competition, *Corixidae, Hesperocorixa-lobata, Sigara-macropala, *Waterboatmen.

The spatial and temporal distributions of 12 spp. of waterboatmen in a 1.2 ha pond in Northern Michigan were studied for 3 consecutive summers. Enclosure experiments involving the growth of 1, 2, and 3 corixid species were performed to test for interspecies competitive interactions and to determine whether the dominant species reach the upper limits to population growth. The experimental data indicate that interspecific competition between the 2 dominant species, Hesperocoriza lobata and Sigara macropala, in enclosures led to a significant reduction in the population size of H. lobata but not of S. macropala. From the enclosure experiments it appears that H. lobata failed to grow to its maximum limit because of competition, while S. macropala did reach its limit, at least in late summer. The experiments also showed that the early summer and late summer breeding habits of H. lobata and S. macropala, respectively, are not physiologically (genetically) fixed properties of these species. It is suggested that the corixid species ensemble here studied may be characterized as 2 sets of ecological homologues: 1 set of Hesperocorixa species that breeds early in the summer and 1 set of Sigara species that breeds later.--Copyright 1973, Biological Abstracts, Inc.
W76-10123

A MATHEMATICAL MODEL OF BLOOMS OF PLANKTON DIATOMS, (IN GERMAN),
Deutsche Akademie der Wissenschaften zu Berlin (East Germany). Forschungsstelle fuer Umweltgestaltung.
For primary bibliographic entry see Field 5C.
W76-10127

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 6. ADAMS, BENTON, DOUGLAS, FRANKLIN, GRANT, LINCOLN, WALLA WALLA, AND WHITMAN COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W76-10138

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 7. PEND OREILLE, SPOKANE, AND STEVENS COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W76-10139

GREAT LAKES POLLUTION CLEANUP STAGNATES AS PROBLEMS MOUNT,
For primary bibliographic entry see Field 5G.
W76-10250

STRENGTHENING LAKE-SHORELAND MANAGEMENT IN MASSACHUSETTS,
Massachusetts Univ., Amherst, Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W76-10264

BORON AND ARSENIC STUDIES IN FLORIDA WATERS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5B.
W76-10265

A SPECIFIC-ACTIVITY AND CONCENTRATION MODEL APPLIED TO CESIUM MOVEMENT IN AN OLIGOTROPHIC LAKE,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-10275

THE ROLE OF EMERGENT MACROPHYTES IN MINERAL CYCLING IN A FRESHWATER MARSH,
Wisconsin Univ., Milwaukee. Dept. of Botany,
For primary bibliographic entry see Field 5C.
W76-10289

CHANGES IN WATER CHEMISTRY AND PRIMARY PRODUCTIVITY OF A REACTOR COOLING RESERVOIR (PAR POND),
DuPont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5C.
W76-10290

NUTRIENT LOSSES IN PARTICULATE FORM AS WEIR POND SEDIMENTS FROM FOUR UNIT WATERSHEDS IN THE SOUTHERN APPALACHIANS,
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-10330

THE EFFECT OF URBAN LAND USE ON NUTRIENT AND SUSPENDED-SOLIDS EXPORT FROM NORTH FLORIDA WATERSHEDS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 4C.
W76-10331

NUMERICAL MODEL FOR STORM SURGE AND TIDAL RUN-UP STUDIES,
Dames and Moore, Los Angeles, Calif. Advance Technology Group.
For primary bibliographic entry see Field 2L.
W76-10456

MACROZOOBENTHOS OF WATER BODIES OF THE KHAZARASP REGION OF THE KHOREZM OBLAST, (IN RUSSIAN),
S. Embergenov.
Uzb Biol Zh. 18(3), p 41-43, 1974.

Descriptors: *Benthos, Lakes, Taxonomy, Diptera, Mayflies.
Identifiers: Hemiptera, Khazarasp, Khorezm, Oblast, Odonata, *USSR(Uzbek-SSR), *Zoobenthos.

Morphological and hydrological characteristics of the waters of the lakes Dunguzuldy, Khassa, Davrokh, Yumalandy and Akkul in the Khazarasp region in the Uzbek SSR (USSR) and the qualitative composition of macrozoobenthos in them are discussed. The macrozoobenthos was composed of 23 spp. in 8 taxonomic groups and 3 types. The larvae of Chironomidae (11 spp.), Odonata (4 spp.), Ephemeroptera and Hemiptera (2 spp. each) made up 52.5%.--Copyright 1975, Biological Abstracts, Inc.
W76-10476

EXCHANGE FLOW BETWEEN LAKE ONTARIO AND HAMILTON HARBOUR,
Canada Centre for Inland Waters,Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-10496

APPLICABILITY OF THE TECHNICON AUTOANALYZER I AND II SYSTEMS FOR SHIPBOARD ANALYSIS OF GREAT LAKES WATER SAMPLES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-10497

2I. Water In Plants

COMPETITION AND THE RELATIVE ABUNDANCES OF TWO CLADOCERANS,
Maryland Univ., College Park. Dept. of Zoology.
J. D. Allan.
Ecology. 54(3), p 484-498, 1973.

Descriptors: Algae, *Competition, *Crustaceans, Daphnia, Bacteria, Detritus, *Predation, Mortality, Aquatic animals.
Identifiers: Carbon-14, Chaoborus, *Daphnia-parvula, *Holopedium-gibberum.

Two cladocerans, Daphnia parvula and Holopedium gibberum, were studied to determine whether the species were competing and whether the observed coexistence was predictable from competitive relationships alone. Experimental manipulations of intra- and inter-specific competition using 14C-labeled algae, bacteria, and detritus revealed clear competitive effects only with algae. Some resource partitioning was demonstrated. A model was proposed specifying Holopedium to be the poorer competitor for mutually shared resources, but also to be less reliant on those mutual resources, owing to its larger niche. This model predicts coexistence and a higher relative abundance for Holopedium. However, the dynamics of field populations did not correspond to this prediction. Daphnia was rare and declining throughout the study whereas Holopedium exhibited a prenounced burst of growth. Analysis of birth and death processes revealed that Holopedium was relatively free from mortality throughout most of the study, while Daphnia suffered death rates of 20% day or higher. This differential mortality explains the discrepancy between the competition model and observed densities. Finally, field studies indicated that mortality of Daphnia owing to predation by Chaoborus larvae is more than twice that of Holopedium. Daphnia and Holopedium could coexist in a purely competitive system; however, because of selective predation, their observed abundances correspond little to their competitive status.--Copyright 1973, Biological Abstracts, Inc.
W76-10125

ANOMALOUS DIURNAL PATTERNS OF STEM XYLEM WATER POTENTIALS IN LARREA TRIDENTATA,
New Mexico State Univ., University Park. Dept. of Biology.
J. P. Syvertsen, G. L. Cunningham, and T. V. Feather.
Ecology, Vol. 56, No. 6, p 1423-1428, Autumn 1975. 1 tab, 7 fig, 18 ref.

Descriptors: *Soil-water-plant relationships, *Creosote, *Xylem, *Soil water movement, *Soil moisture, New Mexico, Water vapor, Transpira-

tion, Soil profiles, Root zone, Stemflow, Thermocline, Soil temperature, Shrubs.

At a study area in northeast Dona Ana County, New Mexico, diurnal stem xylem water potentials of Larrea tridentata (DC.) Cov. were measured with a pressure chamber during the summers of 1973 and 1974. Plants growing in dry soils had minimum water potentials at night and maximum values during the day, possibly due to vertical water vapor movements in the soil profile in response to temperature gradients. Water vapor apparently moves up from the rooting zone at night and drops again during the day. This process probably enhances the ability of Larrea shrubs to maintain photosynthetic activity when soil water potentials are low. Daily stem xylem water potentials may exceed the predawn value by as much as 35 bars and reach midday levels similar to well-watered plants. Midday values will probably begin exceeding predawn values when the latter fall to between -32 and -43 bars; this range is likely to vary according to soil type and climatic conditions. (Jahns-Arizona)
W76-10172

TECHNIQUES FOR IMPROVING TREE SURVIVAL AND GROWTH IN SEMIARID AREAS,
Agricultural Research Service, Manhattan, Kans.
J. D. Dickerson, N. P. Woodruff, and E. E. Banbury.
Journal of Soil and Water Conservation, Vol. 31, No. 2, p 63-66, March-April, 1976. 3 fig, 4 tab, 38 ref.

Descriptors: *Scotch pine trees, *Juniper trees, *Plant growth, Soil-water-plant relationships, *Semiarid climates, Environmental effects, Microenvironment, Water harvesting, Irrigation effects, Mulching, Water management(Applied), Windbreaks.
Identifiers: *Redcedar trees(Juniperus virginia), *Tree survival, Snowfence protection, Shade treatment, Soil profile modification.

Seven techniques were tested for supplying more water or altering the microclimate of eastern redcedar (Juniperus Virginiana) and Scotch pine (Pinus sylvestris) planting sites to improve survival and growth. Water-harvesting treatments (50 x 100 and 50 x 50 feet areas) provided 40 and 30 percent more redcedar growth than the control; drip irrigation and snowfence protection improved growth by 35 and 33 percent respectively. Survival increased with those techniques and with shade treatment, the latter having no positive influence on growth. Scotch pines responded less to the same treatments but survived and grew best with snowfence protection and drip irrigation. Soil profile modification and mulch plot treatments were unsuccessful; no Scotch pines survived under those techniques. Results indicate that trees in semiarid regions can be brought more rapidly to effective wind-barrier heights. (Jahns-Arizona)
W76-10175

EFFECT OF LOW MOISTURE LEVEL ON CATALASE ACTIVITY IN SOME CROP PLANTS DURING JUVENILE PHASE,
Gujarat Univ., Ahmedabad (India). Botany Div.
A. B. Vora, H. C. Patel, A. V. Vyas, B. R. Patel, and J. A. Patel.
Annals of Arid Zone, Vol. 14, No. 3, p 229-234, September 1975. 3 tab, 14 ref.

Descriptors: *Moisture stress, *Germination, *Crops, *Soil-water-plant relationships, *Plant tissues, Corn(Field), Plant physiology, Enzymes, Embryonic growth stage, Water requirements, Seeds, Legumes.
Identifiers: *Catalase activity.

After seeds of maize (Cv. Ganga 5), gram (Cv. Chafa) and Sesamum (Cv. Patan 64) were germinated under 'adequate' and 'low' moisture levels, catalase activity was determined in the growing axis and in maize endosperm, gram cotyledons, and Sesamum seedlings every 24 hours for 4 days. Low moisture levels caused catalase activity declines in the growing axis of maize and gram seedlings and gram cotyledon, while the endosperm enzymic activity of maize was unaffected. Enzymic activity of Sesamum seedlings increased at 24 and 72 hours and decreased at 48 hours of germination. The embryo axis of adequately watered seedlings showed greatly increased catalase activity for 72 hours followed by a decline. At a low moisture level, catalase activity remained low until a sharp rise occurred approaching 96 hours. Activity was much greater in the axis than the cotyledon, but low moisture levels depressed both. (Jahns-Arizona)
W76-10178

YIELD-NUTRIENT ABSORPTION RELATIONSHIPS AS AFFECTED BY ENVIRONMENTAL GROWTH FACTORS,
National Fertilizer Development Center, Muscle Shoals, Ala.
G. L. Terman, F. E. Khasawneh, S. E. Allen, and O. P. Engelstad.
Agronomy Journal, Vol. 68, No. 1, p 107-111, January-February, 1976. 7 fig, 17 ref.

Descriptors: *Plant growth, *Nutrients, *Crop production, *Soil temperature, *Soil environment, Nitrogen, Phosphorus, Corn(Field), Oats, Growth rates, Root development, Soil management, Crop response, Absorption.

Temperature effects on crop yield-nutrient concentration and uptake relationships were evaluated in three greenhouse pot experiments and as reported in the literature on such factors. Several rates of applied nitrogen and phosphorus were compared in experiments on oats grown for 7 weeks at three combinations of day length and temperature; corn grown for 4 weeks at water bath temperatures of 16 and 27C; and corn grown for 3 and 6 weeks to compare P rates and temperatures of 16 and 21 C and at ambient temperatures (25 to 35C). Plant nutrient concentrations, especially of P, increase with greater soil temperatures in short-duration experiments, with little yield response to temperature. Where marked yield response occurs, dilution of plant nutrient concentrations but higher uptake are the dominant trends with temperature increases up to the optimum for each crop species; the opposite trend usually occurs at temperatures above the optimum. Substrate nutrient release under higher temperatures varies with the soil fertility level and amounts of applied nutrients. Root growth rate is probably important in uptake, especially with nutrients having limited mobility in the soil. (Jahns-Arizona)
W76-10184

INTERACTION OF WATER POTENTIAL AND TEMPERATURE EFFECTS ON GERMINATION OF THREE SEMI-ARID PLANT SPECIES,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Land Resources Management.
M. L. Sharma.
Agronomy Journal, Vol. 68, No. 2, p 390-394, March-April, 1976. 2 fig, 1 tab, 16 ref.

Descriptors: *Osmotic pressure, *Germination, *Temperature, *Soil moisture, Planting management, Semiarid climates, Environmental effects, Moisture stress, Thermal stress, *Australia, Grasses, Shrubs, Viability.
Identifiers: *Water potential, *Matric potential, *Osmotic potential, New South Wales.

The interactive effects of temperature with matric and osmotic potential on the germination of Danthonia caespitosa, Atriplex nummularia and A. vesicaria are reported. The rate and total germination of all three dryland species from New South Wales decreased as water potential declined. Germination rates increased with increasing temperature, but final germinations were greatest at intermediate temperatures (20 - 25 C). Low water potentials during optimum temperatures produced the best germination. Osmotic and matric potential effects were qualitatively similar, but osmotic inhibition decreased at low temperatures. Both Atriplex germinated at extreme temperatures (5 and 40 C), while D. caespitosa failed to germinate. At low water potential (-15 bars) A. nummularia germinated from 15 to 40 C and D. caespitosa at 25C, while A. vesicaria germinated poorly at all temperatures. A. nummularia had the greatest resistance to environmental stress. Atriplex spp may germinate after rains during summer as well as winter; Danthonia germination is likely only during spring and autumn. (Jahns-Arizona)
W76-10185

MOISTURE USE EFFICIENCY OF DRYLAND CROPS AS INFLUENCED BY FERTILIZER USE II. RABI CEREALS,
Indian Agricultural Research Inst. New Delhi.
For primary bibliographic entry see Field 3F.
W76-10186

ACCUMULATION AND MOBILITY OF CESIUM IN ROOTS OF TULIP POPLAR SEEDLINGS,
Tennessee Valley Authority, Norris. Div. of Forestry, Fisheries, and Wildlife Development.
For primary bibliographic entry see Field 5B.
W76-10297

RADIOCESIUM LEVELS IN VEGETATION COLONIZING A CONTAMINATED FLOOD PLAIN,
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5C.
W76-10298

SEASONAL VARIATION IN RADIOCESIUM CONCENTRATIONS IN THREE TREE SPECIES,
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5C.
W76-10299

EFFECTS OF TREE SPECIES, TEMPERATURE, AND SOIL ON TRANSFER OF MANGANESE-54 FROM LITTER TO ROOTS IN A MICROCOSM,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5C.
W76-10317

INFLUENCE OF NUTRIENT AVAILABILITY ON ECOSYSTEM STRUCTURE,
Mansfield State College, Pa. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10324

NUTRIENT RETURN IN THE STEMFLOW AND THROUGHFALL OF INDIVIDUAL TREES IN THE PIEDMONT DECIDUOUS FOREST,
Duke Univ., Durham, N. C. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W76-10326

2J. Erosion and Sedimentation

SEASONAL DYNAMICS OF SUSPENDED MATTER IN THE AZOV SEA, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
Yu. P. Khrustalev, L. Z. Ganicheva, and L. A. Chernousova.
Izv Sev-Kavk Nauchn Tsentra Yvssh Shk Estestv Nauki. 1, p 76-80, 1974.

Descriptors: Suspended solids, Seasonal, Productivity, Rivers.
Identifiers: Biological studies, *USSR(Azov Sea).

On the basis of seasonal observations the main sources of suspended material in the Azov Sea (due to shore abrasion, disintegration of bottom rocks and discharge of the Don and Kuban Rivers) were determined and their seasonal dynamics traced. A pattern of quantitative distribution and dependence on hydrologic conditions, biological productivity and intensity of shore abrasion, and evacuation of materials by the Don and Kuban Rivers was established.--Copyright 1975, Biological Abstracts, Inc.
W76-10126

THE SIMULATION OF SEDIMENT TRANSPORT,
Hydrocomp, Inc., Palo Alto, Calif.
K. M. Leytham.
Simulation Network Newsletter, (Hydrocomp), Vol. 7, No. 8, p 1-8, November 15, 1975. 4 fig, 9 ref.

Descriptors: *Analytical techniques, *Simulation analysis, *Clays, *Sands, *Silts, Sediments, Mathmatical models, Model studies, Runoff, Natural streams, Scour, *Sediment transport.

A deterministic, fixed bed stream sediment transport model has been developed which accepts inputs of water and sediment from the land surface hhase as modeled by the Agricultural Runoff Management (ARM) Model. A kinematic wave technique is used to simulate flows in the system. Interchange of suspended material with stream bed material, scour and aggradation, the effect of armoring on scour rates, and longitudinal dispersion due to variations in velocity are the major sediment processes represented. Sediment outflow from a channel reach is first approximated by assuming slug flow but the estimate is later adjusted to allow for longitudinal dispersion and changes in sediment concentration with time. It is assumed that all the sand, some silt, and a small portion of the clay settle out during the modeling interval. Steady state transport rates for cohesionless materials are converted to scour rates by assuming that ultimate steady state concentrations would be achieved by the end of each modeling interval. The model includes additional algorithms for beds containing cohesive clay and silt materials. Armoring, an effect in which immobile, cohesionless particles protect the particles under them from scour, is included in the model. The algorithms for settling and scour are used to calculate a new concentration which, together with the initial concentration assumed for slug flow, is used to calculate the sediment outflow. (Snyder-FIRL)
W76-10244

NUTRIENT LOSSES IN PARTICULATE FORM AS WEIR POND SEDIMENTS FROM FOUR UNIT WATERSHEDS IN THE SOUTHERN APPALACHIANS,
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-10330

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME II.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 8B.
W76-10415

TESTS ON THE EQUILIBRIUM PROBILES OF MODEL BEACHES AND THE EFFECTS OF GRAIN SHAPE AND SIZE DISTRIBUTION,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 2L.
W76-10422

TIME GROWTH OF TIDAL DUNES IN A PHYSICAL MODEL,
Queen's Univ., Kingston, Ontario. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10424

LABORATORY EFFECTS IN COASTAL MOVABLE-BED MODELS,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W76-10425

SIMULATION OF DELTA BUILDING PROCESS,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 2L.
W76-10426

MOVABLE-BED MODEL INVESTIGATION OF TAICHUNG HARBOR, TAIWAN, REP. OF CHINA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10427

COASTAL MOBILE BED MODEL - DOES IT WORK,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10428

MODELING SEDIMENT DEPOSITION IN A TIDAL RIVER,
Dames and Moore, Cranford, N.J.
For primary bibliographic entry see Field 2L.
W76-10447

COMPUTER SIMULATION OF BEACH EROSION AND PROFILE MODIFICATION DUE TO WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10448

MODELLING OF SUSPENSION CURRENTS,
Trondheim Univ. (Norway). Vassdrags-og Havnelaboratoriet.
For primary bibliographic entry see Field 5B.
W76-10449

ANALYTICAL MODEL OF DUCT-FLOW FLUIDIZATION,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 8B.
W76-10450

LCHF COASTAL SEDIMENT MODELING TECHNIQUES,
Laboratoire Central d'Hydraulique de France, Paris.
For primary bibliographic entry see Field 2L.
W76-10463

2K. Chemical Processes

SALT-LOAD COMPUTATIONS--COLORADO RIVER; CAMEO, COLORADO, TO CISCO, UTAH: PART 1. DATA SUMMARY,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-10142

SALT-LOAD COMPUTATIONS--COLORADO RIVER; CAMEO, COLORADO, TO CISCO, UTAH: PART 2. BASIC DATA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-10143

MAPS SHOWING GROUND-WATER CONDITIONS IN THE RANEGRAS PLAIN AND BUTLER VALLEY AREAS, YUMA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-10149

BORON AND ARSENIC STUDIES IN FLORIDA WATERS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5B.
W76-10265

INTERLABORATORY QUALITY CONTROL STUDY NO. 5, CHROMIUM, IRON, MOLYBDENUM AND VANADIUM,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-10493

INTERLABORATORY QUALITY CONTROL STUDY NO. 4, ARSENIC, CADMIUM, COBALT, MERCURY AND NICKEL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-10495

2L. Estuaries

SHORT-TERM REGULATION OF BOD UPSETS IN AN ESTUARY,
Delaware Univ., Newark, Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W76-10020

INDUSTRIAL RESEARCH INSTITUTE STUDYING POLLUTION PROBLEMS OF SETO INLAND SEA,
Chugoku National Industrial Research Inst., Hiroshima (Japan).
For primary bibliographic entry see Field 5B.
W76-10031

ECOSYSTEMS ANALYSIS OF THE BIG CYPRESS SWAMP AND ESTUATIES,
Environmental Protection Agency, Athens, Ga. Surveillance and analysis Div.
For primary bibliographic entry see Field 6G.
W76-10046

AN ANALYSIS OF THE DYNAMICS OF DDT AND ITS DERIVATIVES, DDD AND DDE, IN MARINE SEDIMENTS
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 5C.
W76-10050

TUBE-WORM-SEDIMENT RELATIONSHIPS IN POPULATIONS OF PECTINARIA GOULDII (POLYCHAETA: PECTINARIIDAE) FROM BARNEGAT BAY, NEW JERSEY,
Rutgers-The State Univ., New Brunswick, N. J. Dept. of Zoology.
D. A. Busch, and R. E. Loveland.
Marine Biology, Vol. 33, No. 3, p. 255-264, 1975. 1 tab., 11 fig., 13 ref.

escriptors: Environmental effects, Animal ehavior, Sediments, Sands, *Bottom sediments, article size, *Worms, Benthos, *Sludge worms, ampling, Aquatic animals, Benthic fauna, lethodology, Growth stages, New Jersey, Bays, istribution.
lentifiers: *Pectinaria sp., *Polychaetes, *Tube orms, *Barnegat Bay(NJ).

ectinaria gouldii constructs over its lifetime a onical tube of increasingly large sand grains, re-ardless of surrounding sediment characteristics. lowever, the rate of increase of mean grain size f the tube and the population density of the worm ary with sediment type. The distribution of this pecies is limited by sediment composition. Vorms of equal length will always have equal an-erior tube apertures, although the thickness of the ube walls may be unequal. Tube surface-area, orm dry weight, and tube weight all increase as a ower function of the tube length. The conical hape and increasing mass of the tube impose an pper limit to worm growth, but do not interfere ith worm mobility. (Katz)
/76-10061

. COMPARISON OF GROWTH AND BUNDANCE FOR TIDAL POOL FISHES IN 'ALIFORNIA AND BRITISH COLUMBIA,
uelph Univ. (Ontario). Dept. of Zoology.
. M. P. Chadwick.
ournal of Fish Biology, Vol. 8, No. 1, p. 27-34, 976. 5 fig., 3 tab., 20 ref.

escriptors: Intertidal areas, Population, Analyti-al techniques, *Growth rates, *California, Sculpins, *Tidal waters, *Biological communi-es, *Fish populations, Statistical models, Fish, labitats, Sampling, Microscopy, Life cycles, Life listory Studies, Size.
dentifiers: *Oligocottus sp., Diversity index, British Columbia, Age determination.

A qualitative comparison of species compositions, elative abundances, diversity and growth was nade betwen tidal pool fishes collected in Port Renfrew, British Columbia and Bruels Point, California. The two most preponderant cottid spe-ies Oligocottus maculosus and Clinocottus glo-iceps were aged using vertebrae, from which ack calculated growth values were obtained. Spe-ies from Port Renfrew were found to have a igher diversity index, greater species composi-ion and abundance. No growth differences were ound between the two localities despite the 1120 m (700 miles) separating them. (Katz)
/76-10064

PETROLEUM HYDROCARBONS: DEGRADA-TION AND GROWTH POTENTIAL FOR AT-LANTIC OCEAN SEDIMENT BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-10068

PHYSICAL FACTORS CONTROLLING ABUNDANCE OF MEIOFAUNA ON TIDAL AND ATIDAL BEACHES,
ordan Univ., Amman. Marine Science Pro-ramme.
For primary bibliographic entry see Field 5A.
/76-10069

FRESH WATER CAN BE STORED IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 4B.
/76-10107

A COMPUTER SIMULATION OF COMPETI-TION AMONG FIVE SYMPATRIC CONGENER-IC SPECIES OF XANTHID CRABS,
Puerto Rico Univ., Rio Piedras. Dept. of Biology.
E. M. Preston.
Ecology. 54(3), p 469-483, 1973.

Descriptors: *Crabs, *Simulation analysis, Computer models, *Hawaii, Competition.
Identifiers: Pocillopora-meandrina-var-nobilis, Trapezia-digitalis, Trapezia-ferruginea, Trapezia-flavomaculata, Trapezia-intermedia, Trapezia-wardi, Xanthid crabs.

In Hawaii 5 species of xanthid crabs of the genus Trapezia (T. intermedia, T. wardi, T. ferruginea, T. digitalis, T. flavomaculata) are commensals of the branching coral Pocillopora meandrina var. nobilis. As adults, crabs are found in heterosexual pairs. Intraspecific agonistic interactions typically restrict host occupancy to one pair per species, but multiple species combinations are common. Though niche overlap among the species is nearly complete, they exhibit statistically different host size requirements. Field observations suggested that the distribution patterns of the species are influenced by interference competition during host selection. A stochastic computer model of host selection produced species distributions similar to those observed in the field. In the absence of evidence consistent with alternative hypotheses, this suggests that interference competition resulting from random encounters during host selection by adults is sufficient to account for site variability in the distribution patterns of species of Trapezia. Simulation experiments were conducted to assess the relative importance of the potential sources of competitive pressure to each species of Trapezia. The suitability of the hosts available at each study site to each species was estimated (1) assuming the presence of competitors and (2) assuming the hosts were uncolonized. The decrease in suitability of the hosts due to the presence of competitors was used as an index of competitive pressure on the species. There was no significant correlation between the degree of niche overlap and the intensity of competition between species. Caution is advised in using niche overlap measurements to estimate competition intensity.--Copyright 1973, Biological Abstracts, Inc.
W76-10124

SEASONAL DYNAMICS OF SUSPENDED MATTER IN THE AZOV SEA, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
For primary bibliographic entry see Field 2J.
W76-10126

LARGE-SCALE ESTUARINE WATER QUALITY MATRIX MODEL,
Texas Univ. at Austin. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 5B.
W76-10191

DISPOSAL OF SEWAGE FROM COASTAL TOWNS: THE CASE FOR SEA OUTFALLS,
Taylor (John) and Sons, London (England).
For primary bibliographic entry see Field-5E.
W76-10224

THE SIMULATION OF SEDIMENT TRANSPORT,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2J.
W76-10244

THE ROLE OF PHYSICAL MODELING IN MARSH-ESTUARINE MINERAL-CYCLING RESEARCH,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5B.
W76-10276

SYSTEMS MODELS FOR PHOSPHORUS MANAGEMENT IN FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W76-10277

MINERAL CYCLING IN MARINE ECOSYSTEMS,
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-10278

DISTRIBUTION OF COPPER AND ZINC IN OYSTERS AND SEDIMENTS FROM THREE COASTAL-PLAIN ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W76-10279

EFFECTS OF ENVIRONMENTAL LEVELS OF MERCURY AND CADMIUM ON RATES OF METAL UPTAKE AND GROWTH PHYSIOLOGY OF SELECTED GENERA OF MARINE PHYTOPLANKTON,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W76-10280

THE ROLE OF SPARTINA ALTERNIFLORA IN THE FLOW OF LEAD, CADMIUM, AND COPPER THROUGH THE SALT-MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W76-10281

HEAVY-METAL CONCENTRATIONS IN SELECTED GEORGIA ESTUARINE ORGANISMS WITH COMPARATIVE FOOD-HABIT DATA,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W76-10282

CONCENTRATIONS OF TOTAL MERCURY AND METHYL MERCURY IN FISH AND OTHER COASTAL ORGANISMS: IMPLICATIONS TO MERCURY CYCLING,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W76-10283

NITROGEN REGENERATION BY THE CTENOPHORE MNEMIOPSIS LEIDYI,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W76-10284

THE ROLE OF BENTHIC COMMUNITIES IN THE NITROGEN AND PHOSPHORUS CYCLES OF AN ESTUARY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W76-10285

RIVER INPUT OF INORGANIC PHOSPHORUS AND NITROGEN TO THE SOUTHEASTERN SALT-MARSH ESTUARINE ENVIRONMENT,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W76-10286

BASE-LINE DATA ON EVERGLADES SOIL-PLANT SYSTEMS: ELEMENTAL COMPOSITION, BIOMASS, AND SOIL DEPTH,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 5C.
W76-10314

AROCLOR 1016: TOXICITY TO AND UPTAKE BY ESTUARINE ANIMALS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-10340

DEEP-SEA BACTERIA: GROWTH AND UTILIZATION OF HYDROCARBONS AT AMBIENT AND IN SITU PRESSURE,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-10349

A DISCUSSION OF THE EFFECTS OF CERTAIN POTENTIAL TOXICANTS ON FISH AND SHELLFISH IN THE UPPER DELAWARE ESTUARY,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5C.
W76-10352

PROCEEDINGS OF THE CONFERENCE ON MARINE BIOLOGY IN ENVIRONMENTAL PROTECTION HELD AT SAN CLEMENTE ISLAND, CALIFORNIA ON 13-15 NOVEMBER, 1973.
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5C.
W76-10353

PROBLEMS AND TECHNIQUES OF MARINE BIOLOGY IN THE FIELD: MODELING THE MARINE ECOSYSTEM,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-10355

ISOLATION OF THE RUNOFF-DEPENDENT SALINITY IN A SHALLOW RIVER-MOUTH OFFSHORE ZONE UNDER CONDITIONS OF WIND-INDUCED RISE AND FALL OF THE WATER LEVEL, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na Donu (USSR).
A. M. Bronfman.
Izv Sev-Kavk Nauchn Tsentra Vyssh Shk Estestv Nauki, p 82-84, 1974.

Descriptors: *Salinity, *Rivers, Water levels, Benthos, Isolation, Fish, Spawning, Bays, Plankton, Shallow water, Methodology, Spatial distribution.
Identifiers: *USSR(Don Rivermouth).

A method is proposed for isolating the runoff-dependent component of salinity in the shallow offshore zone of the Don River (USSR), free of the effect of wind-induced fluctuations of the water level. The runoff-dependent salinity can differ from the actual (measured) salinity at a given point of the offshore zone by more than 3.0%. The route of Don River waters in Taganrog bay (Azov Sea) is defined, explaining the specific characteristics of the spatial distribution of a number of hydrochemical indices and of some biological characteristics (plankton benthos, fry of fish spawning in the Don, etc.).--Copyright 1975, Biological Abstracts, Inc.
W76-10361

MARINE POLLUTION MONITORING (PETROLEUM). PROCEEDINGS OF A SYMPOSIUM AND WORKSHOP,
National Oceanographic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 5B.
W76-10370

MOVEMENT OF SPILLED OIL IN SAN FRANCISCO BAY AS PREDICTED BY ESTUARINE NONTIDAL DRIFT,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-10385

OIL POLLUTION ALONG THE INDIAN COASTLINE,
National Inst. of Oceanography, Panjim (India).
For primary bibliographic entry see Field 5B.
W76-10386

SAMPLING ERRORS IN THE QUANTIFICATION OF PETROLEUM IN BOSTON HARBOR WATER,
Massachusetts Inst. of Technology, Cambridge. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5A.
W76-10387

LONG TERM WEATHERING CHARACTERISTICS OF IRANIAN CRUDE OIL: THE WRECK OF THE 'NORTHERN GULF',
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-10405

DETERMINATION OF HYDROCARBONS IN MARINE ORGANISMS AND SEDIMENTS BY THIN LAYER CHROMATOGRAPHY,
California Univ., Berkeley. Naval Biomedical Research Lab.
For primary bibliographic entry see Field 5A.
W76-10407

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME II.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 8B.
W76-10415

RESONANCES IN HARBORS WITH VARIABLE DEPTHS,
Florida Atlantic Univ., Boca Raton. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 8B.
W76-10416

WAVE RESPONSE OF OFFSHORE BOTTOMLESS HARBORS,
Tehran Univ. (Iran).
For primary bibliographic entry see Field 8B.
W76-10417

NONLINEAR LATERAL OSCILLATION IN A HARBOUR MODEL,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
For primary bibliographic entry see Field 8B.
W76-10418

NUMERICAL PREDICTION OF HARBOR RESPONSES,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 8B.
W76-10419

FREE OSCILLATIONS IN BAYS AND HARBORS,
Department of the Environment, Ottawa (Ontario). Oceanography Branch.
For primary bibliographic entry see Field 8B.
W76-10420

COMPUTATIONS OF HARBOR OSCILLATIONS BY RAY METHODS,
Technical Univ., of Denmark, Lyngby. Lab., of Applied Mathematical Physics.
For primary bibliographic entry see Field 8B.
W76-10421

TESTS ON THE EQUILIBRIUM PROBILES OF MODEL BEACHES AND THE EFFECTS OF GRAIN SHAPE AND SIZE DISTRIBUTION,
Tetra Tech, Inc., Pasadena, Calif.
J. I. Collins, and C. B. Chesnutt.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 907-926, 1975. 13 fig, 3 tab, 25 ref. Army DACW72-72-C-0024.

Descriptors: *Beaches, *Model studies, *Hydraulic models, Sediment transport, Sediments, Sands, Erosion, Beach erosion, Sedimentation, Deposition(Sediments), Geomorphology, Waves(Water), Ocean waves, Particle size.
Identifiers: *Movable-bed models.

This study was conducted to investigate the effects of the model sediment size distribution and particle shape in movable-bed models. Secondly, an experimental evaluation of the scale model relationship was performed. The results showed that the effects of grain shape and size distribution are varied. For many cases there was little or no measurable effect, but in others, particularly for smaller wave steepnesses, marked differences were apparent. These included the appearance of multiple bars in the case of bimodal sediment size distribution and an instable bar in the cases of very narrow unimodal size distributions and for some cases with a spherical grain shape. It was found that the initial profile slope can influence the final stable profile shape. 'Rocklite', a manufactured, light-weight ceramic sediment, appeared to be a potentially useful model material. The attempted verification tests were only partially successful. The slope of the foreshore was reproduced in scale, but the shape of the offshore and surf zones and the movement of the shoreline were not reproduced. (See also W76-10415) (Sims-ISWS)
W76-10422

PHYSICAL MODELING OF SCOUR INITIATION AND SEDIMENT TRANSPORT IN DISTORTED TIDAL MODELS,
Florida Univ., Gainesville. Dept. of Civil Engineering.
B. A. Christensen, and R. M. Snyder.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 927-935, 1975. 1 fig, 8 ref. NOAA 04-5-158-44.

Descriptors: *Scour, *Sediment transport, *Model studies, *Hydraulic models, Particle size, Roughness(Hydraulic), Estuaries, Inland waterways, Erosion, Sedimentation, Hydraulics.
Identifiers: *Movable-bed models.

While the construction and operation of undistorted fixed bed Froude models of hydraulic structures (such as spillways, intakes, guide vanes, etc.) generally do not present substantial problems, this is not the case when models of entire waterways, estuarine regions, and coastal

areas are considered. The horizontal extension of such flow systems combined with the need for not too small depths in the model require the operation of distorted models with artificial roughness elements introduced to distort the slope of the energy grade line correctly. Formulas for the size and distribution of these roughness elements were developed and tested in a tidal model of the canal between Little Lake Worth and Lake Worth in Palm Beach County, Florida. Furthermore grain-size model scales which will allow true modeling of scour initiation and sediment transport were developed for lighter than prototype model bed materials, thereby avoiding too small model grain-size. (See also W76-10415) (Sims-ISWS)
W76-10423

TIME GROWTH OF TIDAL DUNES IN A PHYSICAL MODEL,
Queen's Univ., Kingston, Ontario. Dept. of Civil Engineering.
M. S. Yalin, and W. A. Price.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 936-944, 1975. 2 fig, 6 ref.

Descriptors: *Sediment transport, *Dunes, *Model studies, Mathematical models, Hydraulic models, Tidal effects, Particle size, Ripple marks, Sand waves, Sands, Erosion, Sedimentation, Tides, Estuaries.

A method was suggested to determine the scale of the duration of the development of dunes forming on the bed of a tranquil flow. It was expected that the scale relations determined should be applicable to both unidirectional and tidal flows. The derivation rested on dimensional principles as well as on a mathematical relation describing the duration of development as a certain function of the geometric dimensions of dunes in their developed state, and a typical transport rate. The treatment was two-dimensional, the granular material being cohesionless. It was assumed that the movable bed of the model is formed by either sand or a lightweight material. The application of the method was illustrated by a numerical example. (See also W76-10415) (Sims-ISWS)
W76-10424

LABORATORY EFFECTS IN COASTAL MOVABLE-BED MODELS,
Coastal Engineering Research Center, Fort Belvoir, Va.
C. B. Chesnutt.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 945-961, 1975. 9 fig, 1 tab, 8 ref.

Descriptors: *Beaches, *Sediment transport, *Model studies, *Hydraulic models, Sands, Sediments, Coasts, Shores, Estuaries, Waves(Water), Ocean waves, Erosion, Sedimentation.
Identifiers: *Movable-bed models.

Profile changes were measured during three lengthy experiments in a 6-ft wide by 3-ft deep by 107-ft long outdoor wave tank, with a piston wave generator at one end and a movable bed of 0.2-mm sand at the other end. Generator period (1.90 sec), water depth (2.33 ft), and nominal wave height (0.36 ft) were constant in the three experimnts. The controlled experimental variables were the initial test length (distance from the wave generator to the initial still water level intercept) and the initial profile slope. The water temperature was uncontrolled. The average shoreline recession rate (which governed the rate of profile development) varied from 0.02 to 0.10 ft/hr during the first 50 hours of the three experiments. The differences in recession rate were apparently the result of water temperature variations and/or the differences in initial test length. Trasiet and final profile shapes appeared to be affected by the initial profile slope. (See also W76-10415) (Sims-ISWS)
W76-10425

SIMULATION OF DELTA BUILDING PROCESS,
Central Water and Power Research Station, Poona (India).
S. V. Chitale, V. G. Galgali, and K. N. Appukuttan.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 962-973, 1975. 4 fig, 1 tab. 3 ref.

Descriptors: *Deltas, *Sedimentation, *Model studies, *Hydraulic models, Rivers, Dams, Reservoirs, Sediments, Suspended solids, Sedimentation rates, Deposition(Sediments), Reservoir silting, Silting, Sedimentology.
Identifiers: *India, *Movable-bed models, *Beas River(India), *Pandoh Dam(India).

A rockfill dam of height 200 feet above the river bed is under construction on Beas river at Pandoh for diverting waters to the Bhakra reservoir on river Sutlej through a long water conductor system. The Beas river has a steep slope of about 1 in 200. After construction of the dam it is expected that the river would ultimately get completely silted up to the crest of the spillway. Model investigations were carried out to attempt scaler reproduction of the formation of sediment delta and of the conditions obtaining after final silting of the reservoir which were considered critical for sediment entry into the intake for diversion of the Beas supplies into the Sutlej. At the end of 10th cycle, the sediment inflow and the outflow equilized, indicating the stability of the delta. It was also observed that the slope of the stabilized delta was more or less same as the original bed slope of the river allowing for changes in the cross sectional flow area at higher elevations. (See also W76-10415) (Sims - ISWS)
W76-10426

MOVABLE-BED MODEL INVESTIGATION OF TAICHUNG HARBOR, TAIWAN, REP. OF CHINA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
H-S. Hou, B. A. Christensen, and T. Y. Chiu.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, Calfornia, September 3-5, 1975. American Society of Civil Engineers, New York, p 974-992, 1975. 21 fig, 3 tab, 1 ref.

Descriptors: *Harbors, *Littoral drift, *Model studies, Hydraulic models, Sediment transport, Ocean waves, Waves(Water), Sedimentation, Silting, Coasts, Beaches, Sands.
Identifiers: *Movable-bed models, *Taiwan, *Taichung Harbor(Taiwan).

The paper describes the establishment and operation of a distorted movable-bed model of Taichung Harbor located on the west coast of Taiwan where sand migration from the littoral drift, partially nourished by the Ta-Chia River, makes extensive dredging necessary to keep the harbor inlet channel open. The model employed is a three-dimensional movable-bed Froude model for all prototype depths less than 50 m. At depths in excess of this value the influence of sediment transport is considered negligible and a fixed-bed is used. The objective of the model study was to investigate the performance of various outer breakwater configurations and to select the optimum configuration which will stabilize the harbor inlet channel, i.e., protect it from excessive shoaling caused by the seasonal wave action and the littoral drift. The wave used in the model corresponds to a wave of 5 m in height and 12 seconds in period from a northerly direction. The optimum breakwater configuration was determined such that dredging of the harbor inlet will not be necessary during the first 15 years of the structures lifetime. After this period of time has elapsed minor yearly dredgings are expected to be needed. (See also W76-10415) (Sims - ISWS)
W76-10427

COASTAL MOBILE BED MODEL - DOES IT WORK,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
J. W. Kamphuis.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 993-1009, 1975. 2 fig, 1 tab, 27 ref, 2 append.

Descriptors: *Coasts, *Beaches, *Model studies, *Hydraulic models, Sands, Littoral drift, Erosion, Sedimentation, Sediment transport, Particle size, Geomorphology, Tracers, Coastal engineering.
Identifiers: *Movable-bed models.

After a number of years of study, coastal mobile bed models were classified and scale effects resulting from various non-similarities were discussed. Two methods of classification were given - one according to non-similarity of basic scaling relationships and another according to the type of model required. All but one class of model is subject to substantial scale effect and thus no easy scaling recipes can be given. Modelling still remains an art and this extensive study only results in pointing out some common pitfalls to be avoided. Models using lightweight material were shown to be eminently unsuitable for inshore areas and it appears to be virtually impossible to determine time scales for bed morphology because of scale effect. The simple tracer model appears to yield best value for money invested. (See also W76-10415) (Sims -ISWS)
W76-10428

MULTILAYER HYDRODYNAMICAL-NUMERICAL MODELS,
Naval Environmental Prediction Research Facility, Monterey, Calif.
T. Laevastu.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1010-1025, 1975. 6 fig.

Descriptors: *Coasts, *Hydrodynamics, *Model studies, Coastal engineering, Tides, Winds, Currents(Water), Ocean currents, Mathematical models, Computer models, Path of pollutants, Waves(Water), Estuaries, Beaches, Erosion, Deposition(Sediments), Sedimentation.

The basic hydrodynamical formulas were solved with an explicit finite difference method of Hansen. The layers (up to five layers in the existing model) are vertically integrated. The upper layer is driven by tides, winds, and thermohaline gradients. The lower layers are coupled with internal friction, as well as with horizontal and vertical density gradients. The model uses a staggered grid (Hansen type), actual depths, and coastline. The tides and 'permanent thermohaline currents' were introduced at the selected open boundaries. The surface wind was specified at each time step.

Verification and tuning of the model was done with tide gage data or curtent recordings in one or more locations within the area which have not been used for open boundary input. The basic outputs of the model at desired time intervals are: sea level, actual depth, and currents. Various other subroutines have been added to the models, which give: transport and diffusion of pollutants, drift of objects, and transport of water through various sections (flushing). Some examples and verifications were shown together with some specific applications of the results to coastal engineering and water management problems. (See also W76-10415) (Sims - ISWS)
W76-10429

MULTI-PHASED MODEL STUDY OF THE SETO INLAND SEA,
Chugoku Inst., of Industrial Technology, Kure (Japan). Hydraulic Research Section II.
N. Hayakawa, T. Higo, H. Tanabe, Y. Takasugi, and M. Takarada.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1026-1041, 1975. 6 fig, 2 tab, 2 ref.

Descriptors: *Model studies, *Bays, *Estuaries, Mathematical models, Hydraulic models, Tides, Sea level, Circulation, Water circulation, Water pollution, Currents(Water), Flow, Tidal waters.
Identifiers: *Seto Inland Sea(Japan), *Japan.

The Seto Inland Sea of Japan, with an area of about 21,400 sq km and greatly complicated topography, is plagued by water pollution problems due to heavy concentration of population and industry in the surrounding area. Reported here was an endeavor to develop both hydraulic and mathematical models of an enormous size with the ultimate goal of predicting water pollution in the Sea. Much effort was spent to counter the size and complex geometry of the model. Results of the verification study and some associated problems were described. (See also W76-10415) (Sims - ISWS)
W76-10430

TIDAL RESIDUAL CIRCULATIONS IN THE HYDRAULIC MODEL,
Ehime Univ., Matsuyama (Japan). Dept. of Ocean Engineering.
H. Higuchi, T. Sugimoto, H. Ueshima, T. Yanagi, and H. Yasuda.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1042-1049, 1975. 9 fig, 3 ref.

Descriptors: *Model studies, *Bays, *Estuaries, Hydraulic models, Tides, Sea level, Circulation, Water circulation, Water pollution, Currents(Water), Flow, Tidal waters, Coasts.
Identifiers: *Hinchi-Nada Sea(Japan), *Seto Inland Sea(Japan), *Japan.

The tidal residual circulation induced by the coastal boundary geometry of the bay is studied mainly by use of a hydraulic model experiment. The theoretical suggestion that these circulations are formed by the rotation of the non-linear effect of the tidal currents was verified, and the process was made more clear. These circulations have great importance for local distributions of substances as well as water exchange of the bay. They are similarly reproduced in the model when the non-dimensional parameters, Froude number and Reynolds numbers, are made to coincide between the model and the prototype. (See also W76-10415) (Sims-ISWS)
W76-10431

MODELING OF TURBULENCE IN THE SURF ZONE,
Technische Hogeschool, Delft(Netherlands). Dept. of Civil Engineering.
J. A. Battjes.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1050-1061, 1975. 16 ref.

Descriptors: *Surf, *Ocean waves, *Turbulence, *Model studies, Mathematical models, Coasts, Shores, Beaches, Energy dissipation, Energy loss, Waves(Water).

The problem dealt with was the estimation of the horizontal turbulent momentum exchange in the surf zone. In contrast to previous models, the relevant properties were estimated taking account of the wave energy dissipation by breaking. The resultant expression for the turbulent energy dissipation, combined with an analysis of the interaction of the turbulent velocity field with the rate of strain in the longshore current, led to estimates of the turbulence intensity, its macro-length-scale, and its contribution to the momentum exchange. The latter appeared in a form similar to that in the common eddy-viscosity models, although this had not been assumed a priori. The coefficients in the resultant expression, while of necessity adjustable, are expected to be of order unity. (See also W76-10415) (Sims-ISWS)
W76-10432

NEARSHORE WATER CIRCULATION INDUCED BY WIND AND WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering.
W. A. Birkemeier, and R. A. Dalrymple.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1062-1081, 1975. 12 fig, 13 ref. ONR N00014-69-A-0407.

Descriptors: *Waves(Water), *Winds, *Beaches, *Model studies, Mathematical models, Coasts, Shores, Wind tides, Ocean waves, Surf, Seiches, Circulation, Water circulation, Harbors, Estuaries.

A finite difference model for time-dependent, wave-induced nearshore circulation has been developed which includes wave refraction, wave-current interaction, wave setup, wind effects, and coastal flooding. Results were shown for set-up in wave tanks due to steady waves and wave groups, and also for a longshore periodic beach. Important results were that tuned wave groups can incite seiching in enclosed basins and harbors and that rip currents will be induced or maintained by the presence of surf zone channels. (See also W76-10415) (Sims-ISWS)
W76-10433

NUMERICAL MODEL FOR WAVE REFRACTION BY FINITE AMPLITUDE WAVE THEORIES,
California State Univ., Long Beach. Dept. of Civil Engineering.
H-L. Chu.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1082-1100, 1975. 6 fig, 11 ref, 2 append.

Descriptors: *Model studies, *Waves(Water), *Refraction(Water waves), Mathematical models, Computer models, Ocean waves, Equations.
Identifiers: Wave rays, Small amplitude waves, Stokes' third order waves, Cnoidal waves.

A mathematical model applying the concept of finite amplitude surface waves for computing and plotting wave refraction diagrams was presented. The important wave parameters considered in the model were wave height, wave period, and bottom contours. For the construction of the model, equations governing the wave ray curvature for a depth gradient of unit (defined as the curvature coefficient) were derived separately for the small amplitude waves, the Stokes' third order waves, and the cnoidal waves. The equations were also presented graphically, showing the regions of applicability for each theory and regions' overlap. Application of the model was demonstrated on a symmetrical shape submarine valley using a set of 12-second period waves with initial wave heights of 0 feet, 5 feet and 10 feet, respectively. Results in the form of wave refraction diagrams from the finite amplitude model were presented and were compared with those obtained from the small amplitude model. As the initial wave height to depth ratio H/d increased, refraction of wave rays subsided, which indicated that the small amplitude wave refraction model tended to overestimate the refraction. Even for waves of relatively small initial H/d ratio the differences in refraction patterns between the results from the small amplitude and those from the finite amplitude models were significant. (See also W76-10415) (Sims-ISWS)
W76-10434

SCALE EFFECTS ON PHYSICAL/MATHEMATICAL MODELING,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 8B.
W76-10435

APPLICATION OF A DYNAMIC NETWORK MODEL TO HYDRAULIC AND WATER QUALITY STUDIES OF THE ST. LAWRENCE RIVER,
For primary bibliographic entry see Field 5B.
W76-10440

MEASURED CONTRIBUTIONS OF THE TERMS OF THE VERTICALLY INTEGRATED HYDRODYNAMIC EQUATIONS,
Delta Service, Rijkswaterstaat (Netherlands).
W. J. Van de Ree, and H. Y. Schaap.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1237-1248, 1975. 6 fig, 2 ref.

Descriptors: *Model studies, *Ocean currents, *Estuaries, *Tidal waters, On-site investigations, Measurement, Currents(Water), Current meters, Hydraulic models, Water levels, Tides, Flow, Data processing, Mathematical models.
Identifiers: *The Netherlands, *North Sea.

In engineering studies for the Delta project, two-dimensional tidal computations were used in conjunction with hydraulic models for the prediction of tide levels and currents in the estuaries of the Rhine and Scheldt and adjacent sections of the Southern North Sea. A detailed field survey of tide levels and currents near Goeree, which was made to assess changes in tide levels and currents as a result of the closure of one of the branches of the Rhine estuary, made it possible to compute the time histories of all terms of the momentum equation at a few locations. During the survey, simultaneous current measurements were made at 16 stations over a 13-hour period. The velocities and direction were measured in the vertical at several locations. From this data the vertically-averaged velocities and directions were computed. In addition, at a large number of stations the tide levels

were measured. Float measurements were made also. From the analysis of this data it was concluded that, in hydraulic models of areas with flow conditions similar to those investigated, and at the same latitude, the effect of the earth's rotation should be simulated. If two-dimensional tidal computations of such areas are made, the advection terms should not be neglected in the computation, as the contribution of these terms is significant in the determination of the flow field. (See also W76-10415) (Sims-ISWS)
W76-10442

SIMULATION OF THE SALINITY DISTRIBUTION IN THE ST. LAWRENCE ESTUARY BY A TWO-DIMENSIONAL MATHEMATICAL MODEL,
Laval Univ., Quebec. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-10443

OVERVIEW OF PHYSICAL ESTUARY PRACTICE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
F. A. Herrmann, Jr.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1270-1290, 1975. 12 fig, 8 ref.

Descriptors: *Model studies, *Estuaries, *Hydraulic models, *Mathematical models, Reviews, Rivers, Sediment transport, Flow, Sea water, Freshwater, Salinity, Water quality.
Identifiers: Model scales, Scale effects, Model verification.

A very brief discussion is presented of similitude relations, selection of model scales, and scale effects for distorted-scale, fixed-bed physical models of estuaries. The problems susceptible to model analysis were enumerated. The advantages and disadvantages of employing physical models were discussed, including a cursory comparison with numerical models. The purpose and methods for model verification were discussed and verification test results were presented from several typical models. An emergency study in the Delaware River model to determine the rate of saltwater advancement up the estuary during the 1965 drought was described. A study of shoaling in Brunswick Harbor was also presented. The recommended improvement plan has been constructed in the field and data were presented for comparison with the model predictions. The cost savings effected by a dike rehabilitation study in the Delaware River model were also presented. (See also W76-10415) (Sims-ISWS)
W76-10444

COMPARISON BETWEEN PHYSICAL AND MATHEMATICAL MODELLING OF A TIDAL FJORD SYSTEM IN NORTHERN NORWAY,
Trondheim Univ. (Norway). Vassdrags- og Havnelaboratoriet.
T. Audunson, J. P. Mathisen, H. Naeser, and T. McClimans.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1291-1310, 1975. 13 fig, 1 tab, 10 ref.

Descriptors: *Model studies, *Fjords, *Tidal waters, Mathematical models, Hydraulic models, On-site investigations, Tides, Inlets(Waterways), Coasts, Currents(Water), Circulation, Water circulation, Diffusion, Tracers, Hydraulics, Hydrodynamics.
Identifiers: *Norway.

Results were presented from a physical and numerical model study of a tidal fjord system with three tidal inlets in northern Norway. The velocity field in the distorted physical model was shown to be in good agreement with available field data. The tidal velocity fields computed from a two-dimensional vertically integrated numerical model showed fair agreement with observations from the physical model. The computations showed little effect from the earth rotation. Stability of the numerical calculations required the incorporation of a diffusion term in the equations of motion. Numerical computations of spreading and dilution of tracer material employed a vertically integrated two-dimensional diffusion-advection model. In these computations use was made of the solution of the equations of motion. The numerical results were compared to similar results from the physical model. Agreement was found at some locations, disagreement at others. Diffusion effects in the distorted physical model seems larger than what was obtained in the numerical computations. The results strongly emphasized the importance of adequate data for comparison with numerical computations before such models may be used with confidence. (See also W76-10415) (Sims-ISWS)
W76-10445

COMPARISON OF HYDRAULIC AND NUMERICAL TIDAL MODELS,
Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.
E. B. Thornton, and L. S. Romer.
In: Symposium on Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1311-1328, 1975. 5 fig, 10 ref.

Descriptors: *Model studies, *Bays, *Tidal waters, Mathematical models, Hydraulic models, Tides, Tidal effects, Currents(Water), Circulation, Water circulation, Estuaries, Inlets(Waterways), Hydraulics, Hydrodynamics.
Identifiers: *San Diego Bay(Calif).

A comparison was made of the merits and limitations of hydraulic and numerical models. The discussion was limited to models having uniform density over depth and the driving force is the tide only. The model comparison was for San Diego Bay. Prototype measurements were used to calibrate both models. Comparable results were obtained from the hydraulic and numerical models dependent on how well they were calibrated. Techniques were described to divide large arrays representing embayments in the numerical model into smaller segments that are handled more easily and faster in the computer. This technique can allow using finer mesh lengths to obtain better spatial resolution. (See also W76-10415) (Sims-ISWS)
W76-10446

MODELING SEDIMENT DEPOSITION IN A TIDAL RIVER,
Dames and Moore, Cranford, N.J.
J. I. Ordonez.
In: Symposium on Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1347-1368, 1975. 8 fig, 10 ref.

Descriptors: *Model studies, *Estuaries, *Deposition(Sediments), Computer models, Sediment transport, Rivers, Tidal waters, Tidal streams, Sediments, Sedimentation, Intakes, Flow, Mathematical models, California.
Identifiers: *Sacramento River(Calif).

A computer modeling technique was developed to study the extent and depth of sediment deposits in tidal rivers downstream from a local source of oversupply of sediment. The model describes the deposits as one-dimensional deltas of uniform height moving in the flow direction according to the varying transport capacity of the river at different discharges and bed elevations. The model incorporates a reorganization of the hydraulic computations in the Einstein Method, for sediment transport calculations in alluvial rivers, to permit the determination of the sediment transport capacity of a given channel with a given discharge, when the depth or velocity in the reach are known. The new procedure does not require a knowledge of the friction slope and is particularly suited for the computation of transport capacities in gradually varied unsteady flow where the hydraulic conditions can be represented by a series of uniform flows during discrete intervals of time. (See also W76-10415) (Sims - ISWS)
W76-10447

COMPUTER SIMULATION OF BEACH EROSION AND PROFILE MODIFICATION DUE TO WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering.
H. Wang, R. A. Dalrymple, and J. C. Shiau.
In: Symposium on Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1369-1384, 1975. 9 fig, 10 ref.

Descriptors: *Model studies, *Beach erosion, *Waves(Water), Computer models, Mathematical models, Littoral drift, Sediment transport, Erosion, Sedimentation, Suspended solids, Tidal effects, Tides, Beaches, Coasts.

The phenomenon of beach erosion has become important in recent years as the coastline has become a focus of human activity. In order that adequate planning in the coastal zone be possible, it is necessary to understand and to model the evolving coastline. A computer model has been developed to predict coastal erosion as a function of input deepwater wave conditions, tidal conditions, and the nearshore present bathymetry. The model predicts sediment transport in the offshore zone due to transport of material by the wave-induced mass transport and in the surf zone, caused primarily by the longshore current. Examples of the capabilities of the model were presented, including the modification of the beach profile with time due to the uneven littoral drift across the surf zone and the alteration of an irregular shoreline with time due to wave and tidal effects. (See also W76-10415) (Sims-ISWS)
W76-10448

PROBLEMS OF PHYSICAL MODEL TESTS WITH HARBOURS,
Danish Hydraulic Inst., Copenhagen.
For primary bibliographic entry see Field 8B.
W76-10451

TWO-DIMENSIONAL FINITE ELEMENT DISPERSION MODEL,
Dames and Moore, Cranford, N.J.
For primary bibliographic entry see Field 5B.
W76-10453

FLOW2D: A TWO-DIMENSIONAL FLOW MODEL FOR FLOOD PLAINS AND ESTUARIES,
Resource Analysis, Inc., Cambridge, Mass.
G. J. Vicens, B. M. Harley, and J. C. Schaake, Jr.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1487-1504, 1975. 6 fig, 4 ref.

Descriptors: *Model studies, *Floods, *Flood plains, *Estuaries, Mathematical models, Finite element analysis, Water levels, Flow, Flood flow, Streamflow, Hydrographs, Hydrology, *Puerto Rico.

In a variety of flood plains and estuaries a one-dimensional analysis of the water movement is inappropriate. For these cases a Two-Dimensional Flow Model (FLOW2D) has been developed. FLOW2D numerically solves the equations of continuity and momentum in finite element form to predict stages and discharges throughout the area of interest. The continuity equation relates the rate of change in water surface elevation to the net rate of instantaneous flow into a segment. A flood plain or estuary is divided into a number of segments. The input data required are: minimum, median, and maximum elevations within each segment; segment size; cross-section descriptions for the boundaries between segments; Manning's n for each of these cross-sections; and flow or water surface hydrographs at the external boundaries. A unique feature of this model, which seeks to minimize the cost of simulation runs while maintaining strict control of the accuracy of the solutions, is a variable time step. Through the use of filter/prediction techniques, the model internally reduces the time step when sharp changes in water surface elevations are occuring. In this manner a more 'detailed' description of these changes is obtained. On the other hand, where no such variations are present, the model increases the time step so as to minimize the cost of the solution. This model has been used to estimate flood elevations in a variety of flood plains in Puerto Rico. In those basins where observed flood elevations were available, the simulated results were in close agreement. (See also W76-10415) (Sims-ISWS)
W76-10454

ANALOGOUS MODELLING OF AQUIFEROUS SYSTEMS IN COASTAL ZONES,
Akademiya Nauk SSSR, Moscow. Interagency Geophysical Committee.
G. V. Bogomolov, Y. G. Bogomolov, and A. M. Soyfer.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1505-1515, 1975. 2 fig, 5 ref.

Descriptors: *Model studies, *Saline water-freshwater interfaces, *Saline water intrusion, Coasts, Aquifers, Analog models, Analog computers, Groundwater, Sea water, Infiltration, Estuaries.

The problem of analog modelling of water-bearing systems in coastal zones was described with application of effective head as the potential function during boundary displacement of fresh and salt waters. The paper also presented peculiarities of solution of an inverse problem and an example of solution of a test problem. (See also W76-10415) (Sims-ISWS)
W76-10455

NUMERICAL MODEL FOR STORM SURGE AND TIDAL RUN-UP STUDIES,
Dames and Moore, Los Angeles, Calif. Advance Technology Group.
A. K. Runchal.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1516-1534, 1975. 7 fig, 10 ref.

Descriptors: *Model studies, *Storm surge, *Tidal waters, Mathematical models, Mud flats, Tidal marshes, Beaches, Reservoirs, Winds, Pressure, Friction, Coriolis force, Waves(Water), Algorithms, Flow, Water circulation, Numerical analysis, Simulation analysis.
Identifiers: *Tidal run-up.

The mathematical and numerical basis of a computational model developed for study of run-up and draw-down on tidal flats was described. The model is based upon the 'shallow water' theory and accounts for the presence of coriolis force, basin friction, wind stresses, and pressure gradients. The mathematical model is pseudo-two-dimensional in nature in that the gradients of the variables are assumed negligible in a direction normal to that of the main concern. The resulting algorithm is especially efficient and economical. Unlike many other numerical algorithms, the present one was found to be especially suited for preserving the characteristic wave speeds and amplitudes of the solution. It has been tested with a number of trial problems and found to provide results which accord well with the available approximate or analytic solutions. (See also W76-10415) (Sims-ISWS)
W76-10456

NUMERICAL SIMULATION OF STORM SURGES IN BAYS,
Danish Hydraulic Inst., Horsholm.
A. Damsgaard, and A. F. Dinsmore.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1535-1551, 1975. 9 fig, 2 tab, 4 ref.

Descriptors: *Model studies, *Storm surge, *Coasts, *Florida, Mathematical models, Hurricanes, Storms, Winds, Waves(Water), Floods, Flood plains, Bays, Estuaries, Barrier islands, Tides, Wind tides, Numerical analysis, Simulation analysis.
Identifiers: *Biscayne Bay(Fla), *Hurricane Betsy.

A two-stage approach for numerical simulation of storm surges in complex coastal areas has been adopted by the Danish Hydraulic Institute. The first stage simulates the open coast surge on a large and relatively coarse model including enough area that the surge is generated entirely within the model. The second stage routes the open coast surge into the nearshore area and superimposes the locally generated surge on top of the open coast surge. This method is particularly suited to simulation of surges in such complex areas as bays and estuaries partly sheltered by barrier reefs, low-lying barrier islands, which might be overtopped at some stage during the surge, and inundated flood plains. It has been applied to design hurricane simulations in Biscayne Bay, Florida, and Darwin, Australia, among other locations. Both model stages are based on DHI's computer system 'System 21' which computes the flows and water levels in a model of the area under study using a finite difference method for solution of the equations of continuity and momentum for nearly-horizontal two-dimensional flows. The area may be of quite arbitrary shape and bathymetry. (See also W76-10415) (Sims-ISWS)
W76-10457

PORTABLE BREAKWATER WITH SHIP HULKS,
Dames and Moore, New York.
For primary bibliographic entry see Field 8B.
W76-10459

MODELING OF INLET-BAY SYSTEMS IN RELATION TO SAND TRAPPING,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
D. B. King, and O. H. Shemdin.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1623-1637, 1975. 12 fig, 4 ref. ONR NR-388-106 ONR N00014-A-0173-0020

Descriptors: *Model studies, *Inlets(Waterways), *Bays, *Sedimentation, Mathematical models, Channels, Estuaries, Littoral, Rivers, Coasts, Tides, Tidal waters, Sands, Sediment transport, Sediments, Hydraulics.

Models of inlet-bay systems were considered through the use of the equations of motion and continuity. The models include inertia in the inlet, changing cross sectional area in the inlet, changing surface bay area and considers river discharge. Previous analytical models simplify such considerations and predict symmetric flows in and out of inlets over a tidal cycle. The nonlinear friction in the inlet coupled with the above considerations produce asymmetric flows over a tidal cycle of varying degrees. The sediment transport capability of inlets were considered in terms of power of the flow rates. The inlet-bay systems were interpreted in light of their capability to trap sand from the littoral zone. It was found that some inlets behave as sinks and others eject sand to the ocean. This depends on the repletion coefficient as defined by Keulegan and on whether the inlet cross sectional area or bay surface area increase with the tidal elevation as in marsh regions. The sand trapping capability was also investigated in light of the phase shift between the ocean tide and the inlet current. The model results were discussed in light of observations obtained from Florida inlets. (See also W76-10415) (Sims - ISWS)
W76-10462

LCHF COASTAL SEDIMENT MODELING TECHNIQUES,
Laboratoire Central d'Hydraulique de France, Paris.
C. Migniot, C. Orgeron, and F. Biesel.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1638-1657, 1975. 18 fig.

Descriptors: *Model studies, *Coasts, *Sediment transport, Hydraulic models, Analytical techniques, Waves(Water), Currents(Water), Winds, Sands, Erosion, Sedimentation, Harbors, Breakwaters, Structures, Littoral drift, Beaches, Estuaries, Reviews.

Systematic studies of the complex motions induced by waves, currents and wind action have to be made for a large variety of projects including large or recreational harbors and coast protection works. Except for the simplest cases, scale model techniques remain the only reliable and economical means to forecast the effect of a maritime structure on bottom topography and to optimize the layout in order to suppress or minimize unwanted accretion or erosion. For the last thirty years, the Laboratoire Central d'Hydraulique de France (L.C.H.F.) has been developing a scale model technology allowing this kind of research to be carried out with a good accuracy. The present paper sets forth these techniques and shows examples comparing forecasts obtained with models with actual observed evolution. (See also W76-10415) (Sims - ISWS)
W76-10463

FLOATING STRUCTURE ARRANGEMENT,
For primary bibliographic entry see Field 8A.
W76-10465

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SEWAGE HANDLING AND DISPOSAL PROCESS FOR CHLORIDE (NACL) CONTAMINATED SLUDGES,
Dorr-Oliver Inc., Stamford, Conn. (Assignee).
For primary bibliographic entry see Field 5D.
W76-10205

COMPOSITE SEMIPERMEABLE MEMBRANES MADE FROM POLYETHYLENIMINE,
Universal Oil Products Company, Des Plaines, Ill. (Assignee).
W. J. Wrasidlo.
U. S. Patent No. 3,951,815, 5 p, 15 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1350, April 20, 1976.

Descriptors: *Patents, *Desalination, *Reverse osmosis, Membranes, Membrane processes, Waste water treatment, *Water pollution treatment, Water quality control, Water purification, Semipermeable membranes, Thin films, Chemical reactions.
Identifiers: Composite semipermeable membranes, Ultrathin films.

The object of the invention is to provide an improved method for making composite semipermeable membranes having good salt rejection characteristics in which membranes are resistant to deterioration. By employing a film-forming polymer having a plurality of reactive amino or hydroxyl groups, and by treating this polymer with a monomer which will cross-link the polymer, rather than react with two groups on the same molecule, ultrathin films can be created which have effective salt-rejecting capability and are thus useful in the creation of composite semipermeable membranes. When polyethylenimine is used, it may first be reacted with an appropriate amount of acrylonitrile under conditions which assure cyanoethylation of substantially all of the primary amino groups or the polyethylenimine may first be cross-linked and then reacted with acrylonitrile or a suitable reactant. This is a standard graft polymerization reaction and is carried out under known conditions. After the cyanothylation is complete, an appropriate water solution of the graft polymer is prepared, and a microporous substrate is soaked in this solution for a sufficient period of time. The reaction of the polyamine with the dicyl halide or some other monomer, is allowed to proceed for an appropriate period of time to assure that cross-linking to the extent desirable is achieved. (Sinha - OEIS)
W76-10485

3B. Water Yield Improvement

FIELD RESEARCH AND TESTING OF A WATER HAND PUMP FOR USE IN DEVELOPING COUNTRIES,
Battelle Columbus Lab., Ohio.
For primary bibliographic entry see Field 8G.
W76-10086

FRESH WATER CAN BE STORED IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 4B.
W76-10107

3C. Use Of Water Of Impaired Quality

EFFECTS OF TREATED MUNICIPAL WASTEWATER ON OAT FORAGE AND GRAIN,
Arizona Agricultural Experiment Station, Tucson.
For primary bibliographic entry see Field 5D.
W76-10119

USE OF SALINE WATER IN AGRICULTURE. I. DESCRIPTION OF THE SYSTEM,
Central Arid Zone Research Inst., Jodhpur (India).
R. P. Dhir, and O. P. Bhatia.
Annals of Arid Zone, Vol. 14, No. 3, p 206-211, September, 1975. 4 tab, 9 ref.

Descriptors: *Saline water, *Irrigation wells, *Irrigation practices, *Water management(Applied), *Arid lands, *Saline water systems, Crop production, Fallowing, Wheat, Barley, Groundwater, Sodium, *Salt tolerance.
Identifiers: *Rajasthan, India(Pali district), Raya, Jowar.

Details are presented of an irrigation system developed in western Rajasthan, India, using saline to highly saline sodic underground waters considered unfit for such purposes by all available water quality standards. Data were collected from 37 sites concerning water and soil characteristics, management practices and duration of well use. Irrigation using saline and sodium well water has increased over the last 50 years in this region; 90-95% of the wells were in use between 1970 and 1973; loam to clayey texture soils, from 60-90 cm deep were most commonly irrigated. Lands irrigated with waters below 5 mmhos are usually double cropped, while those under higher salinity irrigation are used in rotation with a fallow period (generally 18 mo) between applications allowing natural amelioration of soil through rainfall. Wheat is the most popular crop and is sometimes grown with barley; when waters below 5 mmhos are used, raya, jowar and maize are also grown. (Jahns-Arizona)
W76-10168

SEED GERMINATION AND EARLY SEEDLING GROWTH OF WHEAT (TRITICUM AESTIVUM LINN.) CV. 1553 UNDER THE INFLUENCE OF SALINITY AND PLANT-GROWTH HORMONES,
Swami Shradha Nand Coll., Alipur (India).
V. R. Babu, and S. Kumar.
Annals of Arid Zone, Vol. 14, No. 3, p 221-228, September, 1975. 4 tab, 11 ref.

Descriptors: *Seed treatment, *Germination, *Salt tolerance, *Plant growth regulators, *Soil-water-plant relationships, Wheat, Moisture content, Root development, Salinity, Plant growth.
Identifiers: Benzyl adenine, Kinetin, Osmotic stress, India.

Plant hormones benzyl adenine and kinetin promoted wheat seed (Triticum aestivum Linn. cv. 1553) germination and survival under osmotically stressed conditions of soil salt solutions up to 3.5%. The utilization of seed reserves decreased as soil salt concentrations increased. This inhibitory effect could be overcome up to 1% of salt solution by adding benzyl adenine and kinetin. Seedlings survived as long as 8 days in the 2.5 - 3.5% salt concentration range utilizing the assimilates in solution with hormones. The hormones had a corrective influence in seedling dry matter mobilization up to 1.5% soil solutions. Seedling water content also increased. Root and shoot elongation rates under test conditions were comparable to controls grown in distilled water, with hormone-treated seedlings at a 1% salt concentration having a greater shoot elongation than controls. Root elongation rates were higher in salt solutions with benzyl adenine than with kinetin. Increased water content may have been due to enhanced membrane permeability resulting from hormonal influence. (Jahns-Arizona)
W76-10169

OBSTACLES TO THE DEVELOPMENT OF ARID AND SEMI-ARID ZONES.
For primary bibliographic entry see Field 3F.
W76-10179

GEOTHERMAL POWER METHOD,
J. S. Swearingen.
U.S. Patent No. 3,951,794, 9 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1343, April 20, 1976.

Descriptors: *Patents, *Geothermal studies, Thermal properties, *Scaling, *Heat exchangers, Heat transfer, Energy, Suspensions, Suspended solids, Impaired water quality.

The object of this invention is to provide a system and method of extracting heat from hot unrefined water by passing it directly through a conventional heat exchange apparatus. Scaling and other solid build-up of impurities from the water is prevented in the hot water well casing and water transport equipment as well as in the heat exchange equipment. The heat exchanger surface may be the surfaces of a conventional heat exchanger such a tube and shell or they may be the surfaces of the porous material in an accumulator-type heat interchanger. The improvement involves adding to the hot unrefined water an agent capable of increasing the formation of non-scale-forming species of the scale- forming impurities so that scaling and other solid build-up on the heat exchange surface, particularly upon cooling of the water, is minimized. Non-scale-forming species are those which remain in solution or suspension in the unrefined water as it is passed through the heat exchange apparatus without forming scale and/or those which are harmlessly precipitated, e.g. solid non-scale particles which are small enough to remain in suspension in the moving water and be carried out of the heat exchange apparatus. (Sinha -OEIS)
W76-10470

CHANGE OF WATER REGIME AND CONTENT OF MOBILE FORMS OF N, K, MN AND FE IN MEADOW-PEAT SOIL OF THE RAMENSK FLOODPLAIN OF THE MOSCOW RIVER IN CONNECTION WITH AGRICULTURAL USE, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Ovoshchnogo Khozyaistva, Moscow (USSR).
For primary bibliographic entry see Field 2G.
W76-10477

3D. Conservation In Domestic and Municipal Use

TACOMA'S NORTH FORK WELLS.
For primary bibliographic entry see Field 4B.
W76-10089

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-10141

HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-10145

URBAN SERVICE PRICING AND LAND USE: SOME PRELIMINARY RESULTS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 6C.
W76-10193

RECIRCULATING SEWERAGE SYSTEM,
Koehler-Dayton, Inc., New Britain, Conn. (Assignee).
For primary bibliographic entry see Field 5D.
W76-10209

SYSTEM FOR TOTAL DIRECT RECYCLE OF SECONDARY MUNICIPAL WASTEWATER, VOL I -- DESIGN CONCEPTS,
Houston Research, Inc., Tex.
For primary bibliographic entry see Field 5D.
W76-10257

APPLICATION OF A WATER QUALITY MODEL TO THE DENVER METROPOLITAN AREA,
Black and Veatch, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-10438

3E. Conservation In Industry

COAL GASIFICATION IN SOUTHEASTERN OHIO: WATER SUPPLY AND DEMAND,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
E. E. Whitlatch, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 836, $5.00 in paper copy, $2.25 in microfiche. Ohio Water Resources Center, Columbus, Project No. 489X, Completion Report, September 1975. 77 p, 53 ref. OWRT A-041-OHIO(1).

Descriptors: *Water requirements, *Consumptive use, *Water supply, *Ohio, *Cost comparisons, Sites, Linear programming, *Optimization, *Energy, *Natural gas, Coal mines, Reservoirs, Groundwater conjunctive use, *Water demand, Optimum development plans, Water transfer, Water values, Solid wastes, Reviews.
Identifiers: *Coal gasification, Southeastern Ohio, High-Btu gas, Low-Btu gas, Synthetic natural gas, Gas transport, Gas cost, Gas supply, Gas demand, Coal supply.

A general review of the need for coal gasification is made at the National level and for the State of Ohio. Current State energy policy promotes the construction of both low and high-Btu coal gasification plants. Water requirements of such an industry are estimated and water availability is determined for Southeastern Ohio. Direct stream use, reservoir and groundwater sources are compared economically. Linear programming optimization models are also developed for the coal gasification siting problem. These incorporate the cost of plants, gas transmission, coal supply and transport, solid waste disposal and water supply. The estimated range of consumptive water use in a 250 million cubic feet per day, high-Btu plant, is from 7 to 45 million gallons per day (MGD). The most likely consumptive water use for such a plant in Southeastern Ohio is 25 MGD. A generalized cost analysis of three alternative water supply sources indicates that a direct stream source would very likely be the least expensive alternative, followed by reservoir and groundwater sources. The respective costs of these were calculated to be 17.9, 25.4, and 27.2 cents per 1000 gallons. At a gas price of $1.50 per 1000 cubic feet, the cost of water would generally represent from 1.2 to 1.8 percent of the final gas price. Mathematical models of the energy facility siting process can be developed and would be useful in the comparison of alternative trade-offs between low-Btu and high-Btu coal gasification plant construction. The Federal government should support a detailed study of water use and conservation in both the Lurgi and advanced technology processes. Site-specific reconnaissance should be carried out in the selected study area for both reservoir sites and potential groundwater aquifers capable of supplying a coal conversion industry.
W76-10002

COST FUNCTIONS FOR ADDITIONAL GROUND WATER DEVELOPMENT,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W76-10194

POLLUTANT ANALYSIS COST SURVEY,
National Bureau of Standards, Washington, D. C.
For primary bibliographic entry see Field 5A.
W76-10259

3F. Conservation In Agriculture

WATER QUALITY DATA FROM TRUCKEE AND CARSON RIVERS. PYRAMID LAKE AND LAHONTAN RESERVOIR, A WORKING PAPER.
Environmental Protection Agency, San Francisco, Calif.
For primary bibliographic entry see Field 5C.
W76-10054

ALFALFA SAFEGUARDS GROUND WATER.
For primary bibliographic entry see Field 5G.
W76-10093

PUDDLING TROPICAL RICE SOILS: 2. EFFECTS OF WATER LOSSES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
P. Sanchez.
Soil Sci. 115(4), p 303-308, 1973.

Descriptors: *Puddling, Cultivation, *Rice, Root development, *Plant growth, *Soil-water-plant relationships, Drainage effects, *Water loss, Water harvesting, Crop production, Rotations, Crop response.

The advantages of puddling some tropical rice soils are directly or indirectly related with deceasing water losses and not with increasing nutrient-supplying capacity. Puddled flooded treatments produced similar or higher rice yields than other combinations. The limitations of puddling rice soils are in restricting root development when the soil shrinks and cracks at early stages of rice growth in rainfed systems and the slow waterloss patterns after rice harvest which might limit rotations with other crops. When excessive water movement is not a limiting factor, excellent rice performance can be obtained from well-granulated soils.--Copyright 1973, Biological Abstracts, Inc.
W76-10118

SOLUTION PHOSPHORUS CONCENTRATION AND GROWTH OF RICE (ORYZA SATIVA L.) IN FLOODED SOILS,
Texas Agricultural Experiment Station, College Station. Dept. of Soil and Crop Sciences.
L. R. Hossner, J. A. Freeouf, and B. L. Folsom.
Soil Sci Soc Am Proc 37(3), p 405-408, 1973.

Descriptors: Soil-water-plant relationships, Nutrient requirements, *Phosphorus, *Plant growth, Fertilization, *Crop response, *Rice, Aquatic soils, Gulf coastal plain, Texas, Growth rates, Flooding.
Identifiers: Oryza-sativa, Flooded soils.

Soil solution P concentration was monitored at weekly intervals during the vegetative growth of O. sativa L. cv. 'Bluebelle' on flooded soils from the gulf coast region of Texas. Significant increases in dry matter production were obtained from application of phosphate fertilizer. Average soil solution P concentration ranged 0.02-5.28 ppm when all soils and P fertilization rates were considered. A linear relationship was obtained between the logarithm of the average soil solution P concentration and the P concentration or P uptake of the plant. Yields were greater than 90% of maximum when the average soil solution P concentration was greater than 0.1 ppm. The concentration of P in the plat tissue at 0.1 ppm soil solution P was 0.25%.--Copyright 1973, Biological Abstracts, Inc.
W76-10122

DIFFERENT LEVELS OF SOIL ORGANIC MATTER IN DESERT SOIL AND NITROGEN FERTILIZER ON YIELDS AND MINERAL COMPOSITION OF BARLEY GROWN IN THE SOIL,
California Univ., Los Angeles. Div. of Environmental Biology.
E. M. Romney, A. Wallace, J. W. Cha, and J. D. Childress.
Communications in Soil Science and Plant Analysis, Vol. 7, No. 1, p 51-55, 1976. 2 tab, 9 ref.

Descriptors: *Sierozems, *Soil environment, *Organic matter, *Crop response, *Barley, Soil moisture, Plant growth, Vegetation effects, Fertilizers, Soil types, Plant physiology, Nitrogen, Soil amendments.

Barley plants (Hordeum vulgare L. cultivar Atlas 57) were grown for 30 days in desert soil from bare areas (low soil organic matter) and from beneath long-established shrubs (moderately high soil organic matter). Plants were grown in pots with three replicates, with and without nitrogen fertilizer, watered daily and maintained at near 1/3 bar soil moisture or higher. Those produced in soil from under shrubs had three times greater dry weight than those grown in low organic matter soil with N added. Silicon levels of high organic soil plants were reduced by N fertilizer and were greater in plants from low organic matter soil with and without N. Shoot concentrations of iron, Al and Zn were positively correlated with N concentrations and negatively with those of Si. Mn levels were higher in plants from low soil organic matter; calcium was positively correlated with shoot concentrations of Ba. (Jahns-Arizona)
W76-10170

WATER QUALITY IMPLICATIONS OF CATTLE GRAZING ON A SEMIARID WATERSHED IN SOUTHEASTERN UTAH,
Oregon State Univ., Corvallis. Rangeland Resources Program.
For primary bibliographic entry see Field 5G.
W76-10171

CENTER-PIVOT IRRIGATION,
W. E. Splinter.
Scientific American, Vol. 234, No. 6, p 90-99, June 1976. 9 fig.

Descriptors: *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, *Pasture management, *Crop production, Land use, Soil moisture, Arid lands, Soil management, Economic feasibility, Irrigation practices, Irrigation systems.
Identifiers: *Center-pivot irrigation.

The center-pivot system involves irrigation of circular fields using a series of sprinklers mounted on a pipe supported by a row of mobile towers and rotated to distribute water supplied by a central well. Sprinklers are spaced so that the water is applied at increasing rates with distance outward along the pipe. The advantages are its automatic

eration on large tracts, minimized application, ign for the quarter section (160 acres) and the lity to irrigate lightly and frequently. The last ture is especially advantageous with coarse or dy soil; moisture in the root zone is replenished ficiently to allow intensive cropping on such ls. Pasture irrigated by this system has proved matically more productive. Fertilizers can be ected into the water supply line to administer rients as needed. Some disadvantages are the stantial energy requirements and possible letion of underground water reservoirs. The nomic potential is analyzed, and some ad- tageous methods of application are presented. hns-Arizona)
6-10173

FECT OF CULTURAL PRACTICES ON AIN YIELD AND YIELD COMPONENTS IN RIGATED WHEAT,
zona Univ., Tucson. Dept. of Agronomy and nt Genetics.
D. Day, A. Alemu, and E. B. Jackson.
ronomy Journal, Vol. 68, No. 1, p 132-134, uary-February, 1976. 3 tab, 13 ref.

scriptors: *Wheat, *Crop response, *Growth es, *Crop production, *Planting management, zona, Water management(Applied), Irrigation ects, Cultivation, Plant growth.

periments at Yuma, Arizona, evaluated effects wheat (Triticum aestivum) production of plant- methods and different cultural practices. Two nting methods (on the flat and on beds), 3 seed- rates (29, 58 and 87 kg/ha) and 4 row positions beds (north, south, east and west) were studied. t and bed methods produced similar wheat in yields and grain volume weights; seeding es had little net effect on those results, although low seeding rate resulted in more wheat seed head and fewer heads/unit area than higher es. Beds with an east-west orientation produced re heads/unit area, more seed/head and higher in yields than those running north-south. The ith row position on east-west beds had better ults than the north position except in seed ight response which was unaffected. Higher ding rates on north-south beds produced heavi- seeds. Row position on north-south beds did not ect head/unit area values and grain yields. sults suggest that wheat grown on north-south ls should have lower seeding rates for economi- production. (Jahns-Arizona)
6-10176

RTILIZATION, NUTRIENT COMPOSITION, D YIELD RELATIONSHIPS IN IRRIGATED RING WHEAT,
izona Agricultural Experiment Station, Yuma. pt. of Soils, Water, Engineering and Plant ences.
R. Gardner, and E. B. Jackson.
ronomy Journal, Vol. 68, No. 1, p 75-78, Janua- February, 1976. 3 fig, 5 tab, 5 ref.

scriptors: *Nitrates, *Fertilization, *Crop ponse, *Nutrient requirements, *Wheat, izona, Root zone, Crop production, Testing ocedures, Plant tissues, Phosphates.

e effect of N fertilization on the growth and ld of semidwarf spring wheat (Triticum tivum L.) in the Yuma Valley of southwestern izona and a tissue test as guide for applying h fertilizers is presented. Excessive N used is luated, in two field experiments reduced yields htly when compared with sufficient N levels. plication of 336 kg N/ha produced the best lds, with no further increase resulting from her rates. Yields intermediate between control l high-yield results were achieved with 112 and kg/ha rates prior to planting; similar results at se two rates suggest much of the N applied plant was leached from the root zone. N caused reases in number of heads/unit area and seeds/head, with a decrease in the weight of individual seeds. Total N content in the grain increased with larger N applications. Determination of P in the lower portion of wheat stems was of doubtful value in determining the crop's P status. (Jahns-Arizona)
W76-10177

OBSTACLES TO THE DEVELOPMENT OF ARID AND SEMI-ARID ZONES.
Nature and Resources, Vol. 11, No. 4, p 2-11, October-December, 1975. 1 fig.

Descriptors: *Arid lands, *Semiarid climates, *Land development, *Comprehensive planning, *Land use, Livestock, Sheep, Irrigation efficiency, Irrigation effects, Rainfall, Tourism, Human population, Social aspects, Crop production, Salinity, Salt tolerance.

Difficulties of animal husbandry, irrigation, rainfall cultivation, urban growth, industrial development and tourism within arid and semi-arid zones are discussed and some solutions offered. Arid zone problems are somewhat easier to contend with since specific solutions are based on divisionof arid areas into specialized land use units. Semi-arid zone development involves conflict between various methods (agriculture or animal husbandry), and population density increases complicate the decision-making process. Animal husbandry problems include those of climate, over-grazing, over-population, pastoral vs. agricultural orientations, loss of grazing land and livestock marketing complications. Irrigation produces harmful side-effects, salinization, soil cultivation and health factors. Rainfall cultivation is complicated by variable precipitation, erosion, animal husbandry and crop cultivation, and crop rotation. These and other obstacles to arid and semi-arid zone development are described. Proposals for specific management programs are outlined and recent innovations explored. (Jahns-Arizona)
W76-10179

ARIZONA'S WATER SUPPLY-SOME REFLECTIONS,
Arizona Bureau of Mines, Tucson.
For primary bibliographic entry see Field 4A.
W76-10183

YIELD-NUTRIENT ABSORPTION RELATIONSHIPS AS AFFECTED BY ENVIRONMENTAL GROWTH FACTORS,
National Fertilizer Development Center, Muscle Shoals, Ala.
For primary bibliographic entry see Field 2I.
W76-10184

MOISTURE USE EFFICIENCY OF DRYLAND CROPS AS INFLUENCED BY FERTILIZER USE II. RABI CEREALS,
Indian Agricultural Research Inst. New Delhi.
R. P. Singh, and Y. S. Ramakrishna.
Annals of Arid Zone, Vol. 14, No. 3, p 263-267, September, 1975. 1 tab.

Descriptors: *Application methods, *Fertilizers, *Water utilization, *Crop response, *Dry farming, Consumptive use, Water requirements, Nitrogen, Soil-water-plant relationships, Wheat, Barley, Crop production, Agronomy, Water conservation.

A study was conducted for two seasons (1969-70 and 1970-71) at the Indian Agricultural Research Institute, New Delhi, to test the response of wheat (Kalyan Sona) and barley (EB3/Ratna) grown on conserved soil moisture to graded levels of nitrogen (20, 40, 60 and 80 kg N/ha) and three methods of N application (broadcast, placement and 1/2 soil plus 1/2 foliar). Wheat and barley tested had 32-47% greater moisture use efficiency than controls when fertilized with 40 kg N/ha. The half-soil (drilled) plus half-foliar method of fertilizer application produced greater moisture use efficiency with wheat, and both that method and a placement technique were superior to the broadcast method with barley. Exact figures are given for crop response to various levels of nitrogen and application methods, and for total consumptive use, yield of grains, value of grains, and moisture use efficiency. (Jahns-Arizona)
W76-10186

1975 ARIZONA AGRICULTURAL STATISTICS.
Agricultural Research Service, Tucson, Ariz. Statistical Reporting Service.
Arizona Crop and Livestock Reporting Service Bulletin S-11, March, 1976. 71 p, 105 tab, 1 fig.

Descriptors: *Agriculture, *Crop production, *Statistics, *Arizona, *Weather data, *Livestock, *Water supply, *Reservoir yield, Rainfall, Reservoir storage, Soil moisture, Colorado River Basin, Profit.
Identifiers: Gila River Basin(Ariz), Salt River(Ariz).

A compilation of statistics is presented on Arizona agricultural production between 1968 and 1975, a summary of weather, crop and livestock conditions in 1975, and a water supply outlook for the state. Total rainfall for 1975 was below normal at most reporting stations, but a few mountain stations were slightly above average. Estimated crop sales amounted to $607.5 million or 1% below the 1974 level; this decrease was due to lower prices for some crops and reduced quantities in certain cases. Livestock and livestock products brought $618.5 million, or 6% greater than the 1974 total. Reservoir storage totals in the Gila and Colorado River Drainage basins are presented. It is expected that 1976 water supplies will be adequate if normal precipitation continues throughout the season. Heavy rainfall in February accounted for greatly increased flows in the Salt and Gila Rivers. Rain and melting snow have produced good soil moisture at lower and intermediate elevations, and good runoff is expected from normal precipitation in March and April. (Jahns-Arizona)
W76-10187

EFFECT OF WATER REGIME ON PRODUCTIVITY OF CULTIVATED PLANTS, (IN BELORUSSIAN),
R. I. Lashkyevich.
Vyestsi Akad Navuk B SSR Syer Biyal Navuk. 2, p 5-11, 1974.

Descriptors: Productivity, *Moisture content, Peat, *Water tables, Carrots, Corn(Field), *Soil moisture, Cultivation, *Crop production, Peas, Potatoes.
Identifiers: Beets, Cabbage, Peas, Peat, Potatoes.

The results of 16-yr investigations of the effect of the water table and moisture content of peat soils on the yield of agricultural crops are presented. Maintenance of an optimal water table and copious water charging in early spring improved the moisture of the rhizasphere and increased plant productivity even in an area where the groundwater dropped markedly in late summer. Copious moisture in the 1st half of vegetation when the main vegetative mass is formed and much moisture is consumed, considerably improved crop yield. The highest yields of grain crops were obtained at a water table of 50-75 cm, perennial grasses and peas at 50-55 cm, potatoes, carrots and corn at 60-85 cm, and beets and cabbage at 80-105 cm from the soil surface. The optimal water content of peat soil was established: from 75-85% for perennial grasses and from 70-80% for field crops, with its decrease to 70% of the maximum field capacity 30-35 days before harvesting root crops.--Copyright 1975, Biological Abstracts, Inc.
W76-10189

EFFECT OF TILLAGE ON SOIL STRUCTURE AND PLANT GROWTH UNDER RAIN-FED CONDITIONS,
Indian Agricultural Research Inst., New Delhi.
For primary bibliographic entry see Field 2G.
W76-10487

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

DESIGN OF A STORMWATER SEWER BY NONLINEAR PROGRAMMING--1,
Sherbrooke Univ. (Quebec). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-10034

WATER QUALITY DATA FROM TRUCKEE AND CARSON RIVERS. PYRAMID LAKE AND LAHONTAN RESERVOIR, A WORKING PAPER.
Environmental Protection Agency, San Francisco, Calif.
For primary bibliographic entry see Field 5C.
W76-10054

IRRADIANCE REDUCTION: EFFECTS ON STANDING CROPS OF THE EELGRASS, ZOSTERA MARINA IN A COASTAL LAGOON,
San Diego State Univ., Calif. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-10067

PUDDLING TROPICAL RICE SOILS: 2. EFFECTS OF WATER LOSSES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W76-10118

EVALUATION AND ADAPTATION OF SELECTED COMPUTER PROGRAMS TO WATER RESOURCE PROBLEMS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 7C.
W76-10129

BASIN GOVERNANCE,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W76-10130

DESIGN A RIVER BASIN SAMPLING SYSTEM,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W76-10131

SELECTED STREAMFLOW EXPERIENCE GRAPHS FOR SOUTHWESTERN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-10132

SALT-LOAD COMPUTATIONS--COLORADO RIVER; CAMEO, COLORADO TO CISCO, UTAH: PART 1. DATA SUMMARY,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-10142

SALT-LOAD COMPUTATIONS--COLORADO RIVER; CAMEO, COLORADO, TO CISCO, UTAH: PART 2. BASIC DATA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-10143

HYDROLOGIC DATA FOR LITTLE ELM CREEK, TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-10144

HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-10145

HYDROLOGIC DATA FOR COW BAYOU, BRAZOS RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-10146

HYDROLOGIC DATA FOR NORTH CREEK TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-10147

HYDROLOGIC UNIT MAP--1974, STATE OF WASHINGTON.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-10150

FLOOD PLAIN INFORMATION: CUMBERLAND RIVER, BURKESVILLE, KENTUCKY.
Army Engineer District, Nashville, Tenn.
Prepared for the City of Burkesville and Kentucky Department of Natural Resources, June 1971. 29 p, 5 fig, 7 plates, 6 tab.

Descriptors: *Floods, Flooding, *Flood flow, *River flow, *Flood profiles, *Flood plains, Dams, *Kentucky, Regional flood, Streamflow forecasting, Maximum probable flood, Historic floods, Flood data, Flood frequency, Peak discharge, Flood peak, Flow duration, Snowmelt.
Identifiers: *Cumberland River(KY), Burkesville(KY), Wolf Creek Dam(KY), Intermediate Regional Flood, Standard Project Flood.

Most developed lands subject to flooding in this study area are within the corporate limits of Burkesville. Most land is above flood levels, but there are some commercial and residential developments and a proposed industrial park within the floodway. The Cumberland River drains 17,614 square miles, 6,020 sq mi of this is above Burkesville. Wolf Creek Dam, 34 miles above Burkesville, impounds more than 96% of this drainage area and thus provides excellent protection for Burkesville. Before the dam was finished in 1950 flood stage was exceeded almost once a year but since that time bankfill stage has not been reached. Main periods of potential floods occur in December through April. Records of stream heights in the vicinity of Burkesville are available for years back to 1884, but official data goes back to 1941. The largest flood, in 1826, floated the courthouse out of Burkesville and destroyed many other structures. The highest recent flood occurred in 1946. After building the dam, the highest floodwaters occurred in 1952 when a peak discharge of 57,000 cubic feet per second was recorded. In an Intermediate Regional Flood a peak discharge of 64,000 cfs is expected along with water velocities of up to 5 ft/sec. This flood would last 24 hours. A Standard Project Flood would produce a peak discharge of 90,000 cfs with slightly higher channel velocities. This flood would last about 48 hours, considerably less than floods before Wolf Creek Dam was built. There are no significant obstructions to flood flow within the study reach. (Smith - North Carolina)
W76-10151

FLOOD PLAIN INFORMATION: EAST ARM LITTLE CALUMET RIVER, SALT CREEK-COFFEE CREEK, PORTER COUNTY, INDIANA.
Army Engineer District, Chicago, Ill.
Prepared for the Northwestern Indiana Regional Planning Commission, March 1975. 32 p, 12 fig, 20 plates, 10 tab.

Descriptors: *Floods, *Flooding, Flow characteristics, *Flood protection, *Non-structural alternatives, *Flood plain zoning, Planning, Flood damage, Floodways, Flood plains, Obstructions to flow, *Indiana.
Identifiers: *East Arm Little Calumet River(IN), Porter County(IN), Intermediate Regional Flood, Standard Project Flood, Flood Plain Management Program, Salt Creek(IN), Coffee Creek(IN).

The portion of Porter County covered by this report is subject to flooding from the East Arm Little Calumet River and its tributaries, Salt and Coffee Creeks. The flood plains are primarily residential and agricultural with extensive open spaces currently under pressure for development. Coffee Creek, flowing in a northwesterly direction for 8 miles to its confluence with the river, slopes about 13 feet per mile with a 4 to 5 foot wide channel. Salt Creek, flowing northerly, slopes at an average of 5.2 ft/mi. Total drainage area is 150.1 square miles. The river, with a 3.3 ft/mi gradient, has 10 to 15 foot wide channels. March and April are months of heaviest runoff, but floods occur in all seasons due to excessive rainfall. Floods can rise to peak in a relatively short period of time. Thirty-four bridges and culverts obstruct large flood flows. State and county regulations require prior approval of construction in floodways. The county is expected to adopt flood zoning ordinances in the near future. The most damaging floods, in 1923 and 1954, caused inundation of bridges and several deaths. In 1954 the East Arm Little Calumet River had a peak discharge of 3,110 cubic feet per second. An Intermediate Regional Flood and Standard Project Flood would have peak discharges of 4,240 cfs and 15,000 cfs, respectively, at the existing streamgage. Flood flows from these streams would cover large areas in Chesterton and Porter, damaging residential and commercial properties and private and public utilities. (Salzman - North Carolina)
W76-10152

FLOOD PLAIN INFORMATION: LITTLE EAGLE CREEK AND TRIBUTARIES, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
Prepared for Marion County Metropolitan Planning Department and Indianapolis Flood Control District, June 1971. 46 p, 18 fig, 8 plates, 13 tab.

Descriptors: *Floods, *Flooding, *Flood stages, Flow characteristics, *Flood plains, *Flood protection, *Non-structural alternatives, Control structures, Diversion structures, Historic floods, Flood data, Peak discharge, Flood damage, Planning, Flood plain zoning, Obstructions to flow, Streamflow forecasting, *Indiana.
Identifiers: Little Eagle Creek(IN), Marion County(IN), Falcon Creek(IN), Dry Run(IN), Dry Run Diversion(IN), Intermediate Regional Flood, Standard Project Flood.

This report covers a study reach of 11.21 miles of the Little Eagle Creek and 9.58 miles of Falcon and Guion Creeks, Dry Run and Dry Run Diversion which flow through urban and suburban areas of Speedway and Indianapolis, IN. Having a total drainage area of 26.9 square miles, the streams contain all forms of development in their flood plains which vary in width from 200 feet to 1000 feet, with those of the tributaries being narrower. Flooding occurs during all seasons resulting from heavy rains in winter and early spring and severe thunderstorms in summer and fall. Floods are relatively short with generally high rates of rise. Many bridges and 3 dams obstruct flood flows which can reach 10 ft/sec in the channels. Flood control structures include a diversion channel from Dry Run to Little Eagle Creek and proposed channels, storm sewers, diversion channels and structures for all streams. State and local regulations prohibit construction in the floodways without prior approval. Since the establishment of a stream gage in 1959 the greatest flood occurred in April 25, 1961 cresting at 718.3 feet msld with a peak discharge of 1940 cubic feet per second on Little Eagle Creek. An Intermediate Regional Flood and Standard Project Flood on Little Eagle Creek are estimated to crest at 727.6 ft and 730.7 ft respectively, and have peak discharges of 9,000 cfs and 14,500 cfs. An IRF would rise to peak in 13 hours and remain 7 hours above bankfull, and the SPF would rise in 65 hours and last 20 hrs. (Salzman - North Carolina)
W76-10153

FLOOD PLAIN INFORMATION: CROOKED CREEK AND WILLIAMS CREEK, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
Prepared for Marion County Metropolitan Planning Department and Indianapolis Flood Control District, June 1970. 39 p, 18 fig, 7 plates, 7 tab.

Descriptors: Floods, Flooding, *Flash floods, *Flood flow, *Historic floods, *Flood stages, Flow characteristics, *Flood plains, Flood protection, *Non-structural alternatives, Planning, *Indiana, Flood data, Peak discharge, Flow duration, Building codes, Flood plain zoning, Obstructions to flow, Streamflow forecasting.
Identifiers: Indiana Flood Control Act, Crooked Creek(IN), Williams Creek(IN), Marion County(IN), Intermediate Regional Flood, Standard Project Flood.

Covering a distance of 14.6 miles, the Crooked and Williams Creeks drain 42.3 sq mi on the west side of the West Fork White River. The creeks flow in a southerly direction with slopes of 14.2 ft/mi on Crooked Creek and 16.8 ft/mi on Williams Creek. Residential and undeveloped areas are in the flood plains which range from 400 ft to 1500 ft wide. Most floods occur between January to April resulting from general heavy rains; however, intense local thunderstorms can cause flash flooding. With velocities ranging up to 13 ft/sec in the channel, floods last for a short time in upper reaches, while longer periods of flooding occur in the lower reaches due to backwater effects of the river. Flood damage prevention measures include county and state regulations which require approval of any construction in the floodways. Obstructions to flood flow include 36 bridges as well as heavy vegetation. The greatest flood occurred in 1957 with peak discharges of 4,000 cubic feet per second and 1500 cfs on Crooked and Williams Creeks, respectively. An International Regional Flood and Standard Project Flood would have peak discharges of 8,050 cfs and 15,500 cfs on Crooked Creek and 8,200 cfs and 17,000 cfs on Williams Creek. Velocities typical of both creeks are 13 ft/sec in the channel with 5 ft/sec in the overbank during an IRF; for the SPF, 18 ft/sec in the channel with 7 ft/sec overbank. (Salzman - North Carolina)
W76-10154

FLOOD PLAIN INFORMATION: TURKEY AND JOPLIN CREEKS, JOPLIN, MISSOURI.
Army Engineer District, Tulsa, Okla.
Prepared for the City of Joplin, September 1973. 41 p, 9 fig, 18 plates, 5 tab.

Descriptors: *Floods, *Flood profiles, *Flow characteristics, *Flood plains, Flooding, Streamflow forecasting, Historic floods, Peak discharge, Flow duration, Flashfloods, Obstructions to flow, Dikes, Channel improvement, *Missouri.
Identifiers: Turkey Creek(MO), Joplin Creek(MO), Joplin(MO), Standard Project Flood, Intermediate Regional Flood.

The flood plains of the two creeks of this study area are partially covered with residential, commercial and industrial development. Of particular importance are the Turkey Creek Sewage Treatment Plant, Ozark Bible College and part of a shopping center along Turkey Creek. Joplin Creek, with a drainage area of 6.4 square miles, is a tributary of Turkey Creek which drains 49 sq mi. Continued growth of the watershed will probably intensify land use in the flood plains. The majority of flood producing storms over these watersheds occur during the spring and early summer months. Flooding generally results from intense storms of short duration. Stream gage records are available continuously since 1963. Large floods have occurred 5 times since 1943 and caused rather extensive damages due to the conditions in the flood plain. In the event of an Intermediate Regional Flood peak discharges of 7770 cubic feet per second and 11,800 cfs are expected on Joplin and Turkey Creeks, respectively, along with channel velocities up to 7 ft/sec in Joplin Creek and 9 ft/sec in Turkey Creek. Overbank velocities will average 1 to 3 ft/sec. During a Standard Project Flood peak discharges of 13,400 and 21,500 cfs are expected on Joplin and Turkey Creeks, respectively. Channel velocities could average up to 8 ft/sec in Joplin Creek and 10 ft/sec in Turkey Creek. Maximum velocities, occurring near bridges, could be up to 16 ft/sec. Floods on Joplin Creek would last 4 hours and on Turkey Creek up to 30 hours. Many of the bridges and culverts in the area are obstructive to flow. Flood protection measures include some channel improvement, protective dikes around sewage treatment plant, and park land in the flood plain. (Smith-North Carolina)
W76-10155

FLOOD PLAIN INFORMATION: PORTAGE OPEN BAY AND MAIN DITCH, VICINITY OF PORTAGEVILLE, MISSOURI.
Army Engineer District, Memphis, Tenn.
Prepared for the City of Portageville, September 1972. 23 p, 5 fig, 10 plates, 5 tab.

Descriptors: *Floods, *Flood profiles, *Channels, Flooding, Streamflow forecasting, Historic floods, Peak discharge, Flood peak, Flow duration, Channel improvement, *Missouri.
Identifiers: Portageville(MO), *Portage Open Bay(MO), Main Ditch(MO), Standard Project Flood, Intermediate Regional Flood.

Portage Open Bay, with a drainage area of approximately 50 square miles above the lower limits of this study, is part of the Little River drainage system. Main Ditch drains 18 sq mi and is a tributary of Portage Open Bay. The topography of this area is extremely flat and the average slope of Portage Open Bay is less than 1.5 feet per mile. The flood plain of Portage Open Bay is narrow and practically undeveloped below the mouth of Main Ditch, which has some development in its flood plain. It is likely that future extension of Portageville would be into the flood plain of Main Ditch. Major floods can occur in all seasons of the year and can rise from normal flow to peak in a relatively short period of time. There are no stream gages in the immediate study area, but the largest recent flood occurred in 1966 when some damage was caused in Portageville to buildings and roads. Other floods occurred in 1945 and 1957. In the event of an Intermediate Regional Flood peak discharges of 1310 cubic feet per second and 3060 cfs are expected in Main Ditch and Portage Open Bay respectively, along with water velocities up to 3 feet per second in the main channel and 1.6 ft/sec in the overbank area. This flood would rise to peak in 5.8 hours and last 92 hours above critical stage. Four of 7 bridges would be obstructive to flow. In a Standard Project Flood peak discharges of 2810 cfs and 6550 cfs are predicted for Main Ditch and Portage Open Bay respectively. Water velocities would be slightly higher than during the IRF. This flood would rise to peak in 36 hours and last 120 hours. All bridges would be obstructive to flow. (Smith-North Carolina)
W76-10156

FLOOD PLAIN INFORMATION: SOQUEL CREEK, SANTA CRUZ COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Santa Cruz County, July 1973. 20 p, 8 fig, 10 plates, 7 tab.

Descriptors: *Flood flow, *Flood profiles, *Flood data, *Flood stages, *Flood peak, *California, Runoff, Streamflow forecasting, Storms, Winds, Tides, Flood frequency, Peak discharge, Flow duration, Flow characteristics, Flood damage, Flood plains, Channels, Warning systems, Reservoirs, Obstructions to flow, Channel improvement.
Identifiers: Santa Cruz County(CA), Soquel Creek(CA), Soquel(CA), Capitola(CA), West Branch Soquel Creek(CA), Hester Creek(CA), Hinckley Creek(CA), Coast Range Mountains(CA), Intermediate Regional Flood, Standard Project Flood.

Soquel Creek originates in the Coast Range Mountains about 13 miles northeast of the City of Santa Cruz. West Branch Soquel, Hester Creek, and Hinckley Creek are major tributaries. The creek drains an area of 42 square miles, and flows through the towns of Soquel (population 5,795) and Capitola (population 5,080). Soquel Creek has a slope in its lower reaches of 20 ft/mi. There is commercial, agricultural, and residential development in the flood plain. Eleven floods have occurred since 1899, generally in the months of October to May. The bulk of flooding can be expected from December to March as the result of general winter storms. Obstructions to flood flows include vegetation and 5 bridges and culverts. The majority of the inundation along the lower reaches of Soquel Creek has been due to constrictive encroachment of buildings along the creek and the additional backwater effects caused by tides and winds. Heavy flooding occurred in December 1955 when a peak discharge at the gage in Soquel reached 15,800 cubic feet per second. Damage to commercial and residential development in Soquel was heavy. The Intermediate Regional Flood and the Standard Project Flood would have peak discharges of 16,400 and 19,800 cfs respectively. Channel velocities would range from 7-15 ft/sec and overbank velocities from 1-3 ft/sec during IRF. Soquel Creek would rise 13.7 feet in 6 hours and with flood stage lasting 22 hours. No flood control projects are authorized in this basin, but in 1955 channel clearing was carried out. (Henley-North Carolina)
W76-10157

FLOOD PLAIN INFORMATION: SOUTH FORK SALT RIVER AND DAVIS CREEK, MEXICO, MISSOURI.
Army Engineer District, St. Louis, Mo.
Prepared for the City of Mexico, Missouri, November 1971. 44 p, 11 fig, 15 plates, 13 tab.

Descriptors: Floods, Flooding, *Flood profiles, *Peak discharge, *Flood peak, *Flow duration, *Flood plains, Floodwater, Regional flood, Streamflow forecasting, River forecasting, Historic floods, Hydrographs, *Missouri.

Identifiers: *Salt River-South Fork(MO), Davis Creek(MO), Mexico(MO), Standard project Flood, Intermediate Regional Flood.

Much of the land of Mexico, MO, a town of 11,800 people, is located on high ground, yet there are substantial numbers of residences and commercial buildings in the flood plain. Davis Creek, with a drainage area of 53 square miles is a tributary of the South Fork Salt River which drains about 92 sq mi above the lower limit of the study area. No gages are maintained on either stream near Mexico. A gage near Santa Fe (MO) on the South Fork Salt River was used for this study. Most floods occur during the spring. The largest known flood occurred in 1969 with a peak discharge of 28,800 cubic feet per second recorded in Santa Fe. Damages and losses have been estimated in the thousands of dollars in past innundations. Damage from large future floods would range from substantial to disastrous proportions in areas where development is encroaching on the flood plain. In an Intermediate Regional Flood (IRF) a peak discharge of 20,000 cfs is predicted on Salt River and 12,580 cfs on Davis Creek. Water velocities of up to 5.2 ft/sec in the channel and 2.4 ft/sec in overbank areas are expected on Davis Creek; 4.3 ft/sec in the channel and 1.5 ft/sec overbank for South Fork Salt River. In a Standard Project Flood (SPF) peak discharges of 45,300 cfs and 28,000 cfs are anticipated on the Salt River and Davis Creek respectively. Velocities would be slightly higher than in the IRF which would rise to peak in 14 hours and last a maximum of 23 hours while the SPF would peak in 34 hours and last a maximum of 40 hours. Flash flood conditions could cause substantially higher rates of rise. Most bridges in the study area are somewhat obstructive to flood flow. There are no major flood control measures upstream or in the study area. (Smith-North Carolina)
W76-10158

FLOOD PLAIN INFORMATION: BIG SANDY RIVER, LAWRENCE COUNTY, KENTUCKY.
Army Engineer District, Huntington, W. Va.
Prepared for the State of Kentucky, Department of Natural Resources and Environmental Protection, October 1973. 30 p, 3 fig, 12 plates, 4 tab.

Descriptors: *Floods, *Flooding, *River flow, *Flood forecasting, *Flood profiles, *Flood plains, *Kentucky, Floodwater, Streamflow forecasting, Historic floods, Flow duration, Rivers, Reservoirs.
Identifiers: *Big Sandy River(KY), Tug Fork(KY), Levisa Fork(KY), Louisa(KY), Standard Project Flood, Intermediate Regional Flood.

Big Sandy River is formed by the confluence of Tug and Levisa Forks, and flows northward into the Ohio River. Big Sandy flows on an alluvial fill which contains few bottomlands above the flood of record. The Big Sandy drains 4,290 square miles. There is little development in the flood plains although there is some farming, a highway and a railroad. Louisa, the largest town, occupies high ground near the river. Eight of 10 major floods occurred in months January through April, though the largest flood, in 1875, occurred in July. Never have any floods damaged Louisa directly, yet during periods of high flow, roads, telephones, and water and sewerage systems are generally unusable. It is anticipated that as the area grows there will be pressure to develop bottom land causing heavy future damages. In the Levisa Fork basin 4 flood control reservoirs have been constructed which reduce flood crests by sizeable amounts. In an Intermediate Regional Flood floodwaters would be considerably higher than the largest flood of record, and about 10.7 feet higher than the major 1955 flood, with water velocities up to 8 feet per second. The IRF would rise to peak in about 42 hours and last 4 days. The Standard Project Flood, about 16.5 feet higher than the 1955 flood, would rise to peak in 47 hours and last 4.5 days. There are few obstructions to flow in these streams, though a recently constructed power plant could restrict flow of very large floods. There are no flood regulations in effect. However, Kentucky statutes require review of projects in floodways and the issuance of permits so that development can be controlled. (Smith-North Carolina)
W76-10159

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER, ARKANSAS CITY, KANSAS.
Army Engineer District, Tulsa, Okla.
Prepared for the City of Arkansas City, Kansas, January 1971. 6 p, 7 plates.

Descriptors: Floods, *Floodwater, Flooding, *Streamflow forecasting, *Flood profiles, *Flood plains, *Non-structural alternatives, Flood forecasting, Peak discharge, Stream erosion, Deposition(Sediments), Levee, *Kansas.
Identifiers: *Arkansas River(KS), Arkansas City(KS), Flood proofing.

Developments in this study area include considerable urban land in Arkansas City. In areas previously flooded are now built an oil refinery, a sewage disposal plant and many other structures. The Arkansas River is a tributary of the Mississippi River, and has a total length of about 1,460 miles and a drainage area of 160,600 square miles, 36,100 sq mi of which is above Arkansas City. 'The channel is generally wide and meandering, with low banks.' Though stream flow records are available from 1902 to 1906 and 1921 to the present, this data indicates that a stage-discharge relationship for the study reach would not be reliable because of the erosion and disposition of silt in the sandy channel of the river. The highest peak discharge, 103,000 cubic feet per second, occurred in 1923. Numerous times during the period 1902 to present the Arkansas River has exceeded its bank near Arkansas City. Flooding is most likely to occur from April to October. In an Intermediate Regional Flood a peak discharge of 120,000 cfs is estimated. Waters would reach a stage about 1.8 feet above the 1923 flood, and would overtop an existing levee and cause flooding within the levee. This report gives little information on existing protection measures, if any, but does give guidelines on possible solutions, including flood proofing, urban renewal, flood plain regulations, development policies, open space, tax adjustments and warning signs. (Smith-North Carolina)
W76-10160

SPECIAL FLOOD HAZARD INFORMATION: LABETTE AND LITTLE LABETTE CREEKS, PARSONS, KANSAS.
Army Engineer District, Tulsa, Okla.
Prepared for Labette County Planning Commission, Kansas, February 1973. 7 p, 1 fig, 13 plates, 1 tab.

Descriptors: *Floods, *Flood profiles, *Non-structural alternatives, *Flood plains, Flooding, Streamflow forecasting, Peak discharge, Flood plain zoning, Flood plain insurance, Warning systems, Building codes, Land use, *Kansas.
Identifiers: Labette Creek(KS), Little Labette Creek(KS), Parsons(KS), *Flood plain management, Intermediate Regional Flood.

The study area terrain consists of sparsely wooded, low rolling hills, and is used predominately for seasonal crops and pasture. Labette Creek, with a total drainage area of 397 square miles, is a tributary of the Neosho River. The drainage area above the lower limits of the study area is 88 sq mi. The flood plains of Labette Creek and Little Labette Creek are 1 mile and .5 mile wide respectively. 'The channel through the City of Parsons is well defined with fairly stable banks.' Though historical data indicates that Labette Creek has been subject to frequent flooding, this record is so sparse that it is not presented. In an Intermediate Regional Flood a peak discharge of 33,000 cubic feet per second on Labette Creek below Little Labette Creek is predicted. Above this confluence a peak discharge of 20,500 is expected. A peak discharge of 14,140 cfs is expected on Little Labette Creek. Several bridges in the study area would be overtopped by this flood. No flood plain management has been undertaken in this area, but this report gives guidelines, including a discussion of zoning, subdivision regulations, building codes, health regulations, development policies, and flood insurance. (Smith - North Carolina)
W76-10161

SPECIAL FLOOD HAZARD INFORMATION: WHISKEY AND ROCK CREEKS, INDEPENDENCE, KANSAS.
Army Engineer District, Tulsa, Okla.
Prepared for the City of Independence, Kansas, October.1974. 10 p, 5 plates, 1 tab.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Flood protection, *Kansas, Flooding, Flood flow, Streamflow forecasting, Maximum probable flood, Peak discharge, Obstructions to flow, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Building codes, Reservoirs.
Identifiers: Whiskey Creek(KS), Rock Creek(KS), Independence(KS), Standard Project Flood, Intermediate Regional Flood, Verdigris River(KS), Flood plain management.

Developments in the flood plains of this study area are mainly agricultural, residential and commercial. Whiskey Creek, with a watershed of 3.5 square miles, is a tributary of Rock Creek which in turn is a tributary of the Verdigris River near Independence. Rock Creek has a watershed of 24.8 sq mi including that of Whiskey Creek. No streamgage information is available for these creeks. For Rock Creek the maximum flood occurred in 1945, but caused little damage. In 1967 6.83 inches of rain in 20 hours caused the largest flood to date on Whiskey Creek. It was estimated to have a frequency of 50 years and had a peak discharge of 4,400 cubic feet per second. In an Intermediate Regional Flood (IRF) peak discharges of 5,000 cfs on Whiskey Creek at its confluence with Rock Creek, and 10,000 cfs on Rock Creek are expected. In a Standard Project Flood (SPF) discharges of 7,600 cfs and 19,400 cfs on Whiskey and Rock Creeks, respectively, are anticipated. In an IRF 2 of 8 bridges across Rock Creek would be obstructive to flood flow and in a SPF 5 bridges would cause some obstruction to flow. On Whiskey Creek all 17 bridges would obstruct flow in either major flood. Little has been done in this area to reduce flood damages, though 3 reservoir which have been built on the Verdigris River and its tributaries would reduce the backwater effects of that river. The report gives common methods for dealing with potential floods, including zoning, subdivision regulations, building codes, health regulations, development policies and flood insurance. (Smith - North Carolina)
W76-10162

FLOOD PLAIN INFORMATION: LYNN CAMP AND EAST FORK LYNN CAMP CREEKS, CORBIN, KENTUCKY.
Army Engineer District, Nashville, Tenn.
Prepared for the City of Corbin, Kentucky, May 1974. 42 p, 14 fig, 15 plates, 5 tab.

Descriptors: *Floods, Flooding, *Flood flow, *Flood profiles, *Historic floods, *Flood stages, Channel improvements, *Kentucky, Floodwater, Flash flood, Flood forecasting, Flood peak, Flow duration.
Identifiers: Corbin(KY), Lynn Camp Creek(KY), Standard Project Flood, Intermediate Regional Flood.

Most of the flood plain of Lynn Camp Creek in the only town in this study area, Corbin, is devoted to

esidential, commercial and industrial uses. Lands n the upper ends of the study reach are largely un-eveloped. On the East Fork Lynn Camp Creek here is only light residential build-up. The East ork with a drainage area of 27.8 square miles ows into Lynn Camp Creek which has a drainage rea of 61.2 sq mi. Major floods in this basin sually occur in late winter and early spring and re the result of prolonged heavy rain. Floods at orbin can be of flash type, rising to crest very uickly. Stream gage data has been available in is area since 1957, shortly after the record flood that year when peak discharge was about 9,000 ubic feet per second. Damage in Corbin was ex-ensive and was estimated to be $2 million. In esponse to this flood the Corps of Engineers un-ertook a protection project which includes en-rgement of about 2 miles of the natural channel, cutoff channel about 475 feet long across an rupt bend in the stream, and related bridge and ainage work. The project, completed in 1964, is apable of passing a flood 3 times the capacity of e original channel which will prevent most sses. It is estimated that because of this protec-on an Intermediate Regional Flood (IRF) would e 1.6 feet below the 1957 flood, though a Stan-ard Project Flood (SPF) would be little curtailed the project and would be 9.3 feet above the RF. The IRF would be expected to rise to peak in hours and last only 12 hours, while the SPF ould rise in 7.5 hours and last 21 hours. (Smith - orth Carolina)
76-10163

LOOD PLAIN INFORMATION: CLEAR REEK-MULBERRY CREEK, VICINITY OF HELBYVILLE, KENTUCKY.
rmy Engineer District, Louisville, Ky.
repared for the City of Shelbyville and the Ken-cky Department of Natural Resources, March 73. 26 p, 17 fig, 8 plates, 6 tab.

escriptors: Floods, *Flood flow, *Flood profiles, Flood peak, *Flow duration, *Flood plains, Ob-ructions to flow, *Kentucky, Runoff, Flood-ater, Flooding, Streamflow forecasting, Flood ta.
entifiers: Shelbyville(KY), Clear Creek(KY), ulberry Creek(KY), Standard Project Flood, In-rmediate Regional Flood.

operties along Clear Creek are primarily rural in ture, though there are residential and commer-al developments in Shelbyville, a town of 19,000 ople, which includes many small industries, mmerce, a fire department, a sewage treatment ant, sanitary land fill, and a lake park which is ed for recreation. Mulberry Creek has little velopment along its banks. This creek, with a ainage of 8.4 square miles, flows into Clear eek which has a total drainage area of 61.9 sq . Floods on these creeks are in general caused runoff from intense rainfall in winter and spring nths, though floods have occurred in all asons. During the last 180 years Shelbyville and cinity have been flooded many times. The 1964 od was the largest when a peak discharge of ,000 cubic feet per second was recorded on ear Creek. Thirty people were forced to leave ir homes and $500,000 in damages was caused. an Intermediate Regional Flood (IRF) peak charges of 17,700 cfs and 6,320 cfs are expected Clear and Mulberry Creeks, respectively, along th water velocities up to 10 feet per second in main channel and 3 ft/sec in the overbank as. The IRF would reach peak elevation in out 12 hours after the beginning of rise and uld be 20 hours above bankfull elevation. Dur-a Standard Project Flood peak discharges of 400 cfs and 12,800 cfs are expected on Clear eek and Mulberry Creek, respectively. Water ocities would be slightly higher than during the F. This flood would rise in 36 hours to 48 hours d remain 27 hours above bankfull elevation. nith - North Carolina)
76-10164

FLOOD PLAIN INFORMATION: PIKE CREEK, NEW CASTLE COUNTY, DELAWARE.
Army Engineer District, Philadelphia, Pa.
Prepared for New Castle County (DE) Department of Planning, December 1975. 18 p, 3 fig, 9 plates, 7 tab.

Descriptors: *Floods, *Flooding, *Flood plains, *Peak discharge, *Non-structural alternatives, Flood stages, Flow characteristics, Flood protection, Flood plain zoning planning, *Delaware.
Identifiers: Pike Creek(DE), New Castle County(DE).

Pike Creek, a tributary to White Clay Creek, flows in a southeasterly direction for 6.4 miles through New Castle County covering a total drainage area of 6.3 square miles. Its flood plains consist of agricultural and rural areas with scattered residential and commercial properties which are coming under increasing pressure for development. Characterized by steep banks covered with brush and trees, the stream slopes at an average of 37 feet per mile in the southern reaches and 68 ft/mi in the northern portion. Floods generally occur in mid and late summer due to hurricane and thunderstorm activity reaching flood peaks in a relatively short period of time with high velocities. Although no flood control projects exist on Pike Creek, the county prohibits filling in or development of the flood plains. The greatest flood occurred in July 1969 having an estimated peak discharge of 2550 cubic feet per second and cresting at 40.1 feet. Estimated peak discharges and elevations for a 100-year and 500-year flood are 3,010 cfs and 5140 cfs cresting at 42.7 feet and 45.3 feet respectively. Projected velocities for 100-year flood range from 4.4 to 11.2 ft/sec in channel and from 2.8 to 4.0 ft/sec overbank; for a 500-year flood, 4.2 to 13.2 ft/sec in channel and 2.8 to 5.2 ft/sec overbank. A 100-year flood could have a critical stage for as long as 15 hours. This report furnishes a suitable basis for the adoption of land use controls to guide flood plain management. (Salzman - North Carolina)
W76-10165

FLOOD PLAIN INFORMATION: NORTH FORK KENTUCKY RIVER AND TRACE FORK, VICINITY OF HAZARD, KENTUCKY.
Army Engineer District, Louisville, Ky.
Prepared for the City of Hazard, Kentucky, March 1972. 44 p, 22 fig, 12 plates, 8 tab.

Descriptors: *Floods, *Flood forecasting, *Flood plains, Flooding, Flash flood, Overflow, Indirect flood measurement, Streamflow forecasting, Historic floods, Flood data, Peak discharge, Obstructions to flow, *Kentucky.
Identifiers: *Kentucky River(KY), Lotts Creek(KY), Trace Fork(KY), Hazard(KY), Intermediate Regional Flood, Standard Project Flood.

Development along the streams is principally located in Hazard though there are other communities and intermittent development elsewhere. A considerable number of structures are susceptible to flood damage. Trace Fork is a tributary of Lotts Creek which has a drainage area of 28 square miles and flows into the North Fork of the Kentucky River which drains 2,631 sq mi. In winter and spring floods are caused by widespread heavy rains, and in summer floods due to intense local thunderstorms occur. The largest flood was in 1957 when the peak discharge was 47,800 cubic feet per second, and the business district of Hazard was completely destroyed. Damages were estimated at $6.8 million. Water velocities reached 7 feet per second. In an Intermediate Regional Flood (IRF) a peak discharge of 52,300 cfs is predicted on the North Fork Kentucky River and 2,580 on Trace Fork. Water velocities may range up to 14 and 18 ft/sec in the main channel of North Fork Kentucky River and Trace Fork respectively. Overbank velocities would be 4.6 and 8.5 ft/sec respectively. In a Standard Project Flood (SPF) peak discharges of 140,000 and 5,340 cfs are anticipated on North Fork Kentucky River and Trace Fork respectively along with water velocities slightly higher than the IRF. Most of the many bridges over these streams would be at least somewhat obstructive to flows and some would be very obstructive. Now under construction is a dam at Carr Fork Lake which will have some impact on floods in this study area. Peak discharges would be reduced to 50,300 cfs in an IRF and 135,000 cfs in a SPF. (Smith-North Carolina)
W76-10166

FLOOD PLAIN INFORMATION: DRY TURKEY AND BULL CREEKS, MCPHERSON, KANSAS.
Army Engineer District, Tulsa, Okla.
Prepared for the City of McPherson, Kansas, August, 1972. 31 p, 8 fig, 17 plates, 5 tab.

Descriptors: Floods, *Flood flow, *Flood profiles, *Flow duration, *Flood plains, *Non-structural alternatives, Floodwater, Streamflow forecasting, Historic floods, Peak discharge, Obstructions to flow, Flood plain zoning, *Kansas.
Identifiers: Dry Turkey Creek(KS), Bull Creek(KS), McPherson(KS), Subdivision regulations, Standard Project Flood, Intermediate Regional Flood.

Much of the land in the flood plains along these streams is agricultural, except in McPherson, (population 11,000) an important oil producing area, which is expected to grow in the future. Bull Creek, with a drainage area of 19.6 square miles, is a tributary of Dry Turkey Creek which drains 55.5 sq mi and flows into Turkey Creek. Flooding results generally from intense storms of short duration, occuring usually in spring and fall. Due to mild stream slopes and relatively flat overbank areas, flood waters rise slowly, cover considerable land, and last for extended periods. There are no stream-gages in the area, but six major floods have occurred since 1902. In an Intermediate Regional Flood peak discharges of 5,400 cubic feet per second and 13,900 cfs can be expected on Bull and Dry Turkey Creeks, respectively, along with water velocities of about 2 ft/sec in the main channel and overbank areas. In a Standard Project Flood peak discharges of up to 10,800 cfs on Bull Creek and 27,000 cfs on Dry Turkey Creek are predicted. Water surface elevations for the SPF are estimated to reach as much as 5 feet in some sections of McPherson. Major floods last approximately 30 hours. Most bridges on Dry Turkey Creek and all bridges on Bull Creek would be topped by either flood. There are no existing or proposed Federal flood control measures on these Creeks, though some channel improvements have been constructed by local interests. Subdivision regulations restrain building on lands subject to periodic flooding, yet with proper improvements and adequate drainage such construction can be undertaken. (Smith-North Carolina)
W76-10167

TECHNIQUES FOR IMPROVING TREE SURVIVAL AND GROWTH IN SEMIARID AREAS,
Agricultural Research Service, Manhattan, Kans.
For primary bibliographic entry see Field 2I.
W76-10175

OBSTACLES TO THE DEVELOPMENT OF ARID AND SEMI-ARID ZONES.
For primary bibliographic entry see Field 3F.
W76-10179

COMPARISON OF SHEEP AND CATTLE GRAZING ON SEMIARID GRASSLAND,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Div. of Land Resources Management.
For primary bibliographic entry see Field 4C.
W76-10181

ARIZONA'S WATER SUPPLY-SOME REFLECTIONS,
Arizona Bureau of Mines, Tucson.
H. W. Peirce.
Field Notes, Vol. 6, No. 2, p 1-4, 16, June 1976. 2 fig, 2 ref.

Descriptors: *Arizona, *Water resources development, *Water supply, *Water utilization, *Basins, Water management(Applied), Arid lands, Range management, Human population, Natural resources, Withdrawal, Long-term planning, Agriculture, Groundwater, Geologic formations.

Arizona's water supply and use characteristics are analyzed, and an approach to effective management of this limited resource is outlined. At present, substantially more water is being used than is replenished by natural sources, especially in the areas of rapid population growth (Phoenix and Tucson). This Basin and Range region of southwestern Arizona has more natural resources such as water, minerals and better climate and soil conditions for attracting new residents. The Plateau region in northern Arizona is superior only in its quantity of fossil energy sources. Currently, surface waters account for 40% and pumped underground water for 60% of the withdrawals; 89% of the water is used for agriculture. Over 2 million acre-feet more water is used annually than is replenished. Depletion rates are nearly 100 times the magnitude of dependable (renewable) supply in some of the smaller hydrologic basins. Other statistics relating to water use are provided along with a description of the Basin and Range Province development. (Jahns-Arizona)
W76-10183

INTERACTION OF WATER POTENTIAL AND TEMPERATURE EFFECTS ON GERMINATION OF THREE SEMI-ARID PLANT SPECIES,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Land Resources Management.
For primary bibliographic entry see Field 2I.
W76-10185

AN LP-10 MODEL FOR COORDINATING MULTI-GROUP INPUTS IN RESOURCE PLANNING,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6A.
W76-10192

URBAN SERVICE PRICING AND LAND USE: SOME PRELIMINARY RESULTS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 6C.
W76-10193

NETWORK MODELS AND THE IMPACT OF MODELING ASSUMPTIONS,
Alyeska Pipeline Service Co., Anchorage, Alaska.
C. L. Eggener, and L. B. Polkowski.
Journal of the American Water Works Association, Vol. 68, No. 4, p 189-196, April 1976. 3 fig, 9 tab, 12 ref.

Descriptors: *Networks, *Water distribution(Applied), *Mathematical models, *Simulation analysis, Research, Digital computers, History, Pipes, Water demand, Hazen-Williams equation, Systems analysis, Wisconsin.
Identifiers: Impact, Menomonie(Wis).

With increased emphasis on digital computer modeling of the hydraulic performance of water distribution networks for design and automatic operational control, there has been a recent upsurge of interest in the impact of expedients commonly employed in network simulation, i.e., skeletonization, load consolidation, C value allocation, and assumed pipe resistance factors). This article presents an historical explanation of the recent upsurge of interest and presents an approach to studying the impact of simulation expedients; it is an approach to fulfilling the research need, consisting of building detailed models of actual but representative grid systems, verifying the performance of the models, and using them as research tools to investigate the impact of various simplifying assumptions often made in network modeling. The value of the approach is demonstrated with a case study made in Menomonie, Wisconsin, and its merits are discussed in terms of ultimately being able to generalize about the degree of input data refinement necessary to model grid systems adequately. (Bell-Cornell)
W76-10196

THE INFLUENCE OF THE SURFACE RUNOFF OF HEAVY RAINS ON THE CALCULATION OF SEWERS (UBER DEN EINFLUSS DES FLACHENABFLUSSES DER STARKREGEN AUF DIE BERECHUNG VON KANALISATIONEN),
For primary bibliographic entry see Field 5D.
W76-10197

THE EFFECT OF VARIOUS DESIGNS OF RAIN CATCHING BASINS ON THE POLLUTION OF THE RECEIVING WATER AND THE ECONOMY OF THE SEWER SYSTEM (DIE AUSWIRKUNG DER VERSCHIEDENEN BAUARTEN VON REGENUBERLAUFBECKEN AUF DIE SCHMUTZBELASTUNG DES VORFLUTERS UND DIE WIRTSCHAFTLICHKEIT DES KANALNETZES),
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft.
For primary bibliographic entry see Field 5D.
W76-10198

MINIMIZATION OF CORE REQUIRED IN ROUTING THROUGH A CHANNEL NEWTWORK,
Hydrocomp International, Palo Alto, Calif.
For primary bibliographic entry see Field 2E.
W76-10243

STRENGTHENING LAKE-SHORELAND MANAGEMENT IN MASSACHUSETTS,
Massachusetts Univ., Amherst, Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W76-10264

A PRELIMINARY COMPARTMENT MODEL OF THE NITROGEN CYCLE IN A DECIDUOUS FOREST ECOSYSTEM,
Idaho Univ., Moscow. College of Forestry, Wildlife and Range Sciences.
For primary bibliographic entry see Field 5B.
W76-10269

A MODEL OF WATER CONTENT AND EVAPORATION FOR HARDWOOD LEAF LITTER,
Western Carolina Univ., Cullowhee, N.C. Dept. of Biology.
For primary bibliographic entry see Field 2D.
W76-10270

SIMULATION OF NITROGEN DISTRIBUTION AND ITS EFFECT ON PRODUCTIVITY IN EVEN-AGED LOBLOLLY PINE PLANTATIONS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Theoretical Production Ecology.
For primary bibliographic entry see Field 5B.
W76-10271

A MODEL OF MINERAL-ELEMENT CYCLIN(FOR AN INVERTEBRATE FOOD WEB IN A SOUTHEASTERN HARDWOOD FORES' LITTER COMMUNITY,
Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W76-10272

SEASONAL AND ANNUAL VARIATIONS I THE QUANTITIES OF NITROGEN, POTASS UM, PHOSPHORUS, MAGNESIUM, CALCIUM AND MANGANESE REACHING THE FORES FLOOR AS MAST IN PENNSYLVANIA AN VERMONT FORESTS,
Massachusetts Univ., Amherst. Dept. of Zoology
For primary bibliographic entry see Field 5B.
W76-10306

RESOURCE PARTITIONING IN LEAF-LITTE FAUNAS FROM HARDWOOD AND HARI WOOD-CONVERTED-TO-PINE FORESTS,
Battelle-Columbus Labs., Ohio. Ecology an Ecosystems Analysis Section.
For primary bibliographic entry see Field 5B.
W76-10308

FOREST-FLOOR NUTRIENT DYNAMICS I SOUTHERN APPALACHIAN HARDWOOD AN WHITE PINE PLANTATION ECOSYSTEMS,
Environmental Protection Agency, Washingto D. C. Office of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W76-10309

LEACHING OF NUTRIENTS FROM LEAVE OF SELECTED TREE SPECIES IN NE HAMPSHIRE,
New Mexico Univ., Albuquerque. Dept. of Biol gy.
For primary bibliographic entry see Field 5B.
W76-10312

PHOSPHORUS CYCLING IN A MARYLAN DECIDUOUS FOREST SUBJECTED TO VAR OUS LEVELS OF MINERAL-NUTRIENT LOAI ING,
Smithsonian Institution, Rockville, Md. Radiatio Biology Lab.
For primary bibliographic entry see Field 5B.
W76-10313

ASPECTS OF MINERAL-NUTRIENT CYCLIN IN A SOUTHERN MIXED-HARDWOO FOREST IN NORTH CENTRAL FLORIDA,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W76-10318

THE QUANTITY AND DISTRIBUTION O FOUR NUTRIENT ELEMENTS IN HIGH ELEVATION FOREST ECOSYSTEMS, BALSA MOUNTAINS, NORTH CAROLINA,
Southern Illinois Univ., Carbondale. Dept. Forestry.
For primary bibliographic entry see Field 5B.
W76-10319

SIGNIFICANCE OF BIOLOGICAL NITROGE FIXATION AND DENITRIFICATION IN DECIDUOUS FOREST ECOSYSTEM,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-10320

SOME EFFECTS OF FERTILIZATION O MINERAL CYCLING IN LOBLOLLY PINE,
Southeastern Forest Experiment Statio Research Triangle Park, N.C. Forestry Science Lab.
For primary bibliographic entry see Field 5C.

76-10323

OMBINED USE OF PHYSICAL AND MATHE-ATICAL MODELS FOR ANALYSIS OF ESERVOIR WATER QUALITY,
my Engineer Waterways Experiment Station, cksburg, Miss. Hydraulics Lab.
r primary bibliographic entry see Field 5B.
76-10439

OW2D: A TWO-DIMENSIONAL FLOW ODEL FOR FLOOD PLAINS AND ESTUA-ES,
source Analysis, Inc., Cambridge, Mass.
r primary bibliographic entry see Field 2L.
76-10454

GAE HARVESTER,
r primary bibliographic entry see Field 5G.
76-10478

3. Groundwater Management

EDICTING THE WATER POLLUTION OTENTIAL OF PROPOSED SANITARY LAND-LLS PART I: SANITARY LANDFILL ACHATE...WHAT IT IS,
diana Univ., Indianapolis. School of Medicine.
r primary bibliographic entry see Field 5B.
76-10013

EDICTING THE WATER POLLUTION OTENTIAL OF PROPOSED SANITARY LAND-LLS PART II: AN INDEX OF THE WATER OLLUTION POTENTIAL OF SANITARY NDFILLS,
diana Univ., Indianapolis. School of Medicine.
r primary bibliographic entry see Field 5B.
76-10014

OLLUTION OF GROUNDWATER BY LAND-LLS (POLLUTION DE L'EAU SOUTERRAINE R LES DECHARGES),
r primary bibliographic entry see Field 5B.
76-10016

ROUND-WATER POLLUTION PROBLEMS IN IE NORTHWESTERN UNITED STATES,
bert S. Kerr Environmental Research Lab., a, Okla.
r primary bibliographic entry see Field 5B.
76-10083

YDROGEOLOGIC AND OTHER CONSIDERA-ONS RELATED TO THE SELECTION OF NITARY-LANDFILL SITES IN OHIO,
io Dept. of Natural Resources, Columbus. Re-nal Geology Section.
r primary bibliographic entry see Field 5D.
76-10084

TERNATIONAL SURVEY ON EXISTING ATER RECHARGE FACILITIES.
ernational Association of Scientific Hydrology, ntbrugge (Belgium).
blication No. 87, 1970. 761 p, 32 fig. $10.00.

scriptors: *Artificial recharge, *Water manage-nt(Applied), *Groundwater recharge, Natural harge, Water wells, Recharge wells, Aquifers, erdraft, Well yield, Safe yield, Flooding, Water el fluctuations, Watersheds(Basins), Ground-ter barriers, Geologic control, Geohydrologic ts.
ntifiers: *International artificial recharge in-llation survey.

The International Association of Scientific Hydrology with the assistance of the Burgeap Company (France) established an international inventory of installations for the artificial recharge of underground water-levels. The aims pursued are solutions to the problems of: (1) Dry season pumping at higher rates than natural aquifer recharge capacities; (2) Water storage allowing pumping rates greatly superior to natural groundwater resources; (3) Recharge of overpumped ground-water reservoirs', (4) Improvement of water quality by natural filtration, (5) Fresh water barriers against saline intrusion or infiltrations from polluted rivers; and (6) Flood control. The economics of artificial recharge as well as the reasons for choosing it over alternative measures. Each country included in the recharge installation inventory conducts the process in various geologic lithologies ranging from Diluvium gravels to basalts. This wide variety of lithologies effectively represents worldwide geohydrologic conditions. The origin of injected water, techniques of recharge, structures used for artificial recharge and pumping systems are outlined for each particular installation listed. The inventoried countries include: Germany (western), Australia, England, France, Hungary, Iran, Israel, Jamaica, Japan, Morracco, Mexico, Holland, South Africa, Switzerland, Czechoslovakia and the United States of America. (Heiss-NWWA)
W76-10085

FIELD RESEARCH AND TESTING OF A WATER HAND PUMP FOR USE IN DEVELOPING COUNTRIES,
Battelle Columbus Lab., Ohio.
For primary bibliographic entry see Field 8G.
W76-10086

CHANGE IN DRAWDOWN CAUSED BY ENLARGING A WELL IN A DOLOMITE AQUIFER,
Geological Survey, Columbus, Ohio. Water Resources Div.
S. E. Norris.
Ground Water, Vol. 14, No. 4, p 191-193, July-August, 1976. 1 fig, 2 tab, 5 ref.

Descriptors: *Water wells, *Drilling, *Drawdown, Aquifers, Permeability, Turbulent flow, Groundwater, Ohio.
Identifiers: *Well modification, *Well enlargement, Well-loss constant, Pumping rates, Power cost reduction.

Step-drawdown tests were conducted on a well, in a dolomite aquifer in north-central Ohio, before and after it was enlarged from 10 inches to 12 inches (250 to 300 millimeters) in diameter. Changes were noted in the well-loss constant, the exponent for turbulent flow and the formation loss factor. The calculated difference in drawdown resulting from enlargement is of little importance at rates of 300 to 500 gallons per minute (19 to 31 liters per second), the range of which the well is expected to be pumped, but for higher rates the decrease in drawdown and consequent reduction in power costs could be significant. For a pumping rate of 1500 gallons per minute (95 liters per second), the decrease in drawdown would be 20.4 (6.2 meters). (Heiss-NWWA)
W76-10088

TACOMA'S NORTH FORK WELLS.
Ground Water Age, Vol. 10, No. 10, p 26-28, 43, June, 1976.

Descriptors: *Water wells, *Groundwater, *Surface-ground water relationships, Unconfined aquifers, Sands, Gravels, Pumps, Rotary drilling, Well screens, Water requirements, Water resources development, Water supply, Washington.
Identifiers: *High volume water wells, *High volume submersible pumps, *Green River(Wash), *North Fork(Wash), Tacoma(Wash).

Seven of the most productive water wells in the world are currently being constructed on the North Fork of Washington's Green River. These wells are a part of a 55-million dollar project intended ultimately to double the City of Tacoma's water supply. Each well will yield an estimated twelve-million gallons of water per day. The preliminary ground-water feasibility study performed by Tacoma ground-water geologists showed that a sand and gravel body which underlies, and is fed directly by the North Fork of the Green River near the confluence of the two streams. The study indicated that the aquifer's specific yield was in excess of 72-million gallons per day. The wells were designed for thirty-two inch casings containing twenty-eight inch inner diameter stainless steel screens. Submersible pumps equipped with 380 horsepower, 2300 volt meters, eleven feet long and seventeen inches in diameter were used in the wells, each capable of producing an average of 8,333 gallons per minute. These wells will fulfill Tacoma's water need well into the 21st century. (Heiss-NWWA)
W76-10089

ELECTRICAL WATER PROSPECTING.
Ground water Age, Vol. 10, No. 9, p 27, 30, May, 1976. 1 fig.

Descriptors: *Subsurface investigations, *Electrical resistivity, *Logging(Recording), *Subsurface mapping, *Water wells, Physical properties, Geologic formations, Arid lands, Foreign countries, Africa.
Identifiers: *Geo-electric soundings, Apparent resistivity, Electrode fields, Electrical potential variations, *Geo-electric models, Bore siting, South West Africa.

Geo-electrical soundings have been used for the past two years to find water in the arid northern region of South West Africa. The work is directed at improving the siting of useful boreholes, which previously has had a success rate of only approximately 30 percent in this area. To date, one well has been sunk using geo-electrical soundings, and water was found at an encouragingly shallow depth. The geo-electrical technique is based on the different electrical resistivities of geologic formations. The apparent resistivity of the area is found by passing a current through the ground between electrodes and measuring the resulting potential difference between the furthest pair. Expansion and rearrangement of the electrode field about a chosen point registers the variation of apparent resistivity. This variation of the apparent resistivity with electrode separation can be depicted as a sounding curve. Interpretation of this curve makes it possible to construct a geo-electrical model of the geological structure of the subsurface. The position of the water table profoundly affects the readings. If this application can be verified most of the guess work can be taken out of borehole siting in the area. (Heiss-NWWA)
W76-10090

RECORDING EQUIPMENT BOOSTER.
For primary bibliographic entry see Field 8G.
W76-10091

PITLESS UNIT AND ADAPTER UPDATE.
For primary bibliographic entry see Field 8G.
W76-10092

WHAT TYPE OF RIG SHOULD YOU BUY,
For primary bibliographic entry see Field 8C.
W76-10094

CORROSION,
Plummer and McDannald Co., Galena, Ohio.
For primary bibliographic entry see Field 8G.
W76-10095

GUARDIANS OF GROUND WATER QUALITY,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W76-10096

EXXON USES HANDS-ON METHODS TO TRAIN DRILLING PERSONNEL,
Exxon Co., New Orleans, La.
For primary bibliographic entry see Field 8G.
W76-10098

SELECTING PACKER FLUIDS: HERE'S WHAT TO CONSIDER,
Delta Mud and Chemical Co., Houma, La.
For primary bibliographic entry see Field 8G.
W76-10099

PREDICTING PRODUCTIVE TRENDS RELATED TO WRENCH FAULTS,
Exxon Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 8E.
W76-10100

FRESH WATER CAN BE STORED IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge.
O. K. Kimble, R. G. Kazmann, and W. R. Whitehead.
The Johnson Drillers Journal, Vol. 48, No. 2, p 1-4, 17-18, March-April, 1976. 3 fig.

Descriptors: *Aquifers, *Underground storage, *Reservoirs, *Saline water, Freshwater, *Saline water-fresh water interfaces, Injection wells, Water wells, *Storage capacity, Withdrawal, Pumped storage, Reservoir silting, Saline water intrusion, *Water storage.
Identifiers: *Saline aquifers, Injection-withdrawal cycles, Recovery efficiency, Emergency reservoirs, Surface reservoir disadvantages.

Due to the growing need for emergency fresh water reservoirs, the concept of storing fresh water in saline aquifers is being considered. Traditionally the dammed surface reservoir has served the purpose; but now because of land costs and realization of the silt problems, surface reservoirs have become much less advantageous. Deep saline aquifers underlay much of the country and offer potential storage space for fresh water in convenient locations. Essentially the process is achieved by creating a stagnant zone in the ground water flow of a selected aquifer and storing fresh water in that zone. Fresh water and salt water is segregated due to their density differences. The resultant body of fresh water will be shaped like an inverted, truncated cone whose outer volume is composed of a brackish water interface and whose inner volume is made up of fresh water. The injection field can be single or multi well systems. Recovery efficiency increases after the second injection/withdrawal cycle. The length of storage without appreciable harm to the recovery ratio cannot be predicted at this point. Further study is required in this area before projects of this nature can be implemented. (Heiss-NWWA)
W76-10107

EFFECTS OF A LANDFILL ON GROUND-WATER QUALITY,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-10137

DIGITAL MODEL FOR SIMULATED EFFECTS OF GROUND-WATER PUMPING IN THE HUECO BOLSON, EL PASO AREA, TEXAS, NEW MEXICO, AND MEXICO,
Geological Survey, Austin, Tex.
W. R. Meyer
Available from the National Technical Information Service, Springfield, Va 22161 as PB-253 015 as printed copy $5.50, microfiche $2.25. Water-Resources Investigations 58-75, April 1976. 31 p, 13 fig, 2 tab, 12 ref.

Descriptors: *Groundwater resources, *Model studies, *Water levels, *Projections, *Pumping, *Computer programs, Analytical techniques, Hydrogeology, Aquifer characteristics, Water table, Groundwater recharge, Water storage, *Texas.
Identifiers: *Hueco Bolson(Tex), *El Paso area(Tex).

The Hueco Bolson provides a substantial part of the municipal and industrial water supply of the El Paso area of Texas, New Mexico, and Mexico. Although the supply of fresh groundwater in the bolson is large, about 10.6 million acre-ft (13,070 cubic hectometres) in 1973 in the Texas part of the bolson alone, the supply is being depleted. A digital model study showed that a proposed plan of development for 1973-91, in which pumping would be increased by 29 percent in the Texas part of the bolson and by 34 percent in Ciudad Juarez, would cause additional water-level declines of as much as 45 feet (13.7 m) in the vicinity of El Paso and 70 feet (21.3 m) in Ciudad Juarez. The study also showed that nearly 60 percent of the water would come from storage in the water-table part of the bolson aquifer and 28 percent from leakage from the alluvium. By the end of the period, 9.84 million acre-ft (12,133 cubic hectometres) of fresh water would be in storage in the Texas part of the bolson, as compared to 10.6 million acre-ft (13,070 cubic hectometres) in storage in 1973. (Woodard-USGS)
W76-10140

NATIONAL WATER DATA STORAGE AND RETRIEVAL SYSTEM: INSTRUCTIONS FOR PREPARATION AND SUBMISSION OF GROUND-WATER DATA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 10D.
W76-10148

MAPS SHOWING GROUND-WATER CONDITIONS IN THE RANEGRAS PLAIN AND BUTLER VALLEY AREAS, YUMA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-10149

ARIZONA'S WATER SUPPLY-SOME REFLECTIONS,
Arizona Bureau of Mines, Tucson.
For primary bibliographic entry see Field 4A.
W76-10183

COST FUNCTIONS FOR ADDITIONAL GROUND WATER DEVELOPMENT,
Geological Survey, Reston, Va. Water Resources Div.
T. Maddock, III.
Water Resources Bulletin, Vol. 12, No. 3, p 539-545, June 1976. 2 tab, 9 equ, 6 ref.

Descriptors: *Groundwater, *Water resources development, *Water rights, Costs, Energy, Industries, Equations, Operating costs.
Identifiers: *Cost functions, *Coal gasification.

In many regions of the United States, the development of new water-intensive industries for production of energy may upset the existing water rights structure. Such an industry is coal gasification. This paper develops external cost functions for determining compensation to existing groundwater users when additional withdrawals are requested by new users. The functions reflect increased energy costs, and as presented, they are based on a linear relation between drawdown and pumping. It is assumed that the fixed cost of drilling and completing wells and the variable cost of operating wells overshadow the pipeline company's compensatory payments. It is also assumed that the energy costs represent the profit losses to the original users. In conclusion, it should be noted that compensation payment will result in costs to new users that are not trivial. (Bell-Cornell)
W76-10194

USE OF THE EARTH'S CRUST FOR TREATMENT OR STORAGE OF SEWAGE EFFLUENT AND OTHER WASTE FLUIDS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W76-10216

THE FATE OF POLLUTANTS IN SUBSURFACE ENVIRONMENTS,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5B.
W76-10253

PROGRAM ESOPH - EXTENDED SOPH, SIMULATION OF TIME-VARIANT PIEZOMETRIC SURFACE IN A CONFINED, LEAKY AQUIFER SUBJECTED TO PUMPING.
Department of the Environment, Ottawa (Canada). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-10498

4C. Effects On Water Of Man's Non-Water Activities

HIGHWAY-WILDLIFE RELATIONSHIPS VOLUME I. A STATE-OF-THE-ART REPORT,
Urban Wildlife Research Center, Inc., Ellicott City, Md.
D. L. Leedy.
Report FHWA-RD-76-4, December 1975, 183 p. Final report to Department of Transportation, Washington, D.C., Federal Highway Administration. FCP 33F2-182 P. O. 5-30189.

Descriptors: *Highway effects, Highways, *Wildlife, Fish, *Reviews, Erosion, *Erosion control, *Bibliographies, Research priorities, *Environmental effects, Comprehensive planning, *Vegetation establishment, *Right-of-way, Wildlife habitats, Wildlife management, *Highway deicing, Parks, Waste disposal, Pollution abatement, Fish passages, *Road construction, Roads, Transportation.

This study assesses, primarily through an extensive literature review, what is known about highway-wildlife relationships and suggests research and management approaches to protect and enhance fish, wildlife, and environmental quality. A cooperative effort to this end among natural resource and highway agency personnel is needed on a continuing basis from the initial planning stages for new highway construction through operation and maintenance. The 20 million or more acres in highway rights-of-way have been largely neglected as wildlife habitat. Opportunities exist for creating valuable fish and wildlife impoundments during construction, yet the minimal effort needed to locate and design such impoundments has generally not been made. The Nation's four million miles of streets and highway often create 'edges' conducive to wildlife. Many millions of wild vertebrates are killed annually, but apparently most wildlife populations are not seriously affected by such losses. Highway construction through limited ranges of endangered species can be a serious problem, as can erosion, wetland drainage, stream alteration, structures which

block the passage of anadromous fish, and pollutants resulting from highway maintenance and use. Better measures for mitigating habitat losses, predicting effects of highways on fish and wildlife, reducing animal-vehicle accidents, and enhancing highway environment for fish, wildlife, and people are sorely needed. (See also W76-10004) (FHA)
W76-10003

HIGHWAY-WILDLIFE RELATIONSHIPS VOLUME 2. AN ANNOTATED BIBLIOGRAPHY,
Urban Wildlife Research Center, Inc., Ellicott City, Md.
D. L. Leedy, T. M. Franklin, and E. C. Hekimian.
Report FHWA-RD-76-5, December 1975, 417 p. Final report to Department of Transportation, Washington, D.C., Federal Highway Administration. FCP 33F2-182 P.O. 5-3-0189

Descriptors: *Highway effects, Highways, *Wildlife, Fish, *Reviews, Erosion, *Erosion control, *Bibliographies, Research priorities, *Environmental effects, Comprehensive planning, *Vegetation establishment, *Right-of-way, Wildlife habitats, Wildlife management, *Highway deicing, Parks, Waste disposal, Pollution abatement, Fish passages, *Road construction, Roads, Transportation.

This annotated bibliography of 794 references is based as much as possible upon examination of original articles, particularly from the wildlife literature. The following major subject matter headings are included: The Highway System: Effects on and Relation to Fish and Wildlife; Opportunities for Enhancing Fish and Wildlife and Mitigating or Reducing Damage to the Resource; and Environmental Considerations and Evaluations in Highway Planning, Construction and Operation - General. (See also W76-10003) (FHA)
W76-10004

EFFECTS OF LARGE SCALE FOREST FIRES ON WATER QUALITY IN INTERIOR ALASKA,
National Environmental Research Center, College, Alaska. Arctic Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-10045

CHEMICAL IMPACT OF SNOW DUMPING PRACTICES,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5C.
W76-10049

AN ENVIRONMENTAL ASSESSMENT OF IMPACTS OF COAL DEVELOPMENT ON THE WATER SOURCES OF THE YAMPA RIVER BASIN, COLORADO AND WYOMING--PHASE-1 WORK PLAN,
Geological Survey, Denver, Colo.
T. D. Steele, D. P. Bauer, D. A. Wentz, and J. W. Warner.
Open-file report 76-367, May 1976. 17 p, 2 fig, 3 tab, 11 ref.

Descriptors: *Water quality control, *Water pollution sources, *Coal mine wastes, *Energy conversion, *Environmental effects, Project planning, Water rights, Water demand, Land use, Data collection, River basin development, Colorado, Wyoming.
Identifiers: *Yampa River basin(Colo-Wyo).

Coal resources of the western United States are being developed at ever-increasing rates, causing concerns of the effects of mining and associated activities on the environment. The Yampa River basin in northwestern Colorado and south-central Wyoming is undergoing economic development of its coal, oil and gas, and uranium resources. The Yampa River basin assessment is a 2.5-year program of the U.S. Geological Survey. It is designed primarily to assess the availability and quality of the basin's water resources. The basin assessment also will evaluate potential environmental and selected socioeconomic impacts of energy-resource development plans proposed by mining and power companies. This report serves as a project work plan for the basin assessment's first-phase work activities. (Woodard-USGS)
W76-10135

COMPARISON OF SHEEP AND CATTLE GRAZING ON SEMIARID GRASSLAND,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Div. of Land Resources Management.
A. D. Wilson.
Australian Journal of Agricultural Research, Vol. 27, No. 1, p 155-162, January, 1976. 2 tab, 2 fig, 12 ref.

Descriptors: *Sheep, *Cattle, *Grazing, *Pasture management, *Grasslands, Arid lands, *Australia, Diets, Grasses, Seasonal, Legumes, Forage palatability.
Identifiers: *New South Wales.

A 2-year study in New South Wales compared Hereford steers and Border Leicester X Merino wethers as to their diet's botanical and chemical composition and changes in body weight while grazing a semiarid grassland in adjacent paddocks. The Danthonia caespitosa-Stipa variabilis type grassland contained 200-800 kg/ha of green pasture, primarily warm-season grasses with components of cool-season grasses, chenopod plants, medics and other forbs. Plots were permanently grazed by sheep at 1.03 and 1.45/ha or cattle at 0.13 and 0.18/ha; animals fitted with esophageal fistulas were introduced periodically to estimate diet composition. Cattle ate fewer short medics and cool-season grasses and more dry herbage than sheep, although in vitro digestibles of both diets were similar. Cattle diets were consistently lower in nitrogen and had a higher weight/ha at the greater stocking rate. Weight fluctuations at both stocking rates were greater for sheep, although the differences were slight. Similar weight changes did not support the notion that sheep are better suited to semiarid winter-rainfall areas. Economic differences will probably be more important than biological ones in determining the ratio of sheep to cattle on grazing properties. (Jahns-Arizona)
W76-10181

MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUNICIPAL SUPPLY AND WASTE DISPOSAL,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5B.
W76-10263

EFFECTS OF CLEAR-CUTTING ON NUTRIENT LOSSES IN ASPEN FORESTS ON THREE SOIL TYPES IN MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
C. J. Richardson, and J. A. Lund.
In: 'Mineral Cycling in Southeastern Ecosystems, 1975, (CONF-740513), p 673-686. 1 fig, 3 tab, 27 ref.

Descriptors: *Clear-cutting, *Nutrients, *Deciduous forests, *Soil types, *Leaching, Michigan, Nutrient cycling, Absorption, Nitrates, Ammonia, Phosphates, Potassium, Calcium, Sodium, Iron, Magnesium, Precipitation(Atmospheric), Groundwater, Hydrologic budget.
Identifiers: Aspen forests.

Clear-cutting of aspen may not significantly reduce nutrient uptake because of rapid revegetation by aspen root sprouts. Rapid shoot development would permit absorption and recycling of nutrients from soil and prevent nutrient loss. To evaluate first-year effects of clear-cutting on soil leaching in aspen forests on different soil types, nitrate, ammonium, phosphate, potassium, calcium, sodium, iron, and magnesium ion losses from 60-year-old aspen stands in Michigan were evaluated. Soil-nutrient leachate ion concentrations were not significantly higher on clear-cut plots during the first growing season. Nitrate-nitrogen and ammonium-nitrogen leachate values were less than the seasonal precipitation input. Leachate concentrations were highest following the spring thaw, then fluctuated through the growing season. Highest nutrient losses were generally from good soils. Groundwater accretion was about 12 cm/year higher on clear-cut plots. A preliminary nutrient budget was calculated from input and output determinations. During the first year in controlled clear-cuts, there was little evidence of increased nitrate-nitrogen, ammonium-nitrogen, phosphate, magnesium, potassium, sodium, and iron losses due to clear-cutting. Losses of leachate calcium and magnesium above control levels due to clear-cutting exceeded precipitation inputs only on good soil. Definite answers about nutrient losses cannot be determined until complete nutrient and hydrologic budgets are determined. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10315

THE EFFECT OF NONREMOVAL CLEAR-CUTTING AND PINE REFORESTATION OF THE CATION COMPOSITION OF A HARDWOOD FOREST SOIL,
Environmental Protection Agency, Washington, D.C. Office of Environmental Sciences.
J. D. Yount.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 744-753. 3 fig, 1 tab, 12 ref. NSF AG 199,40-193-69.

Descriptors: *Clear-cutting, *Reforestation, *White pine trees, *Cations, *Forest soils, Hardwood, Deciduous forests, North Carolina, Nutrient requirements, Hydrogen ion concentration, Sodium, Potassium, Calcium, Magnesium, Cation exchange, Soil horizons.
Identifiers: Coweeta Hydrologic Laboratory(NC).

Soil studies were conducted in a deciduous hardwood forest and a white pine plantation established after clear-cutting and decay of previous vegetation at the Coweeta Hydrologic Laboratory, North Carolina. Soil under the pine forest, which had been planted 14 years after clear-cutting and was 15 years-old, differed from the control hardwood forest soil in the opposite direction to that expected, based on relative nutrient demands of young pine and mature hardwood forests. Pine soil pH was 5.8 most of the year and was very well buffered, while hardwood soil pH was below 5.0. Sodium levels were similar, but potassium was higher in the hardwood soil, and calcium and magnesium were higher in the pine soil. Calcium took up 1/3-1/2 the total cation exchange capacity of pine soil. Cation exchange capacity and percent base saturation were significantly higher in pine soil; these characteristics produced a buffering effect resulting in less variable pH in pine soil. Differences in calcium, pH, and base saturation between the two soils can probably be attributed primarily to calcium input from clear-cutting and decay of plant biomass in the pine ecosystem. Soil calcium, pH, and base saturation in the pine forest should decrease to a lower steady-state level in time. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10322

EFFECTS OF FOREST FIRES ON ATMOSPHERIC LOADS OF SOLUBLE NUTRIENTS,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
W. M. Lewis.

In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 833-846. 2 fig., 3 tab., 35 ref. AEC AT(38-1)-819.

Descriptors: *Nitrogen cycle, *Forest fires, *Cycling nutrients, *Pine trees, Litter, Cations, Sulfates, Phosphates, Silicates, Carbon, Hydrogen, Oxygen, Nitrogen, Organic matter, Inorganic compounds, Hydrogen ion concentration, Conductivity, Solubility, Nitrates, Nitrites, Ammonia, Precipitation(Atmospheric), Phosphorus.
Identifiers: Longleaf pine.

Output of soluble substances from fires in longleaf pine litter by volatilization and particulate emission was determined by burning under controlled conditions. After combustion water-soluble substances released by the fire were extracted from the air. Combustion did not produce significant amount of airborne cations, sulfates, orthophosphates, or reactive silicates but volatilized carbon, hydrogen, oxygen, and nitrogen in the form of soluble organic and inorganic nitrogen compounds. These combustion products lowered the pH and conductance of water used in extraction. Approximately one-third of the unburned litter nitrogen content was released; most nitrogen was not recovered as fixed inorganic nitrogen. No nitrates were produced, but nitrite concentration was very high. Total nitrite and ammonia release from litter forest fires was approximately equal to two-thirds the yearly input of fixed nitrogen in rain. Field fires consume more fuel and burn hotter, thus volatile fixed nitrogen output would increase; therefore forest fires could increase regional and global atmospheric fixed nitrogen supplies. Atmospheric links of the nitrogen and possibly the phosphorus cycle are affected by open burning of forest materials and may be a source of atmospheric nutrients. Over long periods rainfall can be important in determining the nutrient inventory of the standing crop. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10328

THE EFFECT OF URBAN LAND USE ON NUTRIENT AND SUSPENDED-SOLIDS EXPORT FROM NORTH FLORIDA WATERSHEDS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
R. R. Turner, R. C. Harris, T. M. Burton, and E. A. Laws.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 868-888. 3 fig., 4 tab., 30 ref.

Descriptors: *Land use, *Nutrients, *Suspended solids, *Storm runoff, *Urban runoff, Forest watersheds, Urbanization, Florida, Agricultural watersheds, Temporal distribution, Streamflow, Dissolved solids, Nitrates, Ammonia, Nitrogen, Nitrites, Phosphorus, Silca, Water quality control, Storm water.
Identifiers: Lake Jackson(Fla).

Two watersheds near Lake Jackson, Florida, representing forested-agricultural and residential-commercial land use were hydrologically instrumented to study nutrient and suspended solids export. Large differences in size and temporal distribution of nutrient and suspended solids concentrations and exports in storm runoff were observed. Urbanization increased peak stream discharge; total stream discharge volume; mean dissolved solids, nitrate, and ammonia concentrations under all streamflow conditions; mean suspended solids, dissolved solids, nitrate-nitrogen, nitrite-nitrogen, ammonia-nitrogen, and orthophosphorus concentrations under storm-flow conditions; stream water composition variability under all streamflow conditions; storm dissolved and suspended constituent export rates; total storm export of dissolved and suspended constituents except dissolved silicon; and relative significance of storms as transport mechanisms. It decreased mean dissolved silicon under all streamflow conditions and mean suspended solids, orthophosphorus, and total dissolved phosphorus concentrations under low streamflow conditions. Urban runoff water quality criteria should be based on loading rates and concentrations. Urban water quality monitoring systems should sample complete storm hydrographs. Plans for beneficial storm water use may have to include differential collecting systems to be effective. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10331

4D. Watershed Protection

EFFECTS OF LARGE SCALE FOREST FIRES ON WATER QUALITY IN INTERIOR ALASKA,
National Environmental Research Center, College, Alaska. Arctic Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-10045

MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUNICIPAL SUPPLY AND WASTE DISPOSAL,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5B.
W76-10263

REDISTRIBUTION OF CESIUM-137 IN SOUTHEASTERN WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W76-10295

LITTER PRODUCTION, DECOMPOSITION, AND NUTRIENT CYCLING IN A MIXED HARDWOOD WATERSHED AND A WHITE PINE WATERSHED.
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W76-10310

MINERAL CYCLING STRATEGIES OF TWO DECIDUOUS AND TWO EVERGREEN TREE SPECIES ON A SOUTHERN APPALACHIAN WATERSHED,
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-10321

CATION FLUX IN HARDWOOD AND WHITE PINE WATERSHEDS,
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W76-10329

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

RETENTION OF METALS IN SEWAGE SLUDGE II: INCORPORATED RADIOISOTOPES,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
J. V. Lagerwerff, G. T. Biersdorf, and D. L. Brower.
Journal of Environmental Quality, Vol. 5, No. 1, p 23-25, January-March, 1976. 5 tab, 20 ref.

Descriptors: *Metals, *Sewage sludge, *Radioisotopes, Analytical techniques, Sludge analysis, Sampling, *Pollutant identification, Waste water treatment.

Digested sewage sludge samples from Washington, D. C., and Baltimore, Maryland, were columned and leached for up to 240 hr with 0.06 N calcium chloride, as well as with water, to study the release of trace amounts of strontium 85 and cesium 137 introduced earlier. Other sludge samples were subjected to hydrogen peroxide treatment and steambath drying, then to incubating with strontium 85 and cesium 137, and either exhaustive water leaching or equilibration with 0.01 N hydrochloric acid or water for one hr. In terms of the original radioactivity, pretreatment increased release of cesium 137 by water leaching between 9 and 18%, and between 7 and 10% for Baltimore and Washington sludge, respectively, depending on whether pretreatment was with water or 3% hydrogen peroxide. For strontium 85, the corresponding ranges were 47 and 55%, and 41 and 48%. Incubation of sludge at room temperature for 44 mo increased water extractability of both cesium 137 and strontium 85 slightly when the material incubated was kept dry. This effect may have resulted from smaller complexing orgaic compound concentrations, or compounds with less complexing ability. The isotopes extractability with hydrochloric acid sharply increased when sludge was moist. This effect would also indicate more organic complexes when storage conditions were moist, since a pH decrease affects their stability. (Snyder-FIRL)
W76-10006

PHOSPHORUS DISTRIBUTION FROM SEPTIC TANK EFFLUENT IN COASTAL PLAIN SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-10015

OPTIMAL ALLOCATION OF MEASUREMENT AND CONTROL RESOURCES WITH APPLICATION TO RIVER DEPOLLUTION,
Columbia Univ., New York. Dept. of Mechanical Engineering.
N. M. Olgac, C. A. Cooper, and R. W. Longman.
IEEE Transactions on Systems, Man, and Cybernetics, Vol. SMC-6, No. 5, p 377-384, May, 1976. 6 fig, 24 ref.

Descriptors: *Model studies, Rivers, *Water pollution control, *Aeration, Dissolved oxygen, Biochemical oxygen demand, Costs, Waste discharge, Equations, *Pollutant identification.

Under suitable circumstances, artificial instream aeration is the preferred abatement method for river pollution. An optimal aeration strategy was developed operating on measurements of dissolved oxygen (DO) and biochemical oxygen demand (BOD). DO measurements, which are relatively inexpensive and essentially instantaneous, were modeled as having no cost or time lag. Constraints in measurement of BOD are contamination by noise, time lag, and expense of collecting data. Partial differential equations describe the relationship between DO, BOD, effluent discharges, and artificial aeration. Without loss of generality, this distributed parameter control problem was transformed into a set of lumped parameter control problems along characteristic lines of the original partial differential equations. A model resulted which is adequate for arbitrary temporal and spatial distributions of effluent discharge and variable river cross sections. This ordinary differential equation model was transformed to a discrete time model because of the inherently discrete nature of the BOD measurements. The model includes uncertainty in the a priori knowledge of effluent source rates and in all water quality measurements. Optimal assignment of valuable efforts between aeration and measurement of BOD was made in terms of this model. This optimal strategy is independent of the measurement values. Numerical calculations were also made indicating how BOD measurements can be best located along a river. The dependence of the

ptimal measurement strategy upon observation oise variance and time lag were numerically in-estigated. (Snyder-FIRL)
/76-10017

. SIMULATION OF WATER POLLUTION IODEL PARAMETER ESTIMATION,
lational Aeronautics and Space Administration, angley Station, Va. Langley Research Center.
or primary bibliographic entry see Field 5B.
/76-10021

OMPUTER-AIDED ANALYSIS OF ENVIRON-IENTAL DATA, PART I: LINEAR REGRES-ION, PRECISION AND ACCURACY,
lew York State Dept. of Environmental Conser-ation, Albany.
I. H. Wang, and L. K. Wang.
n: Proceedings of the 22nd Annual Technical leeting of the Institute of Environmental ciences, April 26-28, Philadelphia, Pennsylvania, 543-547. 1 fig, 3 tab.

escriptors: *Analytical techniques, *Computer odels, *Computer programs, Statistical ethods, Regression analysis, Ultraviolet radia-on, *Pollutant identification, Measurement, hemical wastes.

. FORTRAN computer program has been eveloped which determines the linear regression odel, coefficient of correlation, and precision nd accuracy of environmental data. The precision nd accuracy of a new direct ultraviolet analytical echnique were determined. Samples of varying oncentrations of cetyldimethylbenzylammonium hloride (CDBAC) in distilled water were nalyzed. Graphically, the relationship between DBAC concentration and absorbance appeared be linear. The computer method produced a ear regression line independent of the investiga-r's judgment. This general computer program is uitable for use in analyzing all types of environ-ental data. (See also W76-10023) (Snyder-FIRL)
/76-10022

OMPUTER-AIDED ANALYSIS OF ENVIRON-IENTAL DATA, PART II: BIOCHEMICAL OX-GEN DEMAND MODEL,
ensselaer Polytechnic Inst., Troy, N. Y.
. K. Wang, and M. H. Wang.
n: Proceedings of the 22nd Annual Technical leeting of the Institute of Environmental ciences, April 26-28, 1976, Philadelphia, Pennsyl-ania, p 548-552. 3 fig, 1 tab, 6 ref.

escriptors: *Biochemical oxygen demand, Model studies, *Mathematical models, Oxygen, rganic compounds, Nitrogen compounds, Com-uter models, *Computer programs, *Pollutant lentification.
lentifiers: Carbonaceous oxygen demand, itrogenous oxygen demand.

computer program was developed for the deter-ination of the first-stage biochemical oxygen de-and (BOD), the deoxygenation constant, and the orrelation coefficient of the BOD mathematical odel. BOD is defined as the quantity of oxygen tilized in the biochemical oxidation of organic atter in a specified time at a specified tempera-re. It is used to measure the concentration of or-anic pollutants. If an organic waste contains only arbonaceous matter, its ultimate carbonaceous xygen demand (UOD), also called the first-stage OD, is a constant. The oxygen needed to oxidize e ammonia formed when organic matter contain-g nitrogen is oxidized is the nitrogenous oxygen emand (NOD), also called the second-stage BOD. relatively simple mathematical model for BOD, volving a linear plot, can be used to obtain UOD nd the deoxygenation constant and the UOD and etermining the correlation coefficient. The first ubroutine derives the slope and intercept of the near plot. Results are given for a set of experimental data used as an example. (See also W76-10022) (Snyder-FIRL)
W76-10023

EFFECT OF SURFACTANTS ON THE SPECTROPHOTOMETRIC DETERMINATION OF PHOSPHATE BY DIRECT AND EXTRACTION PROCEDURES,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
P. Pakalns, and H. T. Steman.
Water Research, Vol. 10, No. 5, p 437-441, 1976. 1 fig, 4 tab, 4 ref.

Descriptors: *Surfactants, *Pollutant identification, *Phosphate, *Spectrophotometry, *Detergents, Cations, Anions.
Identifiers: *Extraction method.

The effects of surfactants on determination of phosphate in water and waste water were studied. The surfactants investigated included pure cationic, anionic, and nonionic detergents; industrially prepared detergents; and a soap. Ascorbic acid and stannous chloride spectrophotometric methods and isobutyl acetate extraction were used for determining phosphate. For the spectrophotometric methods, the interference was very large for the cationic detergent but negligible for the biodegradable anionic detergents. The ascorbic acid method, which is simple and elegant, is recommended for routine determination of phosphate in most waters and waste waters containing surfactants. The results show that the standard addition procedure for the extraction method can be used only when the approximate surfactant concentration is known. Cationic and nonionic detergent levels must not exceed 2 and 10 ppm, respectively, but biodegradable anionic detergents do not interfere to at least 1000 ppm. However, compounds present in formulated detergents interfere badly. The extraction method should only be used with samples of at least 50 ml containing no more than 8 ppm of pure detergent. (Snyder-FIRL)
W76-10027

AN INSTRUMENT WITH INTERNAL CALIBRATION FOR MONITORING CHLORINE RESIDUALS IN NATURAL WATERS,
National Bureau of Standards, Washington, D. C.
G. Marinenko, R. J. Huggett, and D. G. Friend.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 4, p 822-826, April, 1976. 2 fig, 3 tab, 5 ref.

Descriptors: *Monitoring, *Chlorine, *Iodine, *Laboratory tests, *On-site investigations, *Pollutant identification, Rivers, Instrumentation.
Identifiers: Chlorine residuals.

A more sensitive field monitor was developed for low level chlorine concentrations. Iodine, resulting from oxidation of potassium iodide by chlorine residual, is measured amperometrically using a platinum microelectrode and a saturated calomel electrode. In the calibrator cell, which operates only when the system is being calibrated, a known amount of iodine is generated by coulometrically oxidizing iodide to iodine, the result being exactly the same as the reaction of chlorine with iodide in aqueous media. The water sample flows at a constant, known rate through the monitor, so that the ratio of electrically generated iodine flux to the water flux corresponds to the iodine concentration. Laboratory tests on the monitor included measurements of repeated quantitative dilutions of tap water and a solution prepared from commercial bleach. Field tests were performed during non-emergency conditions in streams in northern Maryland and during a fish kill in the James River. Data obtained indicated that the new instrument can measure chlorine concentrations down to a few parts per billion. It is portable and has direct read-out display in either microamperes or ppm of residual chlorine. (Snyder-FIRL)
W76-10028

POLLUTION MONITORING DOESN'T HAVE TO BE COSTLY,
Hewlett-Packard Co., Loveland, Colo.
V. Hebert.
Instruments and Control Systems, Vol. 49, No. 4, p 27-30, April, 1976. 6 fig.

Descriptors: *Monitoring, *Water pollution control, *Pollutant identification, Automation, Data collections, Waste water treatment, Data processing.
Identifiers: Data acquisition systems.

Automatic data acquisition systems (DAS) controlled by programmable calculators can effectively monitor pollution control systems. Electrical signals from transducers can be processed in the calculator. Pollution control monitoring includes legally required monitoring, monitoring which is necessary for engineering reasons, and informative monitoring which is helpful in running the system. A calculator based data acquisition system is used for pollution control monitoring at an electronic equipment plant. Automated systems are used to treat the diluted waste in rinse waters, but concentrated process wastes are treated under the direct control of a trained operator. The DAS gathers two kinds of information: the time and date of the data and the data itself. The signals from the transducers are analog signals, but a voltmeter converts them to digital information which the calculator can understand. The DAS can generate written data reports. The calculator based DAS has other potential applications, is versatile and easy to program, and is economically competitive with other systems that perform fewer functions. (Snyder-FIRL)
W76-10029

POTENTIOMETRIC DETERMINATION OF LOW LEVELS OF SIMPLE AND TOTAL CYANIDES,
Canada Centre for Inland Waters, Burlington (Ontario).
I. Sekerka, and J. F. Lechner.

Descriptors: *Heavy metals, *Pollutant identification, *Electrodes, *Potentiometers, Irradiation, Measurement.
Identifiers: *Cyanides.

A method was developed to determine simple and total cyanide concentrations by manual or automated direct potentiometry using a cyanide ion-selective electrode and the addition-known dilution technique. Samples for either simple or total cyanide determination must be treated chemically before measurement, and samples for total cyanide determination must also be irradiated with ultraviolet light. The method was used to determine cyanide ion down to 2 ppb. A procedure was developed to eliminate the interference caused by ions forming little-soluble salts of silver. Since cyanide in acid solution exists as dissolved hydrogen cyanide gas, which is not sensed by the electrode, only the apparent cyanide due to the interfering salts is determined by measuring at pH 2 to 3. This value is subtracted from cyanide measurements at pH 11.5 to determine the real cyanide concentration. The method is simple and efficient, and results obtained using it compare well with those obtained by a conventional method. (Snyder-FIRL)
W76-10030

APPLICATION OF A COMPUTER-BASED CHROMATOGRAPH FOR AUTOMATED WATER POLLUTION ANALYSES,
New Orleans Univ., La. Dept. of Biological Sciences.
B. Dowty, L. Green, and J. L. Laseter.
Journal of Chromatographic Science, Vol. 14, No. 4, p 187-190, April, 1976. 5 fig, 15 ref.

Descriptors: *Pollutant identification, *Gas chromatography, *Automation, *Organic compounds,

Analytical techniques, Measurement, Water analysis, Equipment, Monitoring, Separation techniques, Computer programs, Polymers.
Identifiers: Adsorbents.

An automated, computer-based gas chromatographic technique for the analysis of low molecular weight volatile organics extracted from drinking water by a modified headspace technique is described. The volatile organics are thermally desorbed from the water sample and displaced into the head-space by purging the sample with ultrapure helium. These displaced organics are then adsorbed on a polymer (Tenax-GC) material which is packed in a glass liner which in turn fits into a modified injection port of chromatograph. A Hewlett-Packard reporting gas chromatograph is modified to allow automated collection of volatile organics and their subsequent resolution by capillary chromatographic methods. On line data collection and reduction are achieved by a digital processor incorporated into the chromatograph. Commands establishing operating parameters and methods of data treatment are given via a keyboard. Automation of the procedure results in improved data reproducibility, with consecutive chromatograph analyses of the same sample showing retention time variabilities in the 0.01-0.1 sec range. The automated procedure can also be used to monitor industrial plant effluents and waste water treatment processes. (Kreager-FIRL)
W76-10038

CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM, A CONDENSED GUIDE TO CHEMICAL HAZARDS,
Coast Guard, Washington, D. C. Office of Marine Environment and Systems.
W. M. Benkert.
Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-002 390, $12.00 in paper copy, $2.25 in microfiche. Report CG-446-1, January, 1974. 437 p, 400 tab.

Descriptors: *Water pollution, *Toxicity, *Coast Guard regulation, *Chemicals, Water pollution sources, Chemical industry, *Safety, *Public Health, *Poisons, Ships, Inorganic compounds, *Chemical properties, Chemical wastes, Organic compounds, Human pathology, Transportation, Barges, Access routes, Navigation, Information exchange, Pollutant identification.
Identifiers: *Chemical hazards.

A condensed guide to chemical hazards is provided as guidance for proper decision making by responsible Coast Guard personnel. It also provides certain basic non-emergency related information to support Coast Guard effort to achieve improved levels of safety on the bulk shipment of hazardous chemicals. Included is: technical name, common synonums, physical characteristics of substance, emergency procedures, fire procedures, human exposure considerations and water pollution effects. (Katz)
W76-10047

EVALUATION OF THE ARMY PESTICIDE MONITORING PROGRAM, EVALUATION OF DATA FROM ENVIRONMENTAL SAMPLES COLLECTED PRIOR TO 1 JANUARY 1974, PART I, SOIL, SEDIMENT, WATER,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
C. C. Roan.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 228, $5.00 in paper copy, $2.25 in microfiche. Epidemiological Special Study No. 44-004-74/75, 1 September 1975. 8 p., 5 tab.

Descriptors: Pesticides, *Pesticide residues, Integrated control measures, Dieldrin, Aldrin, Endrin, DDT, DDE, DDD, Surface water, Sediment, Soils, *Monitoring, *Chlorinated hydrocarbon pesticides, *Pollutant identification.
Identifiers: Chlordane.

Analyses for pesticide residues in 389 environmental samples comprised of soil, water and sediment do not indicate extensive, unwarranted environmental contamination associated with the use of pesticides on Army installations. Revised scheduled sampling programs and a continuing evaluation of the pesticide component of the Army's integrated pest management programs are recommended. (Katz)
W76-10048

EFFECTS OF THERMAL AND CHEMICAL DISCHARGES FROM NUCLEAR POWER PLANTS,
Battelle Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5C.
W76-10051

WATER QUALITY DATA FROM TRUCKEE AND CARSON RIVERS. PYRAMID LAKE AND LAHONTAN RESERVOIR, A WORKING PAPER.
Environmental Protection Agency, San Francisco, Calif
For primary bibliographic entry see Field 5C.
W76-10054

ZINC PHOSPHATE GRANULES IN TISSUE SURROUNDING THE MIDGUT OF THE BARNACLE BALANUS BALANOIDES,
Natural Environment Research Council, Anglesey (Wales). Unit of Marine Invertebrate Biology; and University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W76-10057

EFFECT OF TEMPERATURE AND TEMPERATURE ADAPTATION ON CALCIFICATION RATE IN THE HERMATYPIC CORAL POCILLOPORA DAMICORNIS,
Loma Linda Univ., Calif. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10059

ULTRASTRUCTURAL CHANGES IN THE HEPATOCYTES OF GREEN SUNFISH, LEPOMIS CYANELLUS RAFINESQUE, EXPOSED TO SOLUTIONS OF SODIUM ARSENATE,
Texas Univ. at Austin. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-10062

TIDALLY-PRODUCED INTERNAL BANDS ON THE SHELL OF ELMINIUS MODESTUS,
Natural Environment Research Council, Angelsey (Wales). Unit of Marine Invertebrate Biology; and University Coll. of North Wales, Menai Bridge. Marine Science Labs.
D. J. Crisp, and C. A. Richardson.
Marine Biology, Vol. 33, No. 3, p. 155-160, 1975. 1 fig., 3 tab., 6 ref.

Descriptors: *Marking techniques, *Calcium, *Strontium, *Intertidal areas, *Growth rates, Environmental effects, *Tidal effects, Tides, *Crustaceans, Metals, Analytical techniques, Methodology, Invertebrates, *X-ray analysis, Pollutant identification, Path of pollutants.
Identifiers: Growth bands, Elminius modestus, *Barnacles.

Young specimens of Elminius modestus were marked by treatment with calcium and strontium-enriched sea water, allowed to grow in the intertidal environment, and marked again. The number of growth bands laid down coincided with the number of tidal immersions. Strontium is not readily incorporated into the shell, even when its concentration in the external environment is greatly increased. (Katz)
W76-10065

PHYSICAL FACTORS CONTROLLIN ABUNDANCE OF MEIOFAUNA ON TIDAL AN ATIDAL BEACHES,
Jordan Univ., Amman. Marine Science Pr gramme.
N. C. Hulings, and J. S. Gray.
Marine Biology, Vol. 34, No. 1, p. 77-84, 1976. fig., 4 tab., 15 ref.

Descriptors: *Currents(Water), *Connate wate *Regression analysis, Statistical models, Beache Populations, Sands, *Temperature, *Fauna, E vironmental effects, Mathematical studie Analytical techniques, Animal populations, Di tribution patterns, Biological communities, Bioi dicators, Water quality control, Sediments, Poll tant identification.
Identifiers: *Meiofauna, *Mediteranean, Moro co, Algeria, Tunis Tidal Beaches, Atidal Beaches

Quantitative samples of interstitial sand beac meiofauna were collected from Morocco along t North African coast and north to Lebanon, Tu key, and Cyprus. Data on the sediment media diameter, sorting coefficient, and beach temper ture were used to construct multiple-regressio equations relating these factors to total meiofaun numbers. For the tidal beach equations sorting w the most important factor followed by temperatu and median diameter. It is suggested that the fa tors controlling meiofaunal abundance on the beaches are likely to be wave, tide and current a tion which also control sorting. Biological intera tions on atidal beaches may cause the poor fit the data to the model. Regression techniques ma be useful in pollution detection. (Katz)
W76-10069

THE IMPORTANCE OF DISSOLVED ORGANI COMPOUNDS IN SEA WATER FOR TH NUTRITION OF ANEMONIA SULCATA PE NANT (COELENTERATA),
Cologne Univ. (West Germany). Zoological I stitut.
For primary bibliographic entry see Field 5C.
W76-10071

TOXICITY OF POLYCHLORINATED BIPHE YLS (AROCLOR 1254) TO ADULT, JUVENIL AND LARVAL STAGES OF THE SHRIM PALAEMONETES PUGIO,
Texas A and M Univ., College Station. Dept. Biology.
For primary bibliographic entry see Field 5C.
W76-10075

EFFECTS OF CALCIUM, STRONTIUM, AN MAGNESIUM ON THE COCCOLITHOPHOR CRICOSPHAERA (HYMENOMONAS) CA TERAE. I. CALCIFICATION,
South Carolina Univ., Columbia. Electr Microscope Lab.
For primary bibliographic entry see Field 5C.
W76-10078

BODILY DISTRIBUTION, ACCUMULATIO AND EXCRETION OF MERCURY IN A FRES WATER MUSSEL,
Siena Univ. (Italy). Inst. of Comparative Anat my.
For primary bibliographic entry see Field 5C.
W76-10081

DISTRIBUTION OF SELECTED METALS TISSUE SAMPLES OF CARP, CYPRINUS CA PIO,
Marist College, Marist Coll., Poughkeepsie, N. Environmental Science Program
For primary bibliographic entry see Field 5C.
W76-10082

LIBRARY U. OF F. INDIANA-Bloomington

ASYMMETRY ANALYSIS IN FISHES: A POSSIBLE STATISTICAL INDICATOR OF ENVIRONMENTAL STRESS,
Dames and Moore, San Francisco, Calif.
For primary bibliographic entry see Field 5C.
W76-10121

DESIGN A RIVER BASIN SAMPLING SYSTEM,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
T. G. Sanders, B. B. Berger, and D. D. Adrian.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 022, $5.00 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Research Center, Amherst, Publication No. 62, Completion Report FY-76-9, March 1976. 88 p, 12 fig, 14 tab, 77 ref. OWRT A-041-MASS(4) 14-31-0001-4021.

Descriptors: *Sampling, *Design criteria, *Pollutant identification, *River basins, Water quality, *Time series analysis, *Frequency, Streams.

The major objectives were: (1) To develop criteria to be used for specifying the number of sampling points in a river basin and their longitudinal, lateral and vertical location. (2) To develop criteria which would specify the frequency of sampling for baseline concentrations and year-to-year trends. The general location of sampling stations was specified by means of a stream numbering system. This location, termed the macrolocation, was then further refined by considerations of upstream discharges which might influence the longitudinal, lateral and vertical variation in pollutant concentrations. A representative sample of water quality in the stream's transect may require compositing samples withdrawn from various portions of the stream. A time series model was used to determine trends and to investigate the efficacy of various sampling frequencies.
W76-10131

THE MEASUREMENT OF ADENOSINE TRIPHOSPHATE IN PURE ALGAL CULTURES AND NATURAL AQUATIC SAMPLES,
Geological Survey, Doraville, Ga.
W. T. Shoaf, and B. W. Lium.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 241-245, March-April 1976. 3 fig, 4 tab, 9 ref.

Descriptors: *Chemical analysis, *Algae, Natural streams, *Analytical techniques, Sampling, Preservation, Methodology, Biochemistry, Biomass, Aquatic microbiology, Measurement, *Pollutant identification, *Separation techniques.
Identifiers: *Adenosine triphosphate.

Three methods for the extraction of adenosine triphosphate (ATP)--neutral dimethyl sulfoxide (DMSO), boiling tris buffer, and butanol-octalol extraction--were equally effective on the alga Chlorella vulgaris. Dilution of extracted ATP samples was linear. Filtration of different volumes of samples resulted in proportional values for ATP in the extracts. Measurement of activity by either peak height of integration of the area under the peak were equally sensitive and reproducible. The assay of ATP sample was inhibited by mercuric chloride >cadmium chloride >calcium chloride >potassium or sodium phosphate, and by high concentrations of the extractant DMSO. Analysis of ATP in aquatic environments led to the problem of transferring a sample from the field to the laboratory without obtaining a change in ATP concentration. Quick freezing by immersion of filter and algae in liquid nitrogen and storage on dry ice maintained a constant ATP level. Field extraction of the ATP followed by quick freezing in an acetone--dry ice bath maintained the ATP in a convenient and stable form. (Woodard-USGS)
W76-10133

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 6. ADAMS, BENTON, DOUGLAS, FRANKLIN, GRANT, LINCOLN, WALLA WALLA, AND WHITMAN COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W76-10138

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 7. PEND OREILLE, SPOKANE, AND STEVENS COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W76-10139

SALT-LOAD COMPUTATIONS--COLORADO RIVER; CAMEO, COLORADO TO CISCO, UTAH: PART 1. DATA SUMMARY,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-10142

SALT-LOAD COMPUTATIONS--COLORADO RIVER; CAMEO, COLORADO, TO CISCO, UTAH: PART 2. BASIC DATA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-10143

CONTINUOUS RESPIROMETER APPARATUS FOR MONITORING SEWAGE OXYGEN CONTENT.
Robertshaw Controls Co., Richmond (Australia). (Assignee).
Australian Patent 470,334. Issued March 11, 1976. Official Journal of Patents, Trade Marks and Designs, Vol. 46, No. 8, p 773, March, 1976.

Descriptors: *Sewerage, Analytical techniques, *Oxygen, *Monitoring, *Patents, Dissolved oxygen analyzers, Measurement, Aeration, *Pollutant identification, Waste water treatment.
Identifiers: *Respirometers.

A continuous respirometer apparatus to monitor the oxygen contained in sewage in a holding area was patented. It includes a continuous closed flow path formed on its upstream end with an inlet sensing area, and an outlet sensing area on its downstream end. A residence chamber is defined, having a known volume. A pre-aeration vessel is included with an outlet connected to the inlet in the closure area and an inlet for receiving the fluid. Means are included to introduce oxygen to the pre-aeration vessel to add oxygen to the fluid. Outlet and inlet probes sensing oxygen content are disposed in the outlet and inlet sensing areas to continuously sense the oxygen content of the sewage flowing through the outlet and inlet areas. The invention includes supply conduits that lead from the holding area to the pre-aeration vessel inlet to deliver sewage. Dump conduits lead from the outlet sensing area. Sewage delivery equipment continuously delivers sewage to the inlet sensing area. The sewage delivery rate is predetermined to maintain the volume filled and to provide a known residence time required for the sewage to flow between the inlet probe and outlet probe. The means for sewage delivery may be actuated for continuous delivery to the inlet sensing area, also causing flow of the sewage from the inlet probe to the outlet probe while isolated from ambient oxygen and causing the probes to indicate the oxygen content of the sewage at both the outlet and inlet sensing areas. (Snyder-FIRL)
W76-10201

BIODEGRADABILITY--AN IMPORTANT CRITERION FOR THE ENVIRONMENTAL COMPATIBILITY OF SURFACTANTS AND OTHER PRODUCT COMPOUNDS,
Henkel and Cie G.m.b.H., Duesseldorf (West Germany).
W. K. Fischer.
La Rivista Italiana Delle Sostanze Grasse, Vol. 52, No. 11, p 373-376, November, 1975. 3 fig, 6 tab, 1 ref.

Descriptors: *Pollutant identification, Analytical techniques, *Biochemical oxygen demand, *Chemical oxygen demand, *Carbon dioxide, Organic matter, Organic compounds, Carbon, Activated sludge, *Biodegradation, Water quality standards.
Identifiers: Total organic carbon, Dissolved organic carbon.

Biodegradability is increasingly required by national laws and international directives. The biodegradability testing of anionic surfactants stimulates either the self-purification of surface waters or biological sewage treatments in activated sludge plants in static and continuous flow systems. Biodegradability is being demanded increasingly for all organic product components. These demands pose new problems in testing methodology, international comparability, practical relevance of the results, and definition of official minimum requirements. A test combination has been developed consisting of successive application of a screening test and a model sewage treatment plant test; it permits the biodegradability evaluation of organic compounds by means of generally applicable summary parameters. The biodegradation of all organic materials can be determined via the biochemical oxygen demand (BOD) with the Closed Bottle Test. Similar determinations can be made via chemical oxygen demand (COD), total organic carbon (TOC), dissolved organic carbon (DOC) and carbon dioxide with the modified Closed Bottle Test using pure oxygen saturation. The low concentrations used in the conventional Closed Bottle Test make it useful only for BOD. If these screening tests yield low or questionable degradation rates, a modified confirmatory test especially suited to summary parameters is used to establish the elimination rates attainable under sewage treatment conditions. In the continuous activated sludge test, biodegradability may be observed by comparing values of COD, TOC, or both in coupled activated sludge units. (Snyder-FIRL)
W76-10235

DETERMINATION OF THE CHEMICAL OXYGEN DEMAND (COD) BY POTASSIUM DICHROMATE AT VERY HIGH CHLORIDE CONCENTRATIONS (BESTIMMUNG DES CHEMISCHEN SAUERSTOFFBEDARFS (CSB) GEGEN KALIUMDICHROMAT BEI SEHR HOHEN CHLORIDKONZENTRATIONEN),
U. Zietz.
Gas-und Wasserfach-Wasser/Abwasser, Vol. 117, No. 4, p 181-184, 1976. 1 tab, 10 ref.

Descriptors: *Chemical oxygen demand, *Potassium compounds, Analytical techniques, *Chlorides, *Chemical precipitation, Solubility, Axidation, Aqueous solutions, *Pollutant identification.
Identifiers: Potassium dichromate.

A modification of the potassium dichromate method for the determination of the chemical oxygen demand (COD) at very high chloride concentrations without the use of mercury compounds is described. The determination requires closed vacuum flasks for the analysis. Chlorides are quantitatively precipitated in the form of silver chloride. The small chloride concentration resulting from the solubility product of silver chloride is oxidized by the potassium dichromate. The chlorine concentration in the gaseous phase over the solution is negligible. The method is suitable for the determination of even very low COD values. (Takacs-FIRL)
W76-10236

ANALYTICAL NOTES--ELECTROCHEMICAL METHOD FOR EARLY DETECTION AND MONITORING OF COLIFORMS,
National Aeronautics and Space Administration, Langley Station, Va. Langely Research Center.
J. R. Wilkins, and E. H. Boykin.
American Water Works Association Journal, Vol. 68, No. 5, p 257-263, May, 1976. 4 fig, 4 tab, 11 ref.

Descriptors: *Analytical techniques, *Pollutant identification, *Electrochemistry, *Hydrogen, *Coliforms, Estuaries, Freshwater, Evaluation, Metabolism, Measurement, Aquatic microorganisms.
Identifiers: *Electrochemical methods, Fecal coliforms.

An electrochemical method for the detection and monitoring of coliforms in naturally contaminated estuarine and fresh water samples was evaluated. The method was based on the observation that the inoculum size was directly related to the time period required for the detection of hydrogen which is evolved by coliforms as a result of lactose metabolism. Standard methods of coliform analysis were performed on fresh water and estuarine samples, and membrane filtration counts were used to construct dose-response curves. Samples containing coliforms in the range of 100-1000/100 ml were detected in 6.2-8.5 hr for total coliforms in estuarine or fresh water samples, 3.5-6.5 hr for fecal coliforms in estuarine water, and 5.0-7.0 hr for fecal coliforms in fresh water samples. (Kreager-FIRL)
W76-10237

ANIONIC AND NON-IONIC SURFACTANT BIODEGRADATION IN A PURIFYING PLANT USING ACTIVATING MUDS (BIODEGRADAZIONE DE TENSIOATTIVI ANIONICI E NON-IONICI IN UN IMPIANTO DI TRATTAMENTO A FANGHI ATTIVATI),
Stazione Sperimentale Oli e dei Grassi, Milano (Italy).
C. Ruffo, and A. Arpino.
La Rivista Italiana delle Sostanze Grasse, Vol. 52, No. 11, p 383-386, November, 1975. 9 tab, 8 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewage treatment, *Activated sludge, *Sewerage, Treatment facilities, Surfactants, Muds, *Biodegradation.

Since surfactant-containing sewage must be adequately purified before final dumping sewage sampled both downstream and upstream of a purification plant using activated sludge was analyzed. The treatment removed more than 80% of both non-ionic and anionic surfactants. This situation indicates that biodegradable products are in use in Italy, as required by existing regulations. These results agree with those obtained by this research team in 1973, when despite drastically increased detergent consumption, surfactant concentration levels had not significantly risen since 1964. (Snyder-FIRL)
W76-10238

ANALYZING FOR ASBESTOS IN DRINKING WATER,
Municipal Environmental Research Lab., Cincinnati, Ohio.
J. R. Millette.
News of Environmental Research in Cincinnati, p 1-4, January 16, 1976. 4 fig.

Descriptors: *Pollutant identification, *Analytical techniques, *Asbestos, *Potable water, *Electron microscopy, Asbestos cement, Public health, Concrete pipes, Water conveyance, Water supply.

Although the health effects of asbestos fibers in drinking water currently are not known, sufficient concern exists that the levels should be investigated. An electron microscope is used for routine asbestos analysis because it can be used to identify fibers by crystal structure, morphology, and elemental composition. Samples from throughout the country were analyzed, indicating that a few municipal water supplies have relatively high asbestos levels, and that water with certain chemical characteristics may cause asbestos fibers to be released from asbestos cement pipe into water systems. (Snyder-FIRL)
W76-10240

IMPORTANT ASPECTS OF PHOSPHORUS ANALYSIS,
Allied Chemical Corp., Morristown, N. J.
H. E. Zuern.
Water and Sewage Works, Reference number, p R-52-R-53, April 30, 1976. 1 ref.

Descriptors: *Phosphorus, *Analytical techniques, *Colorimetry, *Pollutant identification, *Waste water(Pollution), Organophosphorus compounds, *Phosphates.
Identifiers: Ortho phosphate, Poly phosphates, Sample preparation, Digestion techniques.

Methods for the analysis of phosphorus in waste water are reviewed. All poly and organic phosphates must first be converted to ortho phosphate in order to determine the phosphorus content of a waste water sample. This is done by digesting the sample through chemical addition and heating. Three digestion techniques are suggested in Standard Methods: perchloric acid, sulfuric-nitric acid, and persulfate. The persulfate method is recommended for most waste water laboratories since it involves minimum hazards. After the digestion procedure, samples are checked for clarity to determine if filtering or centrifuging is necessary prior to colorimetric phosphorus determination. Suitable colorimetric methods include: the stannous chloride method which has a useful range of 0.007-2.0 mg/liter, the ascorbic acid method which has a useful range of 0.03-2.0 mg/liter, and the vanadomolybdophosphoric method which has a useful range of 0.75-20 mg/liter. The last method requires only one chemical for color development and is suitable for most field work where minute accuracy is not required. The stannous chloride method is preferred when small quantities of phosphorus (less than 2.0 mg/liter) are to be determined. (Kreager-FIRL)
W76-10241

POLLUTANT ANALYSIS COST SURVEY,
National Bureau of Standards, Washington, D. C.
B. Greiler, and J. K. Taylor.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 991, $7.75 in paper Copy, $2.25 in microfiche. Report EPA 650/2-74-125, December 1974, 196 p, 4 fig, 30 tab, 186 ref.

Descriptors: *Pollutant identification, *Water pollution, *Industrial wastes, *Testing, *Cost analysis, Spectrophotometry, X-ray fluorescence, Spectroscopy, Polarographic analysis, *Trace elements.
Identifiers: Emission spectroscopy, Electron probes, Polarography.

Various approaches to chemically analyzing heavy industrial process materials and effluents for trace elements possibly contributing to environmental pollution are summarized. The costs and capabilities of nuclear methods, spark source spectrometry, atomic absorption spectrometry, voltammetry, and potentiometry are assessed for determining traces of mercury, beryllium, cadmium, arsenic, vanadium, manganese, nickel, antimony, chromium, zinc, copper, lead, selenium, boron, fluorine, lithium, silver, tin, iron, strontium, sodium, potassium, calcium, silicon, magnesium, uranium, and thorium in matrices such as fly ash, oil, coal, ores, minerals, metals, organometallics, alloys, slurry streams, incinerator particulates, and feeds of sedimentation processes. A selected bibliography is included and the Standard Reference Materials available for environmental analysis are reviewed. This report revises and extends the 'Survey of Various Approaches to the Chemical Analysis of Environmentally Important Materials,' which it supersedes. (Snyder-FIRL)
W76-10259

WATER POLLUTION SAMPLER EVALUATION,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
J. J. Barkley, K. M. Peil, and J. W. Highfill.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A009 079, $6.75 in paper copy, $2.25 in microfiche. Technical Report 7501, January, 1975, 162 p. 24 fig, 39 tab, 6 ref, 5 append.

Descriptors: *Pollutant identification, *Analytical techniques, *Instrumentation, Sanitary engineering, *Water sampling, Laboratory tests, Testing procedures, Publications, Equipment.
Identifiers: *Sampler evaluation.

Standardized solutions and testing procedures for evaluating water and waste water samplers were studied. The ability of existing portable sampler to obtain representative samples of various waste water constituents under various physical limitations was evaluated. Sixteen samplers, representing the various types available, were tested with synthetic waste waters consisting of six classes of naturally occurring constituents. Test physical constraint included lift, temperature and sampling duration. Samplers were evaluated as to ease of operation representativeness of sample, and relation to a predefined ideal sampler and ranked as to overall performance. Only refrigerated samples maintained the level of biodegradable material. Gas-operated samplers inhibited bacterial viability in the sampled media, either because of the Freon or the rease associated with Freon. Collection velocity, constrictions, reductions or tees in the flow system, and screens or small holes in the inlet device influence the ability of a sampler to collect suspended solids. Temperature, time, and lift apparently do not significantly affect the collection or maintenance of colloids. No sampler was found efficient for sampling dissolved oxygen. Nonrepeatable result were obtained for the volatile organic class, possibly due to the fact that ambient temperature was not controlled and shortcomings in analytical procedure. Self-purging samplers were generally more efficient than non-purging models. (Snyder-FIRL)
W76-10261

MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUNICIPAL SUPPLY AND WASTE DISPOSAL,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5B.
W76-10263

BORON AND ARSENIC STUDIES IN FLORIDA WATERS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5B.
W76-10265

EFFECTS OF AGE, SEX, AND PELAGE PHENOTYPE ON THE ELEMENTAL COMPOSITION OF THE OLD-FIELD MOUSE,
Savannah River Ecology Lab., Aiken, S. C.
G. A. Kaufman, and D. W. Kaufman.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 518-527. 3 tab., 20 tab., 20 ref. AT(38-1)-310, AT(38-1)-819.

Descriptors: *Trace elements, *Small animals(Mammals), Analysis, *Chemical properties, *Rodents, Laboratory animals, Bioassay, Calcium, Phosphorus, Potassium, Sodium, Magnesium, Iron, Zinc, Aluminum, Manganese, Strontium, Boron, Molybdenum, Sulfur, Southeast U.S., Cycling nutrients, *Pollutant identification. Identifiers: Mice, *Pelage phenotype.

Effects of age, sex, and two naturally occurring pelage phenotypes (dark and light brown) on whole-body elemental composition were analyzed in nonreproducing laboratory-raised old-field mice from 0 to 42 days-old. Their effects on dry weight, live weight, lean-dry- and lean-live-biomass concentrations of calcium, phosphorus, potassium, sodium, magnesium, iron, zinc, sulfur, aluminum, manganese, strontium, boron, molybdenum, and barium were studied, using analysis by variance. Age was the most important factor affecting concentrations of these elements; sulfur expressed as dry- and lean-dry-biomass concentrations and sodium expressed as live- and lean-live-biomass concentrations were not significantly changed by age. Sex significantly affected potassium and zinc when expressed as dry weight concentrations but did not affect any element when expressed as live-weight or lean-dry- or lean-live-biomasses. Pelage phenotype significantly affected strontium when expressed as live-weight or lean-dry- or lean-live-biomass concentrations but not when expressed as a dry-weight concentration, and had no effect on other elements. The variability due to age (size) should be removed before effects of other variables are studied and form of concentrations expression should be considered. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10301

PREDICTION OF ELEMENTAL CONTENT IN THE OLD-FIELD MOUSE,
Savannah River Ecology Lab., Aiken, S. C.
D. W. Kaufman, and G. A. Kaufman.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 528-535. 3 tab., 11 ref. AT(38-1)-310, AT(38-1)-819.

Descriptors: *Rodents, *Physicochemical properties, Analysis, *Small animals(Mammals), *Trace elements, Calcium, Phosphorus, Potassium, Sodium, Magnesium, Iron, Zinc, Aluminum, Sulfur, Manganese, Strontium, Boron, Molybdenum, Barium, Laboratory animals, Bioassay, Forecasting, Regression analysis, Chemical properties, Southeast U.S., Cycling nutrients, *Pollutant identification.
Identifiers: Mice.

Changes in elemental contents of laboratory-raised old-field mice from 0 to 6 weeks-old were studied to determine usefulness of live and dry weights in predicting elemental concentrations. Live weight and live-weight concentrations of calcium, phosphorus, potassium, sodium, magnesium, iron, zinc, aluminum, sulfur, manganese, strontium, boron, molybenum, and barium, and between dry weight and dry-weight concentrations of elements were compared as mere correlations or data transformed to natural logarithms. Equations for estimating elements present from mouse live- and dry-weights were used. Live-weight estimators were best for converting field biomass into elemental standing crops. Sodium and potassium were not correlated with live weight nor were phosphorus, iron, and zinc with dry weight. The best elemental content estimated for 0 to 6 weeks-old mice were by predicting natural logarithms of elements from natural logarithms of live weight. For trappable-size mice 3 to 6 weeks-old, average live-weight concentration was the best elemental content estimator. Elemental contents from dry weights of 0 to 6 and 3 to 6 weeks-old mice should be estimated from regression equations relating elements to dry weight logarithms. Nitrogen, magnesium, aluminum, strontium, molybdenum, and barium were lower in laboratory than field-caught animals. Element concentrations were size specific. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10302

FATHEAD MINNOWS (PIMEPHALES PROMELAS) AND GOLDFISH (CARASSIUS AURATUS) AS STANDARD FISH IN BIOASSAYS AND THEIR REACTION TO POTENTIAL REFERENCE TOXICANTS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
I. R. Adelman, and L. L. Smith, Jr.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 209-214, 1976. 3 tab.

Descriptors: *Minnows, *Toxicants, Laboratory tests, *Bioassay, Analytical techniques, *Bioindicators, *Sodium chloride, Methodology, Standards, *Phenols, Variability, Quality control, Water quality control, Lethal limit, Aromatic compounds, *Pollutant identification.
Identifiers: Pimephales promelas, Carassius auratus, Standard procedures, *Reference toxicants, *Goldfish, Guthion(R), Pentachlorophenol.

Fathead minnows (Pimephales promelas) and goldfish (Carassius auratus) were compared for their suitability as standard bioassay fish. Both species showed the same variability of bioassay results when tested with four toxicants. Fathead minnows are recommended on the basis of their small size and on their capability for use in complete life cycle tests. On the basis of minimum variability of bioassay results, sodium chloride was superior for use as a reference toxicant. Both sodium chloride and pentachlorophenol would be acceptable as a reference toxicant. (Katz)
W76-10336

DELTA-AMINO LEVULINIC ACID DEHYDRATASE ACTIVITY IN FISH BLOOD AS AN INDICATOR OF A HARMFUL EXPOSURE TO LEAD,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W76-10338

AROCLOR 1016: TOXICITY TO AND UPTAKE BY ESTUARINE ANIMALS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-10340

THE IDENTIFICATION OF PHTHALIC ACID ESTERS IN THE TISSUES OF CYPRINODONT FISH AND THEIR ACTIVITY AS HEARTRATE DEPRESSORS,
Oak Ridge National Lab., Tenn.
P. Pfuderer, S. Janzen, and W. T. Rainey, Jr.
Environmental Research, Vol. 9, p. 215-223, 1975. 1 tab., 8 fig., 15 ref.

Descriptors: *Fish physiology, *Chemical analysis, *Bioassay, Water pollution effects, *Absorption, *Carp, *Industrial wastes, *Plastics, Chemical reactions, Spectrophotometry, Analytical techniques, Separation techniques, Laboratory tests, Water pollution sources, Adsorption, Chromatography, Lipids, *Pollutant identification.
Identifiers: Phthalates, Heart rate depressors.

Dioctyl phthalate and butylbenzyl phthalate, isolated from carp liver, exhibited heartrate depressor activity. A pure sample of dioctyl phthalate was not active in the assay, while a sample of butylbenzyl phthalate containing 1.5% dibutyl phthalate was slightly active, probably due to the dibutyl phthalate it contained. Dibutyl phthalate, also found in carp livers, remained active as a heartrate depressor at levels of 5 ppm and higher, in pure form. It is concluded either that traces of a compound that complexes or enhances the activity of dioctyl and butylbenzyl phthalate are responsible for their activity or traces of a more active compound are present with them. Dioctyl phthalate was also shown to form complexes in ethanol with fish lipids, presumably with fish di- and triglycerides. (Katz)
W76-10344

THE INFLUENCE OF HARDNESS COMPONENTS (CA2+ AND MG2+) IN WATER ON THE UPTAKE AND CONCENTRATION OF CADMIUM IN A SIMULATED FRESHWATER ECOSYSTEM,
Northeast Louisiana Univ., Monroe. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10346

MICROBIAL PETROLEUM DEGRADATION: USE OF MIXED HYDROCARBON SUBSTRATES,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-10350

PROCEEDINGS OF THE CONFERENCE ON MARINE BIOLOGY IN ENVIRONMENTAL PROTECTION HELD AT SAN CLEMENTE ISLAND, CALIFORNIA ON 13-15 NOVEMBER, 1973.
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5C.
W76-10353

PROBLEMS AND TECHNIQUES OF MARINE BIOLOGY IN THE FIELD: MODELING THE MARINE ECOSYSTEM,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-10355

BIOLOGICAL CONSIDERATION OF A BIOASSAY SYSTEM,
Naval Ship Research and Development Center, Annapolis, Md.
For primary bibliographic entry see Field 5C.
W76-10359

A RELIABLE ALGAL ASSAY PROCEDURE BASED ON PH MEASUREMENTS,
Naval Research Lab., Washington, D.C.
P. J. Hannan.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973, December, 1974. p 71-88, 8 fig, 11 ref.

Descriptors: *Bioassay, *Algae, Methodology, Water quality, *Primary productivity, *Hydrogen ion concentration, *Toxicity, *Adsorption, *Absorption, Aquatic productivity, Carbon dioxide, Photosynthesis, Adaptation, Environmental effects, Laboratory analysis, Basic data collections, Mercury, Iron, Zinc.
Identifiers: Scandium, *pH changes, *Algal bioassay, Phaeodactylum tricornutum, Instant Ocean.

An assay method has been devised for laboratory and shipboard use, based on the pH changes associated with CO2 absorption by algae. It can be used to determine differences in water quality, or to rank the relative toxicities of various compounds. The equipment consists of a lighted aquarium with six 1-liter Erlenmeyer flasks containing the test suspensions, a sensitive pH meter, an automatic electrode switch, and a six-point recorder or a digital printer. Growth is monitored for 60 hours, and CO2 absorption for each suspension is calculated from a comparison of pH changes observed during growth of the test

suspension with those found during a titration of an aliquot with standard alkali. Close control of the inoculum concentration and of nutrient concentrations is essential for reproducible results; it has been possible to approach 1 percent accuracy throughout the course of the 60 hours with four duplicate cultures. Because this method provides a continuous measure of growth the data contains useful information concerning the adaptation, or lack of adaptation, of the cells to a toxicant. Adsorption phenomena which play an important role in bioassays with algae and other organisms are also discussed. (See also W76-10353) (Katz)
W76-10360

BYSSAL THREAD PRODUCTION AS A TOXICITY TEST,
Naval Undersea Center, San Diego, Calif.
M. H. Salazar.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973, December, 1974. p. 103-116, 1 tab., 4 fig., 4 ref.

Descriptors: *Toxicity, *Bioassay, Physiology, *Mollusks, *Chromium, *Copper, *Mercury, *Zinc, *Sewage, Pelycypods, Mussels, Physiology, Intertidal areas, Methodology, Water quality, Water pollution, Statistical analysis, *Pollutant identification.
Identifiers: *Byssal threads production test.

Byssal thread production in Mytilus edulis decreases significantly when these mussels are stressed by various pollutants. Statistical analysis has shown that this stress can be quantified and used as a reliable measure of toxicity. During the development of this test, the toxicity of heavy metals (lead, chromium, copper, zinc, and mercury), sewage, fuel biocides, synthetic polymers, and oil were evaluated. As it is now conducted the test takes 21 days to complete. Mussels and some other bivalves produce byssal threads to anchor themselves securely to solid substrate. Previous investigators have shown that the number of byssal threads produced by a mussel is a good indicator of general animal health. It was found that byssal thread production in Mytilus edulis and Modiolus demissus decreased when physical factors such as temperature, dissolved oxygen, salinity, pH, and agitation deviated from optimum levels. This study demonstrates a similar decrease when Mytilus edulis is stressed with toxicants. (See also W76-10353) (Katz)
W76-10362

THE ACTIVITIES OF ENZYMES AS POLLUTION INDICATORS,
San Diego State Univ., Calif.
J. H. Mathewson.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973, December, 1974, 117-124, 9 ref.

Descriptors: *Crustacean, *Marine animals, *Toxicity, *Bioassay, Methodology, Laboratory methods, Animal physiology, Biochemistry, *Enzymes, Environmental studies, Mercury, Cadmium, *Bioindicators.
Identifiers: *Enzyme activity measurements, California spiny lobster, Panuliris interruptus, Carbonic anhydrase.

Traditional methods for the prediction of the impact of the pollutant on ecosystems rely on the short-term and generally gross response of uniform collection of mature specimens of a single species to relatively massive doses of a contaminant. The accepted concepts of modern ecology and the subtle and often surprising responses of ecosystems to perturbation require more sophisticated analysis. One approach is the determination of the response of key enzymes in exposed or sensitive tissue to environmentally significant levels of pollutants. Two potentially useful systems for the study of marine pollution problems are the carbonic anhydrases controlling carbon dioxide exchange and the cation dependent ATPases controlling ion balances.
W76-10363

COMPARISON OF TOXICITY TESTS,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5C.
W76-10367

MARINE POLLUTION MONITORING (PETROLEUM). PROCEEDINGS OF A SYMPOSIUM AND WORKSHOP,
National Oceanographic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 5B.
W76-10370

SURVEY ANALYSES FOR PETROLEUM DERIVED HYDROCARBONS IN THE OCEAN,
Maritime Safety Agency, Tokyo (Japan). Oceanographic Div.
For primary bibliographic entry see Field 5B.
W76-10374

MARINE POLLUTION DATA ARCHIVING AND EXCHANGE,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.
R. M. Morse.
In: NBS Special Publication No 409, Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop, December, 1974. p. 41-44.

Descriptors: *Data transmission, *Water pollution, *Data collections, International waters, Water quality sampling, Monitoring, Continuous water pollution control, Federal government.
Identifiers: International Oceanographic Data Exchange(IODE), U.S. Environmental Data Exchange(ENDEX).

The efforts of the United States Government and international agencies including UNESCO to collect and coordinate oceanographic data which applies to the evaluation of marine pollution is outlined. (See also W76-10370) (Katz)
W76-10376

QUANTITATIVE MONITORING AND VARIABILITY OF PELAGIC TAR IN THE NORTH ATLANTIC,
Harvard University, Cambridge, Mass. Dept. of Engineering and Applied Physics.
For primary bibliographic entry see Field 5B.
W76-10378

TAR BALL LOADINGS ON GOLDEN BEACH, FLORIDA,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W76-10379

TAR BALL SAMPLING IN THE WESTERN NORTH ATLANTIC,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W76-10380

EVALUATION OF THIN FILM OIL SAMPLERS,
Coast Guard, Washington, D.C.
W. J. Chang, and J. R. Jadamac.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 85-88, 1 tab., 5 fig., 5 ref.

Descriptors: *Methodology, *Oily water, *Sampling, *Water analysis, Water quality, Data collections, On-site data collections, On-site investigations, Testing procedures.
Identifiers: *Oil sampling, Thin film oil sampling, Oil identification, Marine pollution.

The U. S. Coast Guard is developing sampling systems for their oil films. Four prototypes have been developed and are being evaluated for handling characteristics, maintenance and repair, efficiency and ability to maintain the chemical integrity of the sample. (See also W76-10370) (Katz)
W76-10381

SAMPLING OF OIL SPILLS AND FINGERPRINTING BY INFRARED SPECTROSCOPY,
Rhode Island Univ., Kingston, Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-10383

MAPPING AND IDENTIFICATION OF OIL ON WATER BY THE USE OF AN AIRBORNE LASER SYSTEM,
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Station.
For primary bibliographic entry see Field 5B.
W76-10384

SAMPLING ERRORS IN THE QUANTIFICATION OF PETROLEUM IN BOSTON HARBOR WATER,
Massachusetts Inst. of Technology, Cambridge. Dept. of Chemical Engineering
A. M. Ahmed, M. D. Beasley, A. C. Efromson, and R. A. Hites.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974. p. 109-111, 3 tab, 10 ref.

Descriptors: *Oily water, *Analytical methods, Analysis, *Statistical methods, Methodology, On-the-site observations, Evaluation, Sampling, *Massachusetts.
Identifiers: Carbon tetrachloride extraction, Polyurethan foam adsorption, *Boston inner harbor(Mass), *Sampling errors, Infrared quantification, Marine pollution.

There are two major ways of reducing the large sampling error for petroleum in water. These are replication of samples and larger sample sizes. The measurement of most interest, however, is the thickness of the surface oil layer not the concentration of the dispersed oil below. (See also W76-10370) (Katz)
W76-10387

HYDROCARBON CONCENTRATIONS IN SEAWATER ALONG THE HALIFAX-BERMUDA SECTION: LESSONS LEARNED REGARDING SAMPLING AND SOME RESULTS,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
D. C. Gordon, Jr., and P. D. Keizer
In: NBS Special Publication 409, Marine Pollution Monitoring, (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p 113-115, 2 tab., 3 ref.

Descriptors: *Oil pollution, *Fluorescence, *Spectroscopy, *Atlantic Ocean, Analysis, *Sampling, Oily water, Analytical techniques, Methodology, On-the-site observations, Statistical methods, Canada, Water sampling.
Identifiers: *Fluorescence spectroscopy, Aromatic hydrocarbons in sea water, Nova Scotia,

Halifax, Bermuda, Fluorescent material in sea water.

Petroleum hydrocarbon contamination in seawater along the Halifax-Bermuda section appears limited to the upper few meters. Most is contained in the surface film. The large standard deviation indicates that the distribution is quite spotty. (See also W76-10370) (Katz)
W76-10388

HYDROCARBON CONTENT AND CHLOROPHYLL CORRELATION IN THE WATERS BETWEEN NOVA SCOTIA AND THE GULF STREAM,
Bermuda Biological Station for Research, St. George's West.
For primary bibliographic entry see Field 5B.
W76-10389

DETERMINATION OF AROMATIC HYDROCARBONS IN SEA WATER USING AN ELECTROLYTIC STRIPPING CELL,
National Bureau of Standards, Washington, D.C., Inst. for Materials Research.
S. P. Wasik, and R. N. Boyd.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p 117-118, 2 fig.

Descriptors: *Oily water, Methodology, *Analytical techniques, Analysis, *Gases, *Waste identification, Oil pollution, Sampling, Hydrogen, Marine water, Chromatography, *Pollutant identification.
Identifiers: Aromatic hydrocarbons, Electrolytic stripping cell, Marine pollution.

This paper describes a head-space method for determining aromatic hydrocarbons in sea water. The hydrocarbons are stripped from sea water, under equilibrium conditions, by very small bubbles of hydrogen gas generated electrolytically from a gold electrode located at the bottom of a cylindrically shaped cell. The hydrocarbon concentration in the sea water is determined from the volume of the sea water and the hydrocarbon concentration in the head-space after a measured volume of hydrogen has bubbled through the stripping cell. (See also W76-10370) (Katz)
W76-10390

DETERMINATION OF AROMATIC AND TOTAL HYDROCARBON CONTENT IN SUBMICROGRAM AND MICROGRAM QUANTITIES IN AQUEOUS SYSTEMS BY MEANS OF HIGH PERFORMANCE LIQUID CHROMATOGRAPHY,
Bermuda Biological Station for Research, St. George's West.
A. Zsolnay.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p 119-120, 2 fig, 7 ref.

Descriptors: *Oily water, Methodology, *Analytical techniques, Analysis, *Waste identification, Oil pollution, Marine water, *Chromatography, *Pollutant identification.
Identifiers: Aromatic hydrocarbon analysis, Total hydrocarbon analysis, Liquid chromatography, Flow colorimeter, Marine pollution.

In order to determine the hydrocarbon concentration in small water samples rapidly and fairly simply, two separate but related methods were developed. Both are based upon the use of high performance liquid chromatography. They are more sensitive than the IR methods, which tend to have a maximum sensitivity of 0.05 mg, and they are probably more specific than UV or fluorescence methods used without column chromatography. Their main advantage over GLC lies in the fact that they are simpler and more rapid for the obtaining of quantitative results. (See also W76-10370) (Katz)
W76-10391

DETERMINATION OF C1-C10 HYDROCARBONS IN WATER,
Chevron Oil Field Research Co., La Habra, Calif.
C. D. McAuliffe.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p 121-125, 1 tab, 4 fig, 14 ref.

Descriptors: *Water pollution, Methodology, *Analytical techniques, Analysis, *Gas chromatography, Oily water, Oil pollution, Waste identification, Environment, *Pollutant identification.
Identifiers: Distribution coefficient, Environmental surveys, Equilibrium, Hydrocarbon types, Hydrocarbons in water.

Several fields require the measurement of widely varying concentrations of hydrocarbons dissolved in water. These fields include environmental studies, petroleum exploration, and biochemical research, among others. The method reported here is based on successive gas equilibrations of a hydrocarbon-free gas with an aqueous sample containing dissolved hydrocarbons. All classes of hydrocarbons having up to 11 carbon atoms in the molecule can be determined. (See also W76-10370) (Katz)
W76-10392

SUSPENSIONS OF CRUDE OILS IN SEA WATER: RAPID METHODS OF CHARACTERIZING LIGHT HYDROCARBON SOLUTES,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
R. M. Bean.
In: NBS, Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p 127-130, 1 tab, 4 fig, 12 ref.

Descriptors: *Oily water, *Oil pollution, Methodology, *Gas chromatography, *Waste identification, Analytical techniques, Analysis, Spectrophotometry, *Pollutant identification.
Identifiers: Crude oil, Suspensions, Insoluble oil, Filtration, Oil solutions, Infrared spectrophotometry.

The purpose of this study was to develop rapid means for analysis of dissolved light hydrocarbons with respect to hydrocarbon type, which would be suitable for characterization of bioassay treatment media and oil/water discharges of a similar nature. To accomplish this, it was necessary to develop methods for sampling at locations remote from analytical instrumentation, and for correlation of hydrocarbon composition with simple spectrophotometric methodology. A rapid gas chromatographic method was developed to determine the light hydrocarbon composition of oil/seawater systems. (See also W76-10370) (Katz)
W76-10393

MEASUREMENT AND CHARACTERIZATION OF NONVOLATILE HYDROCARBONS IN OCEAN WATER,
Exxon Research and Engineering Co., Linden, N. J.
For primary bibliographic entry see Field 5B.
W76-10394

IDENTIFICATION, ESTIMATION AND MONITORING OF PETROLEUM IN MARINE WATERS BY LUMINESCENCE METHODS,
Baird-Atomic, Inc., Bedford, Mass.
For primary bibliographic entry see Field 5B.
W76-10395

RECENT DEVELOPMENTS IN THE IDENTIFICATION OF ASPHALTS AND OTHER PETROLEUM PRODUCTS,
Environmental Protection Agency, Cincinnati, Ohio.
F. K. Kawahara.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974. p 145-148, 1 tab., 5 fig., 6 ref.

Descriptors: *Asphalt, *Methodology, *Statistical analysis, Analytical Techniques, Waste identification, Oil pollution, Oily water, Oil spills, Infrared radiation, Industrial wastes, Gas chromatography, Pipelines, *Pollutant identification.
Identifiers: Discriminate function analysis, Infrared spectrophotometers.

This paper reports the successful application of electron capture detector gas chromatography to the analysis of the minor components present in asphalts and their utility to provide prima facie legal evidence, that is corroborated by other methods of identification. (See also W76-10370) (Katz)
W76-10396

IDENTIFICATION OF HYDROCARBONS IN AN EXTRACT FROM ESTUARINE WATER ACCOMODATED NO. 2 FUEL OIL,
Virginia Inst. of Marine Sciences, Gloucester Point. Environmental Chemistry Section.
R. H. Bieri, A. L. Walker, B. W. Lewis, G. Losser, and R. J. Huggett.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 149-153, 3 tab., 3 fig., 6 ref.

Descriptors: *Fossil fuels, *Oil wastes, *Gas chromatography, *Mass spectrometry, Analytical techniques, Methodology, Oily water, *Waste identification, Estuarine pollution, Oil spills, *Pollutant identification, Data processing.
Identifiers: *Fossil hydrocarbons, No. 2 Fuel oil, Specific compound identification, Naphthalene compounds, Indanes, Gas chromatograms, Biphenyls.

The application of the mass spectrometer with interfaced gas chromatography and data handling system to the identification of hydrocarbons in estuarine waters is described. (See also W76-10370) (Katz)
W76-10397

ANALYSES OF HYDROCARBONS IN MARINE ORGANISMS: RESULTS OF IDOE INTERCALIBRATION EXERCISES,
Woods Hole Oceanographic Institution, Mass.
J. W. Farrington, J. M. Teal, J. G. Quing, P. L. Parker, and J. K. Winters.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 163-166, 4 tab., 5 ref.

Descriptors: *Methodology, *Analytical techniques, *Oil wastes, *Oily waters, *Waste identification, *Organic compounds, Laboratory tests, Organic wastes, Chromatography, Oil pollution, *Calibration, Marine animals, *Pollutant identification.
Identifiers: Tuna, Tuna meal, N-alkanes.

The importance of intercalibration of hydrocarbon analyses between laboratories was recognized early in the program of baseline studies of the Office for the International Decade of Ocean Exploration, National Science Foundation. Three participating laboratories analyzed a cod liver sample spiked with a distillate cut of South Louisiana crude oil. Four participating laboratories analyzed a tuna meal sample provided as working intercalibration sample through the courtesy of the

National Bureau of Standards. The methods of analysis were not specified. Each laboratory analyzed the sample using the techniques and methods employed at that time in the respective laboratories. (See also W76-10370) (Katz)
W76-10398

IDOE-5 INTERCALIBRATION SAMPLE: RESULTS OF ANALYSIS AFTER SIXTEEN MONTHS STORAGE,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
G. C. Medeiros, and J. W. Farrington.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 167-169, 1 tab., 1 fig., 3 ref.

Descriptors: *Methodology, *Marine fish, *Laboratory tests, *Waste identification, *Gas chromatography, *Analytical techniques, Oil pollution, Organic compounds, Oily wastes, Louisiana, *Calibration, *Pollutant identification.
Identifiers: Cod liver, South Louisiana crude, Cod liver lipid, Intercalibration, IDOE.

Participation is reported with two other laboratories in an intercalibration exercise using as a sample a cod liver lipid extract spiked with a distillate cut of South Louisiana crude oil. A subsample was stored separately and analyzed 16 months later. The original sample and the stored sample were in agreement. (See also W76-10370) (Katz)
W76-10399

USE OF LOW MOLECULAR-WEIGHT-HYDROCARBON CONCENTRATIONS AS INDICATORS OF MARINE POLLUTION,
Texas A and M Univ. College Station, Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W76-10400

SAMPLING MARINE ORGANISMS AND SEDIMENTS FOR HIGH PRECISION GAS CHROMATOGRAPHIC ANALYSIS OF AROMATIC HYDROCARBONS,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab.
H. E. Bruce.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 181-182, 1 tab.

Descriptors: *Mollusks, *Mussels, *Crabs, *Monitoring, Marine organisms, Monitoring sediments, Pacific Ocean, *Alaska, Cold regions, Sediments, On-the-site investigations, Water quality, Oil pollution, Oily water, *Sampling, Chemical analysis.
Identifiers: *Prince William Sound(Alas), Macoma, Achmaea, Limpet, Cancer magister, Dungeness crab.

Sampling techniques for the collection of sediment samples and inner tidal organisms have been developed as part of a hydrocarbon baseline study in Prince William Sound of Alaska. Two species of clams, a limpet and the Dungeness crab will be analyzed for hydrocarbons. (See also W76-10370) (Katz)
W76-10401

FIELD SAMPLING METHODS AND TECHNIQUES FOR MARINE ORGANISMS AND SEDIMENTS,
University of Southern California, Los Angeles. Allan Hancock Foundation.
D. Straughan.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974. p. 183-187, 2 tab., 1 fig., 10 ref.

Descriptors: *Oil pollution, *Oily water, *Monitoring, Methodology, Sediments, On-the-site investigations, Water quality, Statistical analysis, Chemical analysis, Nets, *Sampling, Marine animals, Pollutant identification.
Identifiers: Coal oil point, Natural petroleum compounds, Animal tissues, Field sampling methods, Field sampling techniques.

Paper addresses itself to the difficulty in obtaining representative data to describe levels of petroleum content of sediments and organisms in an area. Most of the field sampling problems are the result of the uneven petroleum distribution in the marine environment. (See also W76-10370) (Katz)
W76-10402

METHODS FOR ESTABLISHING LEVELS OF PETROLEUM CONTAMINATION IN ORGANISMS AND SEDIMENT AS RELATED TO MARINE POLLUTION MONITORING,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5B.
W76-10403

QUANTITATIVE DETERMINATION OF HYDROCARBONS IN MARINE ORGANISMS,
Battelle Columbus Labs., Ohio.
J. S. Warner.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974. p. 195-196, 1 tab., 2 fig.

Descriptors: *Oil pollution, *Oily waters, *Mollusks, *Clams, *Gas chromatography, *Oysters, *Spectrometry, *Analytical techniques, Marine animals, Pollutant identification.
Identifiers: Fuel oil, Aromatic hydrocarbons, Silica gel fractionation, Tissue extraction, *Marine pollution.

A description is presented for a reliable analytical methodology that is diagnosed for individual hydrocarbon components and applicable to the analysis of relatively large numbers of samples. (See also W76-10370) (Katz)
W76-10404

LONG TERM WEATHERING CHARACTERISTICS OF IRANIAN CRUDE OIL: THE WRECK OF THE 'NORTHERN GULF',
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-10405

ANALYTICAL TECHNIQUES FOR ISOLATING AND QUANTIFYING PETROLEUM PARAFFIN HYDROCARBONS IN MARINE ORGANISMS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. C. Clark, Jr., and J. S. Finley.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 209-212, 2 tab., 4 fig., 6 ref.

Descriptors: *Oil pollution *Oil spills, *Analytical techniques, Gas chromatography, Pathology, Environmental effects, Waste identification, Mussels, Seaweed, Marine plants, Marine algae, Water analysis, Marine animals, *Bioindicators, Pollutant identification.
Identifiers: N-C16 Ratio, Paraffin hydrocarbon, Tissue analysis, Fucus, N-paraffin hydrocarbons.

Marine organisms can be used as indicators of petroleum pollution when it is possible to separate the biogenic paraffin hydrocarbons from pollution hydrocarbons. Once these paraffin hydrocarbon methods suggest petroleum contamination of a marine population, then other methods can be applied to delineate aromatic hydrocarbons and to establish the extent of the pollution in the marine environment. (See also W76-10370) (Katz)
W76-10406

DETERMINATION OF HYDROCARBONS IN MARINE ORGANISMS AND SEDIMENTS BY THIN LAYER CHROMATOGRAPHY,
California Univ., Berkeley. Naval Biomedical Research Lab.
L. Hunter, H. E. Guard, and L. H. DiSalvo.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974. p. 213-216, 1 tab., 2 fig., 6 ref.

Descriptors: *Oil pollution, *Analytical techniques, *Marine animals, *Mussels, *Sediments, *Benthic organisms, *Waste identification, Chromatography, California, Crabs, Clams, Monitoring, *Pollutant identification, Bays.
Identifiers: *San Francisco Bay, Sponge, Starfish, Scallop, Hydrocarbons, Hydrocarbon monitoring, San Francisco Bay hydrocarbons.

Research in the Naval Biomedical Research Laboratory investigates hydrocarbons in organisms as an integrative indicator of hydrocarbon insult in San Francisco Bay water. Surface sediments (0-6 cm) have been analyzed as a transient hydrocarbon storage compartment with a longer residence time than characteristic of organisms. (See also W76-10370) (Katz)
W76-10407

PELAGIC TAR IN THE GULF OF MEXICO AND CARIBBEAN SEA,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W76-10409

INTERLABORATORY QUALITY CONTROL STUDY NO. 5, CHROMIUM, IRON, MOLYBDENUM AND VANADIUM,
Canada Centre for Inland Waters, Burlington (Ontario).
R. W. Wales, and D. J. McGirr.
Canada Centre for Inland Waters, Report Series No. 26, 1973, 6 p, 5 ref, 6 tab.

Descriptors: *Chromium, *Iron, *Molybdenum, *Heavy metals, Water quality, Absorption, Trace elements, Solvent extractions, Chemical analysis, *Pollutant identification, Analytical techniques, Water analysis.
Identifiers: *Vanadium, Atomic absorption.

Samples containing known amounts of chromium, iron, molybdenum and vanadium were distributed to thirteen laboratories to be analyzed by the laboratories' usual methods. The majority of laboratories determined the metals by atomic absorption; in addition, iron was determined colorimetrically for comparison. Only a few participants were able to analyze all four metals, and in the case of molybdenum and vanadium the small number of results received made it difficult to come to firm conclusions about the reliability of the method. The precision for chromium was better than in a previous study. The results obtained for iron by atomic absorption with solvent extraction were good, while the colorimetric method was intermediate in precision and sensitivity between solvent extraction and direct aspiration using atomic absorption. (Environment Canada)
W76-10493

INTERLABORATORY QUALITY CONTROL STUDY NO. 4, ARSENIC, CADMIUM, COBALT, MERCURY AND NICKEL,
Canada Centre for Inland Waters, Burlington (Ontario).

D. J. McGirr, and R. W. Wales.
Canada Centre for Inland Waters, Report Series No. 25, 1973, 7 p., 7 ref., 6 tab.

Descriptors: *Trace metals, *Cadmium, *Cobalt, *Nickel, Water quality, *Mercury, *Chemical analysis, Industrial wastes, Toxins, *Pollutant identification, Water analysis, Analytical techniques, Arsenic compounds.
Identifiers: Atomic absorption, *Arsenic, Stock solutions, Inorganic mercury, Orgnic mercury.

Synthetic samples containing arsenic, cadmium, cobalt, nickel and mercury were analyzed by nine laboratories participating in a study of trace metals. Most laboratories used atomic absorption methods for determining cadmium, cobalt ad nickel; precision and accuracy were good for these three metals. Results were also acceptable for arsenic, which most laboratories determined by the silver diethyldithiocarbamate method. Both precision and accuracy were rather poor for mercury, which was analyzed by various procedures based on flameless atomic absorption; it is suggested that the laboratories review their procedures. (Environment Canada)
W76-10495

APPLICABILITY OF THE TECHNICON AUTOANALYZER I AND II SYSTEMS FOR SHIPBOARD ANALYSIS OF GREAT LAKES WATER SAMPLES,
Canada Centre for Inland Waters, Burlington (Ontario).
F. J. Philbert, O. Elkei, W. D. Blythe, and Y. M. Sheikh.
Water Quality Branch, Technical Bulletin No. 93, 1975, 10 p. 6 fig., 9 ref. 1 tab.

Descriptors: Ships, *Water sampling, *Water quality, Great Lakes, *Lake Ontario, *Lake Huron, Phosphates, Silica, Nitrites, Nitrogen, Nitrates, Phosphorus, Ammonia, Chlorides, Chemical analysis, Sampling, *Pollutant identification, Lakes.
Identifiers: Reactive silicas, Reagents.

Water samples from lakes Ontario and Huron were analyzed simultaneously, using the Technicon AutoAnalyzer I and II (AA1 and AA11) systems, for soluble reactive phosphate, soluble reactive silica, nitrate plus nitrite nitrogen, ammonia nitrogen, total alkalinity and chloride. The major instrumental features of the AA1 and AA11 systems are described and results are compared of sample analysis, standard deviations and percent recoveries for the methods used. Comparable analytical results were obtainable from the two systems for all of the parameters except ammonia. The results of sample analysis for ammonia by the AA1 method exceeded those obtained using the AA11 method by as much as 18%. Both systems gave satisfactory percent recoveries and the precisions compared reasonably well. (Environmental Canada)
W76-10497

5B. Sources Of Pollution

MUDS, SLIMES AND SLUDGES,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Mineral Chemistry.
For primary bibliographic entry see Field 5D.
W76-10008

A METHOD FOR ASSESSING FRICTION LOSSES FOR A NON-NEWTONIAN FLUID, SUCH AS SEWAGE SLUDGE, UNDER LAMINAR FLOW CONDITIONS,
Thames Water Authority, London (England) Metropolitan Public Health Div.
A. J. Selby.
The Public Health Engineer, Vol. 4, No. 2, p 44-48, March, 1976. 13 fig, 2 ref.

Descriptors: Hydraulics, *Flow rates, *Sewage sludge, *Mathematical models, *Friction, *Laminar flow, *Path of pollutants, Waste water treatment, Sludge treatment.

Sewage sludge behaves more like a Non-Newtonian fluid in which shear stress is some function of shear rate, than like a Newtonian fluid. The Generalized Bingham Plastic Equation, which considers the laminar region of Non-Newtonian flow, is used to construct a universal system. This system produces a continuous curve relating friction gradient to flow velocity. It is applied using straight-forward graphical means. To use the method, the relationship between shear stress and shear rate must be determined, requiring rheological testing of the sludge. The density of the sludge must also be determined. (Snyder-FIRL)
W76-10009

PREDICTING THE WATER POLLUTION POTENTIAL OF PROPOSED SANITARY LANDFILLS PART I: SANITARY LANDFILL LEACHATE...WHAT IT IS,
Indiana Univ., Indianapolis. School of Medicine.
W. A. Oleckno.
Journal of Environmental Health, Vol. 38, No. 5, p 331-333, March-April, 1976. 5 tab, 12 ref.

Descriptors: *Landfills, *Groundwater, *Water pollution sources, *Leachate, Anaerobic conditions, Hydrology, Forecasting, Biodegradation, Leaching, *Path of pollutants.

Sanitary landfill leachate creates a water pollution threat to nearby groundwater sources and streams, although the problem can feasibly be prevented by adequate landfill location. Stabilization of a landfill includes biological decay, chemical oxidation, diffusion of gases, movement of liquids, dissolving and leaching of materials, movement of dissolved material, and uneven settlement. The biological decay is usually predominantly anaerobic, although there are zones where oxygen is available and decay is aerobic. Leachate may contain any of the decomposition products, such as organic matter, metallic cations, anions, and dissolved gases. Carbon dioxide dissolved in the leachate may increase the acidity. Initial leachate production depends on the time of emplacement and moisture content, but subsequent generation is seasonal in response to climatic conditions. Leachate has been found 80 ft below a landfill. Variables causing differences in leachate from different landfills include the amount and composition of refuse, its sorting and degree of compaction, the characteristics and amount of water in contact with it, the duration of contact with the water, and temperature. The leachate may be relatively heavily contaminated. However, the leachate always changes with migration, and natural strata can attenuate groundwater contaminated with leachate as it moves away from the fill area. (See also W76-10014) (Snyder-FIRL)
W76-10013

PREDICTING THE WATER POLLUTION POTENTIAL OF PROPOSED SANITARY LANDFILLS PART II: AN INDEX OF THE WATER POLLUTION POTENTIAL OF SANITARY LANDFILLS,
Indiana Univ., Indianapolis. School of Medicine.
W. A. Oleckno.
Journal of Environmental Health, Vol. 38, No. 5, p 334-336, March-April, 1976. 2 ref.

Descriptors: *Leachate, *Landfills, *Waste disposal, *Soil mechanics, Flooding, Environmental engineering, Sanitary engineering, Forecasting, *Path of pollutants, Water pollution sources.

Many factors must be considered in selecting a site for a sanitary landfill. Although landfills may pose serious hazards, landfills can be planned and maintained that will not harm water quality. A numerical index indicating the water pollution potential of proposed sanitary landfills was developed, with point values assigned to various gradations of the criteria. The criteria were precipitation, soil type between the landfill bottom and the maximum water table, and distance between the landfill bottom and the maximum water table. The index does not replace a detailed survey. Because leachate flows slowly through slightly permeable strata, attenuation has a greater chance to occur. Due to possible fractures where channeling might occur, shale, dolomite, and limestone were assigned the same point value as gravel. Since flooding may rapidly bring refuse cells to field capacity and produce large volumes of leachate, the flooding frequency should be once in 50 yr or less. If a site is considered satisfactory by the index, surface water over 200 ft away from it probably will not be contaminated. The index indicates that, all other factors being identical, a site over clayey silt 6 ft above the maximum water table is preferable to a site over 5 ft of fine sand over fractured sandstone with a maximum water table at 15 ft. Even fills found satisfactory should be investigated further to ensure that the data used was fully representative of the site. A site with one satisfactory portion may not be satisfactory 20 ft away, due to a shift in underlying rock or soil conditions. After the site is developed monitoring wells should be drilled and nearby streams sampled periodically to insure that water pollution by leachate is not occurring. (See also W76-10013) (Snyder-FIRL)
W76-10014

PHOSPHORUS DISTRIBUTION FROM SEPTIC TANK EFFLUENT IN COASTAL PLAIN SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
R. B. Reneau, Jr., and D. E. Pettry.
Journal of Environmental Quality, Vol. 5, No. 1, p 34-39, January-March, 1976. 5 tab, 25 ref.

Descriptors: *Septic tanks, *Phosphorus, *Monitoring, *Water pollution sources, Groundwater, Soil analysis, Soil water movement, Effluents, *Path of pollutants, Pollutant identification.

Phosphorus accumulations in Goldsboro and Varina sandy loams, both of whose water tables are high perched, were monitored to study the fate of phosphorus from septic effluent. Lateral and vertical phosphorus movements were determined with piezometers at selected depths and distances from the drainfield. Orthophosphate in the perched water tables decreased from 5.5 micrograms/ml in undiluted effluent to 0.32 micrograms/ml in Varina soil at 3.0 m distance and from 11.8 micrograms/ml to less than 0.20 micrograms/ml in Goldsboro soil at 3.0 m distance. Little orthophosphate was present in either soil at 12 m distance. The possibility of vertical movement contaminating permanent groundwater tables is limited, because the slowly permeable horizons were effective barriers to vertical orthophosphate movement. Phosphorus was concentrated at depths from 142 to 152 cm in the Goldsboro loam. The septic effluent did not appreciably alter fixed phosphorus quantities of phosphorus fraction distributions in the Goldsboro loam or farther than 3 m from the system in the Varina soil. Soil phosphorus fractions near the drainfield were present mainly as ammonium fluoride and sodium hydroxide extractable phosphorus and organic phosphorus. In the Varina loam, the ammonium fluoride extractable phosphorus fraction increased from 2 to 4 micrograms/g in the control profile to as much as 460 micrograms/g, and the sodium hydroxide extractable phosphorus fraction from between 40 and 50 micrograms/g to as high as 425 micrograms/g, at 0.15 m in the argillic horizons. (Snyder-FIRL)
W76-10015

POLLUTION OF GROUNDWATER BY LANDFILLS (POLLUTION DE L'EAU SOUTERRAINE PAR LES DECHARGES),
G. Matthess.

Techniques et Sciences Municipales--L'Eau, No. 2, p 67-75, 1976, 18 ref.

Descriptors: *Groundwater, *Landfills, *Water pollution control, Hydrological aspects, Flow rates, Water pollution sources, Waste disposal.

The possibilities for minimizing hazards of groundwater pollution, as related to choice of landfill site, are discussed. Some hydrogeological conditions are mentioned in which local groundwater pollution can be tolerated to avoid other environmental hazards. In hydrogeological conditions unfavorable to landfill siting, such as karst, heavily fractured rock, and aquifers, where the porosity allows for a high flow rate, landfills should be authorized only where widespread pollution of groundwater is prevented. (Kramer-FIRL)
W76-10016

A SIMULATION OF WATER POLLUTION MODEL PARAMETER ESTIMATION,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
J. F. Kibler.
In: Proceedings of the 22nd Annual Technical Meeting of the Institute of Environmental Sciences, April 26-28, 1976, Philadelphia, Pennsylvania, p 533-537. 5 ref.

Descriptors: *Pollutant identification, *Path of pollutants, *Model studies, Water pollution, Mathematical models, Computer models, *Simulation analysis.
Identifiers: *Pollution transport models.

The parameter estimation procedure for a water pollution transport model was developed using simulated data. A two-dimensional instantaneous-release, shear-diffusion model was selected to represent a simple transport process. It was used with a remote sensor model which connected it with an inertial coordinate system. Data from a remote sensor was simulated by values generated by the transport model, with gaussian noise added. A least -squares batch processor used this data to estimate model parameters, providing a means to evaluate sensor characteristics. The most accurate estimates for all parameters could be produced by variable resolution, but variable resolution would increase sensor or data acquisition costs. Data acquisition strategy distinctly affects estimate accuracy. Imaging strategy can be specially designed for accurate estimates of one or two parameters of interest. All parameters can be estimated accurately by multiple data passes. Data acquisition costs can be reduced by using a limited number of carefully placed images, which can yield nearly the accuracy of many more data points. (Snyder-FIRL)
W76-10021

COMPUTER-AIDED MODELLING OF STREAM PURIFICATION CAPACITY, PART I: NON-LINEAR DO MODEL,
Rensselaer Polytechnic Inst., Troy, N. Y.
L. K. Wang, D. Vielkind, and M. H. Wang.
In: Proceedings of the 22nd Annual Technical Meeting of the Institute of Environmental Sciences, April 26-28, 1976, Philadelphia, Pennsylvania, p 553-557. 2 fig, 2 tab, 15 ref.

Descriptors: *Waste assimilative capacity, *Dissolved oxygen, *Self-purification, Rivers, *Waste water disposal, Biodegradation, Model studies, Mathematical models, Reaeration, Streams, Biochemical oxygen demand, *Path of pollutants, *Computer models.

When non-toxic, biodegradable plant effluent with low nutrient content is released into a stream, the dissolved oxygen (DO) content initially decreases due to the high biochemical oxygen demand (BOD), then increases as the atmospheric aeration rate becomes greater than the BOD, until the normal cycle is reestablished. This process is known as self-purification. Oxygen is needed for the reactions which convert organic substances to carbon dioxide, water, phosphate, sulfate, nitrite, and nitrate. For this reason, a stream is capable of self-purification only if its water contains sufficient DO and necessary microorganisms. The minimum DO concentration is different in different types of streams. Equations exist for calculating the time until the minimum DO content is reached, the DO deficit at that point, the distance to the location where the minimum occurs, and the initial DO deficit. The DO saturation concentration must be known in order to calculate this last quantity. The DO concentration at the critical location must be at least the minimum DO concentration established by governmental standards. A new mathematical model was developed for the DO saturation concentration. A computer was used to compare data with linear, quadradic, and cubic functions of temperature. A cubic function produced the best fit. It was accurate to plus or minus 0.01 mg/liter DO, while a previous model was only accurate to plus or minus 0.1 mg/liter. Results from the model can be used, in turn, to determine DO deficits, the critical DO concentration, and the DO drop that can be allowed in a stream receiving waste water. (See also W76-10025) (Snyder-FIRL)
W76-10024

COMPUTER-AIDED MODELLING OF STREAM PURIFICATION CAPACITY, PART II: MULTIPLE LINEAR CORRELATION METHOD,
Rensselaer Polytechnic Inst., Troy, N. Y.
L. K. Wang, M. H. Wang, and D. Vielkind.
In: Proceedings of the 22nd Annual Technical Meeting of the Institute of Environmental Sciences, April 26-28, 1976, Philadelphia, Pennsylvania, p 558-564. 1 fig, 2 tab, 9 Ref.

Descriptors: *Waste assimilative capacity, *Dissolved oxygen, *Self-purification, Streams, Rivers, Reaeration, Waste water disposal, Biodegradation, Model studies, Mathematical models, Biochemical oxygen demand, *Path of pollutants, *Computer models, *Correlation analysis.

A FORTRAN computer program can derive two mathematical models for the mechanism of dissolved oxygen exchange by natural waters. The quantities modeled are dissolved oxygen (DO) drop and biochemical oxygen demand (BOD) at the DO sag in a stream. The multiple linear correlation method was previously used to model these quantities. A generally good correlation was demonstrated between DO, BOD, stream water temperature, and stream flow. A computer must be used, however, to develop these models for a specific stream. As an example, these models were developed for a stream which had been studied previously without the computer program. A plant discharged effluent into a small creek which then flowed into the main stream. Data were collected on four days with varying flow conditions. Sampling was performed on the creek both upstream and downstream of the discharge and on the main stream above, at, and below the confluence with the small creek. Data on upstream BOD, stream water temperature, stream flow, and BOD at the stream's sag point were used to obtain the specific models for DO drop and BOD. The observed DO drop at the sag point was predicted very precisely by the specific model. The BOD model showed acceptable accuracy in predicting the loads observed at the sag point. (See also W76-10024) (Snyder-FIRL)
W76-10025

INDUSTRIAL RESEARCH INSTITUTE STUDYING POLLUTION PROBLEMS OF SETO INLAND SEA,
Chugoku National Industrial Research Inst., Hiroshima (Japan).
T. Fukuda, and N. Hayakawa.
Civil Engineering in Japan, Vol. 14, p 143-149, 1975. 3 fig.

Descriptors: *Water quality, *Model studies, *Water pollution effects, *Mathematical models, Rivers, Photography, Water pollution control, *Computer models.
Identifiers: *Japan(Inland Sea).

A scale model was built of the Inland Sea, a shallow, narrow body of water surrounded by three major Japanese islands, to study methods of reducing further water quality deterioration. Its scale ratio is one to 2,000 in the horizontal and one to 160 in the vertical. Tides are reproduced with recirculating pumps and oscillating weirs and measured by up to 40 gauges. A computer is available to aid in the simulation and record the measurements. Over 70 rivers discharging regulated flow of dye solution are included in the model. Water samples can be extracted from any part of the model without disturbing the flow. An ultrasonic current meter measures flow velocity. Cameras are mounted above the model, and can be used to photograph floats. A study of dissolved oil diffusion with this model accurately predicted the results of an incident in which an oil refinery tank burst. Tidal flow in the inland sea is being measured for verification of the model. A more generalized density current basin and an alternating flow channel are used for more fundamental study. Mathematical computer models of tidal flow and diffusion in the Inland Sea are also being developed. (Snyder-FIRL)
W76-10031

INTERPRETATION OF INTERNAL TRACER EXPERIMENTS AND LOCAL SOJOURN TIME DISTRIBUTIONS,
City Coll., New York. Dept. of Chemical Engineering.
Y. Zvirin, and R. Shinnar.
International Journal of Multiphase Flow, Vol. 2, No. 5 and 6, p 495-520, April, 1976. 11 fig, 2 tab, 29 ref.

Descriptors: *Tracers, *Flow system, *Flow characteristics, Analytical techniques, Tracking techniques, Measurement, Water pollution, Hydrology, Hydrologic properties, Dispersion, Flow, Mixing, Path of pollutants.
Identifiers: Transport processes, Peclet number.

A general approach for the interpretation of tracer experiments designed to study transport processes in flow systems with multiple inlets and outlets is described. A method for the description of these processes is suggested based on the definition of such local model-free parameters as the purging rate, mixing rate, equivalent Peclet number and local sojurn time distributions. These parameters can be determined directly from tracer measurements without resorting to any model. Their values and especially their spatial distributions in the system describe the nature of the mixing and purging (or flushing) processes in the system. Experiments are described in which tracer material is introduced at given points within the system followed by measurements of the resulting concentration histories at the same points as well as at different sites. The results are pertinent to a variety of areas in which tracer experiments are used, including water physiology, hydrology, and the study of dispersion processes in the oceans. (Kreager-FIRL)
W76-10039

BIOLOGICAL SURVEY OF THE SAVANNAH RIVER IN THE VICINITY OF THE SAVANNAH RIVER PROJECT. PART I - REPORT ON THE WORK DONE AND TENTATIVE CONCLUSIONS ON THE SUMMER SURVEY,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-10041

BIOLOGICAL SURVEY OF THE SAVANNAH RIVER IN THE VICINITY OF THE SAVANNAH RIVER PROJECT, PART II - REPORT ON WORK DONE AND TENTATIVE CONCLUSIONS ON THE FALL SURVEY,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-10042

BIOLOGICAL SURVEY OF THE SAVANNAH RIVER IN THE VICINITY OF THE SAVANNAH RIVER PROJECT. PART III - REPORT ON THE WORK DONE AND TENTATIVE CONCLUSIONS ON THE WINTER SURVEY,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-10043

SAVANNAH RIVER BIOLOGICAL SURVEY, SOUTH CAROLINA AND GEORGIA, AUGUST, 1954.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-10044

CHEMICAL IMPACT OF SNOW DUMPING PRACTICES,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5C.
W76-10049

AN ANALYSIS OF THE DYNAMICS OF DDT AND ITS DERIVATIVES, DDD AND DDE, IN MARINE SEDIMENTS
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 5C.
W76-10050

TIDALLY-PRODUCED INTERNAL BANDS ON THE SHELL OF ELMINIUS MODESTUS,
Natural Environment Research Council, Angelsey (Wales). Unit of Marine Invertebrate Biology; and University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5A.
W76-10065

PETROLEUM HYDROCARBONS: DEGRADATION AND GROWTH POTENTIAL FOR ATLANTIC OCEAN SEDIMENT BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-10068

EFFECTS OF KRAFT MILL EFFLUENTS ON BENTHIC MACROPHYTE ASSEMBLAGES IN A SHALLOW-BAY SYSTEM (APALACHEE BAY, NORTH FLORIDA, U.S.A.),
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 5C.
W76-10077

GROUND-WATER POLLUTION PROBLEMS IN THE NORTHWESTERN UNITED STATES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
F. Van der Leeden, L. A. Cerrillo, and D. W. Miller.
Research Reporting Series, EPA-660/3-75-018, 1975, 361 p, 60 fig, 48 tab, 459 ref, 3 append.

Descriptors: *Water pollution, *Groundwater, Colorada, Idaho, Montana, Oregon, Washington, Wyoming, Salinity, Hardness(Water), Chemical properties, Septic tanks, Sewage treatment, Irrigation water, Return flow, Dry farming, Oil wells, Impoundments, Mine drainage, Landfills, Radioactive waste disposal, *Pacific Northwest U. S.
Identifiers: Future water requirements, Groundwater evaluation.

Ground-water contamination problems have been investigated in six, northwest states: Colorado, Idaho, Montana, Oregon, Washington and Wyoming. Ground water represents 12 percent of the total water utilized in the region. Industrial and agricultural growth and development of new energy sources will cause a sharp increase in groundwater use over the next 30 years. Groundwater quality varies widely throughout the region. The most common problems are salinity, excessive hardness, iron, manganese and flouride. The principle sources of man-caused ground-water quality problems are: Septic tank sewage treatment plant discharges, irrigation return flow, dryland farming, abandoned oil wells, shallow disposal wells, unlined surface impoundments, mine tailings and drainage, municipal and industrial landfills, and radioactive waste disposal. The findings of the investigation were that with the exception of radioactive waste disposal, few cases of groundwater pollution have been examined in detail. A need exists for baseline water-quality data and systematic eavaluation of overall ground-water conditions; especially in urban zones, areas of petroleum exploration and development, and at locations of mining and industrial activity. (Heiss-NWWA)
W76-10083

GUARDIANS OF GROUND WATER QUALITY,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W76-10096

POLLUTION EFFECTS ON SURFACE WATERS AND GROUND WATERS, (LITERATURE REVIEW),
Ontario Ministry of the Environment (Toronto).
For primary bibliographic entry see Field 5C.
W76-10104

AN ENVIRONMENTAL ASSESSMENT OF IMPACTS OF COAL DEVELOPMENT ON THE WATER SOURCES OF THE YAMPA RIVER BASIN, COLORADO AND WYOMING--PHASE-1 WORK PLAN,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4C.
W76-10135

EFFECTS OF A LANDFILL ON GROUNDWATER QUALITY,
Geological Survey, Tallahassee, Fla.
D. H. Boggess.
Open-file report 75-594, 1975. 39 p, 8 fig, 2 tab, 9 ref.

Descriptors: *Water pollution sources, *Groundwater, *Landfills, *Waste disposal, *Path of pollutants, Data collections, Water wells, Sampling, Chemical analysis, Sulfates, Potassium, Ammonia, Nitrogen, Sodium, Chlorides, Evaluation, *Florida.
Identifiers: *Fort Myers(Fla).

Recognizing the potential problem of contamination of groundwater supplies by a landfill operated by Fort Myers, Fla., city officials requested that an investigation be made by the U. S. Geological Survey. Chemical analyses of water from 11 wells were adequate to show definite effects on groundwater quality in the vicinity of the landfill site. These effects were observed as far as 1,200 ft down gradient. When compared to the average concentrations of chemical constituents determined in comparable wells used as controls, water from the well with the greatest effect had sulfate 72 times greater, potassium 43 times greater, ammonia nitrogen 20 times greater, sodium and chloride 12 times greater, and most other chemical constituents 2 to 8 times greater. The results are expected to be of considerable value in the future selection of landfill sites, as well as to provide information on problems associated with existing sites which may be useful in determining more effective methods of operation. (Woodard-USGS)
W76-10137

DIFFUSION AND MASS FLOW OF NITRATE-NITROGEN TO PLANT ROOTS,
Kentucky Agricultural Experiment Station, Lexington. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-10182

CHARACTERISTICS OF THE ACCUMULATION OF FREE AMINO ACIDS BY SOME NON-SPORULATING BACTERIA FROM TYPICAL IRRIGATED SIEROZEM, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Dept. of Microbiology.
V. V. Lazareva.
Uzb Biol Zh. 18(1), p 55-56, 1974.

Descriptors: *Bacteria, *Amino acids, *Sierozems, Irrigated land, Biomass, Cultivation, Isolation.
Identifiers: Achromobacter-Agile, Achromobacter-Agile-Var-Hartlebii, Achromobacter-Liquefacien-Var-Dendr, Amino-Acids.

A study of nonsporulating bacterial cultures isolated from typical irrigated sierozem soils of the Uzbek SSR revealed a large number of producers of glutamic acid, Bacterium agile 745, B. agile var. hartlebii 1071, Bacterium liquefaciens var. dendriticum 353. Accumulation of amino acids and biomass in the culture liquid of nonsporulating producers begins on the 2nd day and reaches a maximum by the 96-120 h of cultivation.--Copyright 1975, Biological Abstracts, Inc.
W76-10188

MODELS FOR EVALUATION OF HAZARDOUS WASTES,
Municipal Environmental Research Lab., Cincinnati, Ohio.
A. J. Klee.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE1, p 111-125, February 1976. 8 tab, 15 equ, 14 ref.

Descriptors: *Wastes, *Streams, *Environmental engineering, *Decision making, Materials, Hazards, Water pollution sources, Model studies, Equations, Systems analysis, Path of pollutants.
Identifiers: *Utility theory, Rating models, *Hazardous wastes, *Hazardous materials.

The problems encountered in the development of models for the quantification of the degree of hazard to the environment of waste streams are examined. With the aid of a numerical example, an additive utility approach is elucidated in detail. Three recently proposed hazardous waste rating models are also critically reviewed. In general, the complexities involved and the assumptions implied in the selection and implementation of such models are not recognized. Further, when applied to a sample of hazardous materials, there is inadequate agreement among these rating models. (Bell-Cornell)
W76-10190

LARGE-SCALE ESTUARINE WATER QUALITY MATRIX MODEL,
Texas Univ. at Austin. Dept. of Electrical Engineering.

B. R. Penumalli, R. H. Flake, and E. G. Fruh.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE1, p 191-209, February 1976. 8 fig, 5 tab, 19 equ, 2 ref.

Descriptors: *Water quality, *Estuaries, *Mathematical models, *Environmental engineering, Algorithms, Management, Numerical analysis, Phosphorus, Optimization, Data collections, Computers, Equations, Systems analysis, *Texas, Path of pollutants.
Identifiers: *Matrices(Mathematics), Transport process, Steady-state model, Linear matrix equation, Linear algebraic constraints, *Corpus Christi Bay(Tex).

A new mathematical modeling approach for predicting the concentrations of water quality constituents in an estuary has been developed. The model foundation is a two-dimensional partial differential equation describing the transport process in the estuary. The discretized version of a steady-state model is reformulated as a large dimensional linear matrix equation whose solution is obtained by an efficient iterative procedure. An analytical criterion for calibration is considered and the agreement of the matrix model solution with field data is examined. The model is calibrated with data for total phosphorus collected in two periods in the fall of 1972 from 18 sampling stations in Corpus Christi Bay. Numerical analysis of the matrix model is presented and its performance is compared with another phosphorus model for the Corpus Christi Bay system. This approach provides a simple structure for the model that is ideally suited to water quality management analysis and cost optimization. (Bell-Cornell)
W76-10191

THE INFLUENCE OF THE SURFACE RUNOFF OF HEAVY RAINS ON THE CALCULATION OF SEWERS (UBER DEN EINFLUSS DES FLACHENABFLUSSES DER STARKREGEN AUF DIE BERECHUNG VON KANALISATIONEN),
For primary bibliographic entry see Field 5D.
W76-10197

THE EFFECT OF VARIOUS DESIGNS OF RAIN CATCHING BASINS ON THE POLLUTION OF THE RECEIVING WATER AND THE ECONOMY OF THE SEWER SYSTEM (DIE AUSWIRKUNG DER VERSCHIEDENEN BAUARTEN VON REGENUBERLAUFBECKEN AUF DIE SCHMUTZBELASTUNG DES VORFLUTERS UND DIE WIRTSCHAFTLICHKEIT DES KANALNETZES),
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft.
For primary bibliographic entry see Field 5D.
W76-10198

DISPOSAL OF SEWAGE FROM COASTAL TOWNS: THE CASE FOR SEA OUTFALLS,
Taylor (John) and Sons, London (England).
For primary bibliographic entry see Field 5E.
W76-10224

PERCOLATION TESTS FOR SEPTIC TANK SUITABILITY IN SOUTHERN ARIZONA SOILS,
Arizona Univ., Tuscon. Dept of Soils, Water, and Engineering.
For primary bibliographic entry see Field 5D.
W76-10248

THE FATE OF POLLUTANTS IN SUBSURFACE ENVIRONMENTS,
Weston (Roy F.), Inc., West Chester, Pa.
A. A. Metry.
In: Proceedings, 22nd Annual Technical Meeting of the Institute of Environmental Sciences, April, 1976, Philadelphia, Pennsylvania, p 1-5. 8 fig.

Descriptors: *Subsurface waters, *Aquifers, *Aquifer management, *Mathematical models, *Groundwater, *Waste disposal, Hydrogeology, Hydrologic data, Computer programs, Model studies, Mathematical models.
Identifiers: Land application.

Degradation of subsurface water quality is widespread. Examples of the pollution of groundwater due to improper land disposal are cited. Subsurface water can also be polluted by waste water seepage, deep well injection, and leachates from hazardous solid wastes. The threat to subsurface water in a given area is indicated by its hydrogeologic parameters, which should be important in planning storage and disposal sites. Mathematical models are developed to predict the migration and fate of leachate and pollutants in subsurface environments. A one-dimensional mathematical model was developed for attenuation of pollutants in subsaturated soils. Several mathematical models are developed for the migration of pollutants from a disposal site into aquifers; all include molecular diffusion, convective dispersion, and chemical reaction. A computer program simulating pollutant fate in aquifers was developed, incorporating the output of the subsaturated soils model and predicting concentrations of pollutants at various points in the aquifer. The models are flexible and practical, and account for the major mass transport mechanisms. They can be used in disposal site selection, evaluation of environmental impact, and recovery of groundwater contaminants. Their accuracy depends on that of the hydrogeologic parameters used in the simulation. (Snyder-FIRL)
W76-10253

MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUNICIPAL SUPPLY AND WASTE DISPOSAL,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
J. Schillinger, and D. Stuart.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 185, $6.00 in paper copy, $2.25 in microfiche. Research Report No. 74, Montana University Joint Water Resources Research Center, Bozeman, March 1976. 124 p, 71 fig, 5 tab, 47 ref. OWRT B-040-MONT(3).

Descriptors: *Water quality, *Land use, *Microbiology, *Chemistry, Water supply, Watersheds(Basins), Waste disposal, *Montana, Municipal water, Clear cutting, Grazing, Bioindicators.
Identifiers: East Gallatin River(Mont), Non-point pollution.

Chemical and bacteriological studies were performed to determine relative impacts of several land uses on water quality. Outdoor recreation, camping, and a winter ski development demonstrated no measurable adverse affect on quality. Clearcut logging with the use of streamside buffer zones resulted in little change in stream quality in the South Fork of Bozeman Creek. Wild animals appeared to cause bacterial contamination in the Bozeman Creek municipal watershed. Cattle grazing also resulted in some bacteriological stream quality degradation in several tributaries of the Hyalite drainage. Further research is required to assess adequately the public health significance of the bacterial levels observed. Agricultural runoff caused increased levels of chemical nutrient and indicator bacteria in the lower reaches of Bridger Creek, Hyalite Creek, and in the East Gallatin River. It appears that better streamside land-use practices could alleviate these adverse water quality impacts. (Holje-Montana State)
W76-10263

BORON AND ARSENIC STUDIES IN FLORIDA WATERS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
N. E. Carriker, W. T. Gillespie, and P. L. Brezonik.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 182, $5.50 in paper copy, $2.25 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No. 34, May 1976. 100 p, 35 fig, 22 tab, 89 ref. OWRT A-024-FLA(1). 14-31-0001-5009.

Descriptors: *Arsenic, *Boron, *Toxicants, *Pollution sources, Water pollution, *Florida, Nutrients, Detergents, Toxicity, Phytotoxicity, Lakes, Sediments.
Identifiers: Lake Apopka(Fla).

Levels of arsenic and boron in Florida natural waters have been measured and found generally to be low and not of toxic concern. Boron levels in municipal sewage effluent are high enough to cause phytotoxicity, at least to sensitive plant such as citrus. The source of the elevated boron levels in sewage evidently is detergent use of borates as softeners and perborates as bleaching agents. Analysis of boron in rainfall found increasing concentrations near the coasts, indicating marine-derived aerosols are an important source of boron in the natural cycle of boron in Florida. Boron is a relatively conservative substance and model ecosystem studies indicate little toxic hazard and little bioaccumulation at the boron levels expected in natural waters. Arsenic levels in Florida surface and ground waters were found to be normally quite low (a few ppb) to undetectable (less than 1 ppb). Canals in South Florida around Lake Okeechobee had higher levels than other parts of the state, with detectable levels in almost all samples and a mean of 5 ppb. The arsenic cycle in aquatic systems appears to be sediment dominated. In citrus grove soils arsenic was associated mainly with the iron fraction, but in anaerobic Lake Apopka sediments, arsenic was present primarily in a leachable 'water soluble' form and was present as As III. Catfish from Lake Apopka do not appear to concentrate arsenic, but waterhyacinths from Lake Apopka had about 1 ppm (dry wt). (Morgan-Florida)
W76-10265

MINERAL CYCLING IN SOUTHEASTERN ECOSYSTEMS.
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5C.
W76-10266

A PRELIMINARY COMPARTMENT MODEL OF THE NITROGEN CYCLE IN A DECIDUOUS FOREST ECOSYSTEM,
Idaho Univ., Moscow. College of Forestry, Wildlife and Range Sciences.
J. E. Mitchell, J. B. Waide, and R. L. Todd.
In: Proceedings of a symposium 'Mineral Cycling in SOutheastern Ecosystems,' 1975, p 41-57. 2 fig, 5 tab, 40 ref, (CONF-740513).

Descriptors: *Ecosystems, *Cycling nutrients, *Nitrogen cycle, *Deciduous forests, Model studies, Forest soils, Organic matter, Vegetation, Litter, Bacteria, Fungi, Root zones, Temperate, North Carolina.
Identifiers: Nitrogen conservation, Franklin(NC), Coweeta Watershed(NC).

A 15-compartment model of nitrogen storage and transfer in a mature hardwood forest at the Coweeta Hydrologic Laboratory, near Franklin, North Carolina, is described and discussed. Most of the nitrogen in this ecosystem is located in large storage compartments that turn over slowly. Over 80% of the total nitrogen is in soil organic matter, with about 11% in vegetation, 3% in litter, 4% in microbes, and 2% in free soil pools. Uptake of

nitrogen is estimated to be 141.6 kg/ha/yr, of which about 10% is retained within the vegetation. A quantitatively large pool of nitrogen is shown to recycle annually within plants, a strategy which contributes to nitrogen conservation. Calculations suggest that litter inputs to soil organic pools are dominated by belowground material, especially small roots and mycorrhizae. In the soil available nitrogen seems to be rapidly immobilized by soil biota or taken up by the root-mycorrhizae complex, with very little nitrogen being lost from the system in stream water or denitrification. The study illustrates a dynamic cycle in which nitrogen is efficiently retained and recycled within the ecosystem. The gap in information on the root zone processes is stressed. (See also W76-10266) (Auen-Wisconsin)
W76-10269

SIMULATION OF NITROGEN DISTRIBUTION AND ITS EFFECT ON PRODUCTIVITY IN EVEN-AGED LOBLOLLY PINE PLANTATIONS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Theoretical Production Ecology.
Penning F. W. T. De Vries, C. E. Murphy, C. G. Wells, and J. R. Jorgensen.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, p 70-83. 6 fig, 1 tab, 15 ref, (CONF-740513). NSF AG-199, BMS 69-01147-A09.

Descriptors: *Nitrogen cycle, *Loblolly pine trees, *Model studies, Coniferous trees, Forest management, Nutrient requirements, Productivity, North Carolina, Computer programs, Southeast US, Nitrogen, Distribution.
Identifiers: Pine plantations.

A model describes growth in even-aged loblolly pine plantations from seedling to mature trees on sites where nitrogen availability is limiting, where the number of trees and shrubs in the understory is kept low, and managed with a 25- or 40-year rotation. The rate of decomposition and nitrogen release of the forest floor is simulated by treating 20-year classes of litter by the amount of biomass and nitrogen. Decomposition rates are calculated from the ratio of total carbon and nitrogen per layer, rather than treating needles and branches separately, and exclude the effects of temperature and humidity on decomposition. Trees were subdivided into roots, stem wood, stem bark, branches, and first- and second-year needles, with total dry weight and nitrogen content simulated for each of these fractions. The limiting effect of nitrogen is on assimilation on an annual basis rather than on growth. The model describes the physiological, microbiological, and mechanical processes relevant to nitrogen distribution and forest growth by a computer program in Continuous Simulations Modeling Program language. The program integrates the rates of change over one year and reports resulting amounts of nitrogen and biomass in the various parts of the system. Sudden modifications of distribution caused by cultural practices are taken into account. (See also W76-10266) (Auen-Wisconsin)
W76-10271

FREQUENCY DISTRIBUTIONS OF RADIOCESIUM CONCENTRATIONS IN SOIL AND BIOTA,
Savannah River Ecology Lab., Aiken, S.C.
J. E. Pinder, and M. H. Smith.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, p 107-126. 2 fig, 1 tab, 44 ref, 2 append, (CONF-740513). AEC AT (38-1)-310, AT(38-1)-708, AT(38-1)-819.

Descriptors: *Distribution patterns, *Radioisotopes, *Frequency analysis, *Mathematical models, Cesium, *Soils, *Biota, Rating curves.

Mathematical modeling to analyze and compare frequency distributions of radionuclide concentrations (primarily C-137) in various components of ecosystems at the Atomic Energy Commission's Savannah River Plant near Aiken, S.C. is discussed. The approach used was to evaluate four simple distributions--normal, log normal, exponential, and Weibull--as possible models of observed frequency distribution of radiocesium concentrations. The normal and exponential distributions showed closest agreement to relatively few sample distributions. When the Weibull model showed the closest agreement to a sample, it was usually only slightly better than one of the other models. The normal models showed the closest agreement to 7 samples, the log normal to 22 samples, and the exponential to 4 samples. The data indicate that a simple general model applicable to all the frequency distributions of radiocesium concentrations may not exist. The frequent rejection of the hypothesis--cumulative distribution function $F(x)=S(x)$ (sample cumulative distribution)--for all models, the occurrence of at least some large values of distribution for each model, and the reduction in skewness and kurtosis from producers to consumers indicate that the distributions are too complex and varied to be accurately modeled by any one of the four distributions considered. (See also W76-10266) (Auen-Wisconsin)
W76-10273

FACTOR ANALYSIS: AN EXPLORATORY TECHNIQUE APPLIED TO MINERAL CYCLING,
Georgia Univ., Athens. Inst. of Ecology.
J. B. Nabholz, and T. H. Richardson.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, p 126-141. 1 fig, 4 tab, 43 ref, 2 append, (CONF-740513).

Descriptors: *Statistical methods, *Correlation analysis, *Ecosystems, APproximation method, Probability, Computer programs.
Identifiers: *Factor analysis.

Factor analysis is a multivariate statistical method that constructs artificial (unobservable) variables to explain the dependence structure found in a correlation matrix. These artificial variables are called common factors. A vector of correlations is generated between the observable attributes and such common factors. These attributes, highly correlated with a common factor, form a group the members of which share some common property over and beyond that which they share with other observed attributes. The exploratory approach is used to gain a better understanding of complex and poorly defined interrelationships among a large set of imprecisely measured attributes. Factor analysis consists of two separate procedures--factor extraction followed by factor rotation. The analysis is always started from a correlation matrix computed from a sample variance-covariance matrix or a multiple thereof, e.g., the matrix of sums of squares and products for error. Factor analysis, its definition, and historical roots are discussed. This statistical technique is contrasted with pseudo factor analysis, i.e., principal-components analysis. Factor extraction and factor rotation, as they apply in factor analysis, are clarified and interpreted. Advantages and disadvantages of the statistical method are enumerated. Applications of factor analysis in mineral-cycling studies and their usefulness in ecology are presented. (See also W76-10266) (Auen-Wisconsin)
W76-10274

A SPECIFIC-ACTIVITY AND CONCENTRATION MODEL APPLIED TO CESIUM MOVEMENT IN AN OLIGOTROPHIC LAKE,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-10275

THE ROLE OF PHYSICAL MODELING IN MARSH-ESTUARINE MINERAL-CYCLING RESEARCH,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
R. L. Eley, J. W. Falco, and C. J. Kirby.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems' 1975, (CONF-740513), p. 166-178, 2 fig, 1 tab, 30 ref.

Descriptors: *Model studies, *Cycling nutrients, *Tidal marshes, *Estuaries, Ecosystems, Environmental effects, Hydrologic aspects, Design criteria, Louisiana, Hydraulic models, Heavy metals.
Identifiers: Physical models, Mineral cycling, Barataria Bay(La).

Physical modeling of marsh-estuarine ecosystems as a supplement to traditional field, laboratory, and mathematical modeling research is discussed, together with their functions in designing and interpreting field studies and in developing and verifying mathematical models. Physical hydraulic models constructed for engineering purpose--navigation and coastal construction projects--can provide significant assistance in mineral-cycling research. The design of a simulator of Barataria Bay, Louisiana, suitable for studying mineral cycling between a shallow estuary and the surrounding tidal marsh ecosystem, is described. The simulator was formulated for use in treatment-control experiments to study differences between nutrient and heavy-metal cycling in natural marsh-estuarine ecosystems and those in ecosystems artificially created with dredged material. The model included representative fauna and flora of the Barataria Bay, consisting of no less than 8 genera of algae and 30 genera of animals representing major phyla from Protozoa to Chordata; these included snails, crabs, shrimp, small fin fishes, and marshgrass insects. The marsh was dominated by Spartina alterniflora with some Distichlis specata. (See also W76-10266) (Auen-Wisconsin)
W76-10276

DISTRIBUTION OF COPPER AND ZINC IN OYSTERS AND SEDIMENTS FROM THREE COASTAL-PLAIN ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W76-10279

THE ROLE OF SPARTINA ALTERNIFLORA IN THE FLOW OF LEAD, CADMIUM, AND COPPER THROUGH THE SALT-MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W76-10281

CONCENTRATIONS OF TOTAL MERCURY AND METHYL MERCURY IN FISH AND OTHER COASTAL ORGANISMS: IMPLICATIONS TO MERCURY CYCLING,
Skidaway Inst. of Oceanography, Savannah, Ga.
W. S. Gardner, H. L. Windom, J. A. Stephens, F. E. Taylor, and R. R. Stickney.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975 (CONF-740513), p. 268-278. 1 fig., 1 tab., 17 ref. NSF GX-33615.

Descriptors: *Mercury, *Fish, *Rooted aquatic plants, *Crustaceans, *Estuaries, South Carolina, Georgia, Florida, Food chains.
Identifiers: *Methyl mercury, Spartina alterniflora, Osteichthyes, Chondrichthyes.

Total and methyl mercury concentrations were determined in a variety of fish, crustaceans, and Spartina alterniflora in estuaries along the coasts of South Carolina, Georgia, and Florida. Higher levels of mercury were found in fish tissues. Because of its relative stability in biological

systems and its unique biochemical characteristics, methyl mercury apparently is metabolized differently than is inorganic mercury, which may explain the greater mercury accumulation in fish. This difference would be expected if the fish were exposed to methyl mercury as it is accumulated in the muscles. Molluscan studies have shown that mercury administered in different forms is excreted at different rates, but methyl mercury was retained much longer than either inorganic mercury and phenyl mercury. The concentration of total mercury relative to methyl mercury in livers and spleens may be indicative of the quantity of inorganic mercury or nonmethyl organic forms to which the fish have been exposed over short periods of time, whereas mercury in muscle tissue represents accumulation of methyl mercury over longer periods. Methyl mercury potentially can be transported upward through Spartina plants thus if the mercury is released to the water column, it could be taken up by fish, which could explain the higher mercury levels in finfish than in the intermediate food-chain members. (See also W76-10266) (Auen-Wisconsin).
W76-10283

MINERAL PATHWAYS IN SMALL APPALACHIAN STREAMS,
Georgia Power Co., Atlanta. Environmental Div.
W. R. Woodall, and J. B. Wallace.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 408-422. 1 fig., 5 tab., 39 ref. NSF AG-199, 40-193-69; FWQA 18050DPQ.

Descriptors: *Cycling nutrients, *Streams, *Energy budget, *Benthic fauna, Appalachian Mountain Regions, Detritus, Standing crops, Leaves, Litter, Crayfish, Salamanders, Potassium, Calcium, Magnesium, Food webs, Leaching, Animal metabolism, North Carolina, *Path of pollutants.
Identifiers: Coweeta Hydrologic Laboratory(NC).

The effects of the metabolism of benthic fauna on the flux of potassium, calcium and magnesium were studied in streams of the Coweeta Hydrologic Laboratory draining southern North Carolina watersheds covered with different vegetation types. Most detritivore and predator standing-crop biomass consisted of crayfish and salamanders, respectively, and accounted for most flux in those food web compartments; they may be important in small stream nutrient flows because they form a sink in the remineralization process. Potassium increases and calcium and magnesium decreases were associated with increased trophic levels. Because food materials were richer in calcium and magnesium than potassium, detritivores concentrated proportionately more potassium. Potassium was principally released from detritus by leaching and calcium and magnesium were released by detritivores feeding on leaves. Cation standing crops in detritus from hardwood and coppice streams were larger than in pine and old-field detritus. Detritus contained more calcium than potassium and magnesium. Coweeta streams are small, so detritus may be more important than in larger streams. Nutrient removal from watersheds by streams is enhanced by invertebrate breakdown of leaf material. The agreement between ingestion and available food explains why there is no long-term detritus accumulation in streams. Because some organisms eat detritus egested by others, available detrital food can be increased 2.5 times. (see also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10291

ORGANICALLY COMPLEXED COPPER, ZINC, AND CHELATING AGENTS IN RIVERS OF WESTERN PUERTO RICO,
Puerto Rico Nuclear Center, Mayaguez.
J. R. Montgomery, and J. E. Echevarria.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 423-434. 1 fig., 3 tab., 29 ref. AEC AT(40-1)-1833.

Descriptors: *Copper, *Zinc, *Chelation, *Rivers, *Puerto Rico, Trace elements, Metals, Organic matter, Water pollution effects, Organic loading, Calcium, Tropical regions, Suspended solids.
Identifiers: *Organic chelators, Guanajibo River(PR), Anasco River(PR), Culebrinas River(PR).

During a study of a trace-metal transport from terrestrial to marine environments at the Puerto Rico Nuclear Center, a method for determination of soluble chelators was used which gave their concentration in copper-equivalent chelating capacity units in fresh or slightly brackish water. Soluble chelators were determined in three Puerto Rican rivers. High values were found in a shallow clear river and below San German which discharges municipal sewage into the Guanajibo River in February when there was also an increased organic load from a sugar mill, decreased rainfall, and increased mean organic matter concentration due to low runoff. There were enough chelating agents in the river water to complex all soluble copper and zinc ions present, but only about 44% of the copper and 75% of the zinc ions were organically complexed. The high calcium ion to copper ion ratio probably prevented formation of more organically complexed copper. Chelator concentrations in tropical rivers seemed higher than in Canadian lakes. Soluble chelator concentrations were directly related to organic material input from municipalities and a sugar mill and inversely related to river particulate matter increases during the rainy season. No significant correlation was found between particulate organic carbon, dissolved reactive phosphate, and chelator concentrations. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10292

REDISTRIBUTION OF CESIUM-137 IN SOUTHEASTERN WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. R. McHenry, and J. C. Ritchie.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 452-461. 1 fig., 3 tab., 13 ref. AEC AT(49-7)-3029.

Descriptors: *Distribution, *Cesium, *Radioisotopes, *Watersheds(Basins), *Southeast U. S., Radioactive fallout, Sediments, Soil erosion, Erosion rates, Reservoirs, Cultivated lands, Crops, Georgia, Kentucky, Maryland, Mississippi, North Carolina, West Virginia.

Movement of radioactive materials in watershed ecosystems must be understood so that decisions on locating nuclear reactors and the release of radioactive materials from reactors can be made to ensure safety and sustain the ecosystems. Cesium-137 fallout from nuclear bomb tests in the 1950s and 1960s was studied in soil surface samples of 14 southeastern watersheds and agricultural reservoir sediments. Cesium-137 levels reflected the nature of the watershed, its cover, and land use. Since cesium-137 distribution results from soil erosion, recent erosion rates were calculated from cesium-137 accumulations in sediments and from decreases in cesium-137 calculated to have been deposited on upland soils. In the watersheds studied, most cesium-137 fallout remained in the watershed. Some moved from the watershed as shown by an areal cesium-137 buildup in sediments of reservoirs controlling watershed outflows. Cesium-137 loss was greater from cultivated than uncultivated watersheds. A considerable amount of the cesium-137 deposited on cultivated areas is removed with crops. If an agricultural watershed was greatly contaminated, little radioactive loss would be expected if crops were not removed. If fine particles entering reservoirs with runoff were flocculated, radioactivity losses through the reservoirs would be reduced. The Cs-137 loss is very small (5%) from uncultivated watersheds. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10295

RADIOCESIUM CYCLING IN VEGETATION AND SOIL,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
R. C. Dahlman, C. W. Francis, and T. Tamura.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 462-481. 2 fig., 7 tab., 57 ref.

Descriptors: *Cesium, *Radioisotopes, *Vegetation, *Soils, Coastal plains, Dynamics, Nuclear reactors, Watersheds(Basins), Radioactive fallout, Clay minerals, Food chains, Root systems, Absorption, Southeast U.S., Milk, Florida, Georgia, Forage grasses.
Identifiers: Tampa(Fla).

Factors that influence the cycling of cesium in terrestrial ecosystems, especially mechanisms influencing the dynamics and fate of Cs-137 in pathways leading to man, are reviewed. Clay minerals in soil, especially micaceous types, fix cesium effectively and remove it from biotic components of ecosystems. Fallout Cs-137 enters food chains primarily by direct deposition on vegetation; uptake by roots is usually less. Soil serves as an effective sink for Cs-137, thus minimizing uptake by roots. Movement from soil to plants is dependent on the temperature, moisture, fertility, hydrogen ion concentration, and the physical, mineral, chemical, and biological conditions of the soil. The estimated Cs-137 concentrations, based on current concepts of its dynamics in vegetation and fixation in soil, agree with values found in vegetation collected in 1969-1970. Mechanisms of direct deposition and increased root uptake due to absence of micaceous clays explain the higher levels found in vegetation in the southeastern U.S. Coastal Plain and were therefore responsible for the high Cs-137 levels found in milk from the Tampa, Florida, watershed. Mycorhizal, symbiotic enhancement of uptake may also affect levels of Cs-137 in vegetation and milk. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10296

ACCUMULATION AND MOBILITY OF CESIUM IN ROOTS OF TULIP POPLAR SEEDLINGS,
Tennessee Valley Authority, Norris. Div. of Forestry, Fisheries, and Wildlife Development.
T. L. Cox.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 482-488. 2 tab., 8 ref.

Descriptors: *Cesium, *Root systems, *Radioisotopes, *Trees, Seasonal, Forest soils, Sorption, Root zone, Distribution, Path of pollutants.
Identifiers: *Tulip poplar.

Seasonal distributions in different root-diameter classes and cesium pathways to forest soils were studied in the tulip poplar, Liriodendron tulipifera, seedlings stem-well tagged with Cs-134, harvested periodically, and separated into shoot and root compartments. Roots less than 0.1 cm in diameter contained 1.5 and 3.0 times the cesium in roots 0.1-0.5 cm and 0.5-1.0 cm in diameter, respectively. Roots contained 24% of the seedling cesium pool in one week, 40% in seven weeks, and 65% eight months after tagging. Roots less than 0.5 cm in diameter contained approximately 36% the seedling pool (root and shoot) and 72% of the cesium pool after a year. Small roots accounted for a considerable portion of annual turnover in the root systems. Growth dilution, leaching, exudation, sloughing, translocation from soil and shoot parts, etc., accounted for seasonal concentration changes. Analysis of soil treatment effects showed that root processes contributed twice as much cesium to the soil as combined aboveground processes. Determination of seasonal distributions of root biomass by diameter class is important in determining the role of roots in accumulation and transfer of cesium and analagous elements, since most annual turnover by mortality occurs in roots

ess than 0.5 cm in diameter. (See also W76-10266) Buchanan-Davidsoni-Wisconsin)
V76-10297

DISTRIBUTION OF RADIOCESIUM IN VEGETATION ALONG A CONTAMINATED STREAM,
Savannah River Ecology Lab., Aiken, S.C.
L. A. Briese, C. T. Garten, and R. R. Sharitz.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 509-517. 2 fig., 1 tab., 15 ref. AT(38-1)-708, AT(38-1)-819.

Descriptors: *Cesium, *Radioisotopes, Vegetation, Streams, South Carolina, Nuclear wastes, Leaves, Streamflow, Distribution, Southeast U.S., Soil contamination, Water pollution, Willow trees, Statistical methods, Path of pollutants.
Identifiers: *Steel Creek(SC), Arrowhead, Smartweed, Woolgrass.

Radiocesium concentrations were measured in leaves of plants along Steel Creek which was contaminated by radioactive effluent from nuclear production reactors at the Savannah River Plant, South Carolina. Leaves of Sagittaria latifolia, Salix nigra, Polygonum punctatum, and Scirpus cyperinus averaged 488.2, 303.2, 191.7, and 86.4 picocuries per gram dry weight, respectively. Radiocesium distribution in vegetation was species specific and independent of distance from the effluent entry point. Leaf radiocesium concentrations were generally higher where the streamflow rate decreased due to impoundments, fallen trees, or increased stream width. Radiocesium levels in these plants were log normaly distributed at all sites. A significcant linear relationship existed between the variance and the mean picocuries per gram; however each species had a different slope and intercept. The radiocesium concentrations in one species could not be used to predict concentrations in another. Physical and biological factors should be considered when evaluating the possible influences of radioactive releases on aquatic systems to determine if a system will accumulate radionuclides. Surveys of aquatic systems should determine where contaminants might accumulate. Accessibility of possible contaminants to the biota and public should be considered. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10300

SEASONAL AND ANNUAL VARIATIONS IN THE QUANTITIES OF NITROGEN, POTASSIUM, PHOSPHORUS, MAGNESIUM, CALCIUM, AND MANGANESE REACHING THE FOREST FLOOR AS MAST IN PENNSYLVANIA AND VERMONT FORESTS,
Massachusetts Univ., Amherst. Dept. of Zoology.
D. L. Graybill, D. P. Snyder, C. A. Tryon, and R. T. Hartman.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 564-579. 3 tab., 47 ref. AEC C00-3426-3, C00-3329-3.

Descriptors: *Forests, *Seasonal, *Nutrients, *Annual, *Trace elements, Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, Manganese, Foods, Pennsylvania, Vermont, Cycling nutrients, Seeds, Litter.
Identifiers: Mast crops, Fruits, Eastern chipmunks.

Variations in selected nutrients reaching the forest floor as mast were studied monthly in forests near Linesville, Pennsylvania; Tionesta Natural Area, Kane, Pennsylvania; and the Green National Forest, Manchester, Vermont. Approximate nitrogen, potassium, phosphorus, magnesium, calcium, and manganese concentrations were determined in selected parts of species collected. Nitrogen was the most abundant element in edible mast; manganese the least abundant; while the other elements varied. Geographic variations of nutrients in edible mast exceeded two orders of magnitude. Annual variations in macronutrient production exceeded one order of magnitude in Vermont but were approximately half an order of magnitude in Pennsylvania. Seasonal variations were related to species composition and mast crop size at each site. Annual differences in seedfall times varid. Fruits of beech, sugar maple, birch, and fall seed producers reaching the ground before September contained little edible material. Spatial distribution of mast was uneven and varied yearly, especially in Pennsylvania. Relationships between edible mast and litter were not analyzed. Fate of nutrients in mast is known; eastern chipmunks are probably the granivores consuming the mast as edible mast disappears rapidly after reaching the forest floor. Chipmunks are the major method of moving nutrients from forest fruits and seeds in these areas. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10306

FALLOUT CESIUM-137 AND MINERAL-ELEMENT DISTRIBUTION IN FOOD CHAINS OF GRANITIC-OUTCROP ECOSYSTEMS,
Georgia Univ., Athens. Inst. of Ecology.
D. A. Crossley, K. M. Duke, and J. B. Waide.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 580-587. 2 tab., 14 ref. AEC AT(38-1)-641.

Descriptors: *Cesium, *Nutrients, *Fallout, *Food chains, *Radioisotopes, Georgia, Poteassium, Lichens, Mosses, Plant tissues, Invertebrates, Sodium, Calcium, Carnivores, Mountains, Slopes, Herbivores, Vegetation, Insects, Southeast U. S.
Identifiers: Arthropods, Panola(Ga), Arabia Mountains(Ga), Granitic outcrops.

To understand nutrient conservation mechanisms in ecosystems and provide information on environmental behavior of radioactive materials, fallout cesium-137 movement through arthropod food chains in the Panola and Arabia mountains, granite monadnocks in the Georgia Piedmont region, was studied. Potassium was low in lichen, intermediate in mosses, and highest in vascular plants; similar but lower results were observed for sodium. Calcium was low in lichens and similar in mosses and vascular plants. Cs-137 decreased from lichens to mosses to vascular plants. Parmelia lichens contained the most Cs-137 and Cladonia lichens and mosses concentrated more Cs-137 than most vascular plants. Arthropod food chains on mountain slopes contained 3-5 times more Cs-137 than adjacent areas or mountaintops. Largest Cs-137 levels were found in herbivores from mountain slope areas with reduced concentrations in predators. Food bases were identified by observation and from cesium/potassium ratios in vegetation and arthropods. Lichens were major accumulators of Cs-137 but were not important food sources for arthropods. Cs-137 levels decreased in food chains. Sampling sites did not affect arthropod mineral concentrations. Trophic level effects were observed for sodium but not potassium or calcium; predators contained more sodium than herbivores. Winged forms usually had lower concentrations than wingless forms of all elements at both trophic levels. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10307

RESOURCE PARTITIONING IN LEAF-LITTER FAUNAS FROM HARDWOOD AND HARDWOOD-CONVERTED-TO-PINE FORESTS,
Battelle-Columbus Labs., Ohio. Ecology and Ecosystems Analysis Section.
B. W. Cornaby, C. S. Gist, and D. A. Crossley.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 588-597. 2 fig., 1 tab., 15 ref. NSF AG-199, 40-193-69, AEC AT(38-1)-641.

Descriptors: *Forests, *Litter, *Leaves, *Biological communities, *Cycling nutrients, Hardwood, White pine trees, North Carolina, Model studies, Detritus, Calcium, Potassium, Deciduous forests, Food webs.
Identifiers: Coweeta Hydrologic Station(NC), Forest litter fauna.

Litter fauna structure and function were measured in hardwood and adjacent white pine watersheds in the Coweeta Hydrologic Station, North Carolina. Models of the role of litter fauna in the watersheds are compared. Biomass of about 18 combined taxa of litter animals were approximately one-third lower, numerical by one-half lower, and calcium and potassium standing crops lower in the pine compared to the hardwood system. Average biomass was 1.30 and 3.81 g/sq m in pine and hardwood watersheds, respectively. In the hardwood watershed 11% of calcium and 3% of potassium from annual leaf-litter inputs were processed by litter animals. Approximately 2% of calcium and 28% of potassium from annual litter inputs entered food webs of pine litter fauna. Pine litter fauna used about 1/10th as much calcium. There was about three times more potassium in pine than hardwood watersheds. The hardwood detrivore calcium standing crop and fauna calcium intake were about ten times larger. Calcium fauna utilization was related to fauna standing crops and perhaps annual litter input, but not litter standing crop. Relationships between potassium standing crops and inputs were not clear. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10308

FOREST-FLOOR NUTRIENT DYNAMICS IN SOUTHERN APPALACHIAN HARDWOOD AND WHITE PINE PLANTATION ECOSYSTEMS,
Environmental Protection Agency, Washington, D. C. Office of Environmental Sciences.
J. D. Yount.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 598-608. 2 fig., 3 tab., 14 ref. NSF AG199, 40-193-69.

Descriptors: *Cycling nutrients, *Forests, Hardwood, White pine trees, Litter, North Carolina, Coniferous forests, Deciduous forests, Appalachian Mountain Region, Forest soils, Biomass, Detritus, Carbon, Soil profiles, Decomposing organic matter, Magnesium, Potassium, Calcium, Sodium, Nitrogen, Phosphorus, Microbial degradation, Leaching.
Identifiers: Coweeta Hydrologic Laboratory(NC).

Nutrient contents and detrital biomass in hardwood and white pine forest floors at Coweeta Hydrologic Laboratory, North Carolina, were studied for a year. Total carbon storage was higher in the pine forest floor where the biomass probably approached a steady state. Three pine and two hardwood litter layers were distinguishable; transition from forest floor-soil was sharp in pine and broad in hardwood forests. Comparisons of litter component concentrations through litter profiles indicated dynamics of litter decomposition and elemental mobilities. Ash-free organic matter, magnesium, and potassium decreased; calcium, sodium, nitrogen, and phosphorus increased. Potassium and nitrogen mobilities were high in both forest floors. Magnesium loss was more closely related to structural breakdown in hardwood than pine litter. In both litter types calcium and phosphorus losses were related to loss rate of the whole forest floor. Forest-nutrient pools result from competing porcesses: litterfall, precipitation, leaching, and microbial decomposition, immobilization, or uptake. For nitrogen, fixation, nitrification, and denitrification processes should be added. These processes cause selective calcium and magnesium concentration in hardwood, nitrogen and phosphorus in pine, and potassium and sodium in both forest floors. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10309

LITTER PRODUCTION, DECOMPOSITION, AND NUTRIENT CYCLING IN A MIXED HARDWOOD WATERSHED AND A WHITE PINE WATERSHED.
Georgia Univ., Athens. Dept. of Botany.

K. Cromack, and C. D. Monk.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 609-624. 4 tab., 45 ref NSF AG-199, 40-193-69, NSF GB-20963.

Descriptors: *Litter, *Biodegradion, *Cycling nutrients, Coniferous forests, Deciduous forests, Hardwood, White pine trees, North Carolina, Biomass, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Energy transfer, Leaves, Lignins, Cellulose, Fibers(Plant), Regression analysis.
Identifiers: Coweeta Hydrologic Laboratory(NC).

Nutrient cycling from litter production and litter decomposition in a mixed-hardwood ecosystem were compared with the same processes in an adjacent white pine plantation in the Coweeta Hydrologic Laboratory, North Carolina. Litterfall data (biomass of litter; nitrogen, phosphorus, potassium, calcium, magnesium; and structural organic constituents of leaf litter--lignin, cellulose, and total fiber) were obtained for leaves, stems, flowers, acorns, and miscellaneous debris in the hardwood watershed and for needles, stems, and cones in the pine watershed. Total annual litter production in the hardwood watershed was 4369 kg/ha in 1970-1971, of which 64% was leaf litter. Production of shrubs and herbaceous litter was about 370 kg/ha/year. Pine litter production was 3253 kg/ha/year, of which 98% was needle litter Litter decomposition data were obtained by studying weight loss rates and nutrient loss rates. The first-year litter breakdown rate of confined mixed-hardwood leaf litter was k = -0.70 per year and of confined white pine needle litter was k = 0.46 per year. Litter decomposition rates of chestnut oak, white oak, white pine, red maple, and dogwood could be correlated with senescent leaf carbon-nitrogen ratio and the sclerophyll index, which gave a better statistical estimate of the decomposition rate. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10310

CERIUM AND COBALT MOVEMENT WITH LITTER LEACHATE IN A FOREST SOIL,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
W. A. Thomas.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 625-629. 1 tab, 12 ref.

Descriptors: *Cobalt, *Radioisotopes, *Kinetics, *Translocation, *Forest soils, Root zone, Leachate, Leaves, Deciduous forests, Tennessee, Hickory trees, Penetration, Regression analysis, *Path of pollutants.
Identifiers: *Cerium, Mockernut hickory, Black gum, Chestnut Ridge(Tenn).

To interpret studies of cerium and cobalt circulation in deciduous forests, the rates these elements move downward in soil after release from decomposing leaves were determined. Leachate containing cerium-144 and cobalt-60 from leaf litter of mockernut hickory (Carya tomentosa) and black gum (Nyssa sylvatica) trees was applied to a forest soil, and the rates at which these elements moved downward after release in the litter layer determined. Leachate was applied in a single application, in a single application at twice the concentration, and in four periodic applications over a yearly period. Relative penetration, determined by regression analysis, describing cerium-144 and cobalt-60 distribution four years after the first application did not differ between the different applications, but cerium-144 movement exceeded that of cobalt-60 in all applications. A combination of chemical and physical phenomena retained both elements in the biologically active zones of the soil. The organic layer and the upper three centimeters of the mineral soil contained 68% of the cerium and 91% of the cobalt. The organic layer and upper nine centimeters of mineral soil retained all detectable cerium and cobalt, indicating that these elements will be retained in the biologically active zone in the soil-vegetation-litter nutrient cycle. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10311

LEACHING OF NUTRIENTS FROM LEAVES OF SELECTED TREE SPECIES IN NEW HAMPSHIRE,
New Mexico Univ., Albuquerque. Dept. of Biology.
J. R. Gosz, G. E. Likens, J. S. Eaton, and F. H. Bormann.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 630-641. 3 tab, 20 ref. NSF GB1144, GB4169, GB6757, GB6742.

Descriptors: *Cycling nutrients, *Leaching, *Leaves, *Trees, New Hampshire, Forests, Hardwood, Laboratory tests, Calcium, Magnesium, Potassium, Sodium, Nitrogen, Maple trees, Birch trees, New Hampshire, Light intensity
Identifiers: Beech trees, Hubbard Brook Forest(NH)

Although leaching is a very important process in natural, forested watershed ecosystems, its role is not well understood, and because of the complexity of plant communities and environmental interactions, field data are hard to interpret. Therefore laboratory studies were made of the amount and rate of leaching of calcium, magnesium, potassium, and sodium ions and total nitrogen from foliage of different species, leaf types, and maturities. Leaves of sugar maple, yellow birch, and beech were placed in containers of water under controlled conditions. The greatest leaching was observed with sugar maples, followed by yellow birch, then beech. In early summer, sun leaves leached faster than shade leaves, but with increased maturity. This difference was less pronounced and became insignificant after abscission. The rate and amount of leaching for all species and all elements except sodium increased with leaf maturity to a maximum after abscission. The rate of nutrient removal in all three species was potassium, magnesium, calcium, nitrogen and sodium in decreasing order. Loss of sodium from leaves was negligible. The results compared favorably with field studies, so this is a simple, reliable way to evaluate the relative mobility of nutrients in leaf tissue subject to throughfall or decomposition processes. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10312

PHOSPHORUS CYCLING IN A MARYLAND DECIDUOUS FOREST SUBJECTED TO VARIOUS LEVELS OF MINERAL-NUTRIENT LOADING,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
D. L. Correll, and J. J. Miklas.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 642-657. 2 fig, 4 tab, 19 ref.

Descriptors: *Phosphorus, *Cycling nutrients, *Deciduous forests, *Kinetics, Movement, Leaves, Litter, Forest soils, Mode of action, Maryland, Tracers, Radioisotopes, Chemical reactions.

The phosphorus cycle was studied in a deciduous temperate forest using carrier-free phosphorus-32 to measure overall phosphorus flux rates and pathways. Phosphorus loading of the leaf-litter zone was varied from natural phosphorus levels of 3 to 12 mg to 430 mg/sq m/day. Kinetics of phosphorus flux in leaf litter, at various soil depths, in horizontal transects, and in tree leaves were estimated from rates of change of specific and total activities. Little phosphorus moved very far into the soil before biological assimilation. Within 11 days, chemical fractions in leaf litter were almost uniformly labeled and leaf-litter total phosphorus specific activity was 200 times higher than soil total phosphorus 3 to 5 cm deep; flux rates through leaf litter under natural loading were only about 1% of total leaf litter phosphorus/day. Biological pathways and mechanisms were defined using phosphorus fractions. When loading was increased, the litter phosphorus content increased fourfold, then stabilized. When loading was discontinued, litter phosphorus decreased to original levels in four months. Phosphorus which was not assimilated by leaf litter moved vertically into soil and horizontally within soil inside microbial cells. Forest trees obtained most of their phosphorus from the litter zone. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10313

MOBILIZATION OF NUTRIENTS IN SOIL BY ACIDS OF SULFUR AND CHELATING AGENTS,
California Univ., Los Angeles, Lab., of Nuclear Medicine and Radiation Biology.
A. Wallace, E. M. Romney, and J. Procopiou.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 687-693. 2 tab., 13 ref. AEC AT (04-1) GEN 12, AT(04-3)-34.

Descriptors: *Cycling nutrients, *Acid base equilibrium, *Salts, *Vegetation, *Sulfur, *Chelation, Air pollution, Hydrogen ion concentration, Southeast U. S., Solubility, Absorption, Heavy metals, Lime, Soybeans, Manganese, Iron, Zinc, Copper, Cobalt, Nickel, Phosphorus, Silver, Magnesium, Lithium, Aluminum, Barium, Potassium, Calcium, Barley, Molybdenum.

Atmospheric precipation of sulfur on southeastern ecosystems was studied by measuring effects of soil acidification with sulfur on ion uptake by plants and leaching from soil. Slightly acid soil (Yolo loam) was treated with sulfur or lime to determine effects on mineral mobilization by soybeans (Glycine Max) and barley (Hordeum vulgare). The soils were treated with the chelator, ethylenediamine tetraacetic acid. With soybeans acidification decreased yields; increased plant manganese, iron, and zinc and increased soil copper, cobalt, nickel, phosphorus, silver, and magnesium; and decreased molybdenum and varium availability. Lime had the opposite effect, and increased molybdenum levels in soybeans and soil. EDTA increased iron and decreased manganese in pH 6.0 and 4.5 soils; increased leaf iron, manganese, zinc, and copper at pH 7.5 and cobalt and nickel at pH 6.0 and 4.5, but did not affect soybean accumulations of other elements. With barley, acidification increased manganese, cobalt, lithium, and aluminum and decreased molybdenum, barium, phosphorus, potassium, and calcium; except for iron at pH 4.5, there was little interaction with EDTA. Acidification can change soil mineral solubilities and increase plant heavy metal concentrations. Atmospheric sulfur could affect mineral recycling in ecosystems with poorly buffered soils; interactions with soil organic constituents which chelate minerals are possible. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10316

EFFECTS OF TREE SPECIES, TEMPERATURE, AND SOIL ON TRANSFER OF MANGANESE-54 FROM LITTER TO ROOTS IN A MICROCOSM,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5C.
W76-10317

ASPECTS OF MINERAL-NUTRIENT CYCLING IN A SOUTHERN MIXED-HARDWOOD FOREST IN NORTH CENTRAL FLORIDA,
Florida Univ., Gainesville. Dept. of Botany.
K. C. Ewel, J. F. Gamble, and A. E. Lugo.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 700-714. 1 fig., 4 tab., 20 ref. AEC AT(40-1)-4066.

LIBRARY U. OF I. URBANA-Champaign

Descriptors: *Cycling nutrients, *Mixed forests, Florida, Cesium, Radioisotopes, Hardwood, Fallout, Southeast U. S. rainfall, Leaching, Soil types, Groundwater, Stemflow, Throughfall, Phosphorus, Potassium, Calcium, Magnesium, Phizosphere.

To determine if cesium-137 accumulates in a natural system in a compartment which has a counterpart in a managed system, mineral cycles were studied in a relatively undisturbed ecosystem (a mixed-hardwood forest near Gainesville, Florida, which contained several species of evergreen hardwoods as canopy dominants). Special attention was given to pathways which might affect cesium distribution in the ecosystem. Seasonal analysis was made of rainfall composition to determine how it was affected by different ecosystem components encountered as water travelled to the forest floor and leached through the soil system to groundwater. Stemflow, throughfall, and rainfall samples were collected for two years and mineral nutrient inputs (phosphorus, calcium, magnesium, potassium) to the forest floor estimated. Total nutrient inputs were phosphorus-32, potassium--24.7, calcium--29.7, and magnesium--8.1 kg/ha/year. Nutrient concentrations were unusually high in rainfall. Species of evergreen trees seemed to play an important role in making these values higher than those from temperate hardwood forests. There was a simildarlity in potassium and Cs--137 concentration patterns. In samples from lysimeters and groundwater pits, potassium and Cs-137 concentratios dropped considerably as the water passed through the root zone in the soil, possibly due to mycorrhizal uptake. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10318

THE QUANTITY AND DISTRIBUTION OF FOUR NUTRIENT ELEMENTS IN HIGH-ELEVATION FOREST ECOSYSTEMS, BALSAM MOUNTAINS, NORTH CAROLINA,
Southern Illinois Univ., Carbondale, Dept. of Forestry.
G. T. Weaver.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 715-728. 5 tab., 36 ref. AEC AT(401)-2077.

Descriptors: *Nutrients, *Mountain forests, North Carolina, Calcium, Potassium, Magnesium, Phosphorus, Distribution, Fir trees, Birch trees, Vegetation, Forest soils, Trees, Shrubs, Mosses, Soil horizons.
Identifiers: *Balsam Mountains(NC), Red spruce, Forest floor.

Calcium, potassium, magnesium, and phosphorus concentration and distribution patterns were studied in red spruce (Picea rubens)-Fraser fir (Abies Fraseri) and yellow birch (Betula lutea) ecosystems in the Balsam Mountains, North Carolina, to see if nutrient pool size and location characterized ecosystems. Relative nutrient quantities decreased in order from calcium:potassium:magnesium:phosphorus. Except that phosphorus amounts differentiated immature ecosystems, ecosystems were not characterized by nutrient pool size. Nutrient sinks for calcium were equal in vegetation and forest floor but lower in soil; in the spruce-fir ecosystem, magnesium, phosphorus, and potassium values were higher in the forest floor than vegetation and lower in soil; in the yellow birch ecosystem, vegetation, soil, and forest floor potassium values were equal. Nutrient distribution differentiated these ecosystems. Larger trees and shrubs contained most of the nutrients in the vegetational compartment. Most nutrients were in boles in the spruce-fir ecosystem, but branches were equal or more important in yellow birch ecosystems. Mosses and herbs were important nutrient sinks in habitats where they developed. Within the forest floor most calcium and magnesium were in the 01 horizon and potassium and phosphorus in the 02 horizon. Relative dry matter distribution did not indicate nutrient distributions reliably. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10319

SIGNIFICANCE OF BIOLOGICAL NITROGEN FIXATION AND DENITRIFICATION IN A DECIDUOUS FOREST ECOSYSTEM,
Georgia Univ., Athens. Dept. of Agronomy.
R. L. Todd, J. B. Waider, and B. W. Cornaby.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 729-735. 2 tab., 26 ref. NSF AG 199,40-193-69.

Descriptors: *Nitrogen fixation, *Denitrification, *Deciduous forests, *Nitrogen cycle, North Carolina, Litter, Forest soils, Oak trees, Hickory trees, Input-output analysis.
Identifiers: Coweeta Hydrologic Laboratory(NC), Forest floors.

Gaseous nitrogen transformations were determined in relation to other nitrogen cycle components of a mixed deciduous forest ecosystem at the Coweeta Hydrologic Laboratory, North Carolina. Rates and total annual amounts of nitrogen fixation and potential denitrification were measured for litter-soil subsystem components (decaying logs, woody and leaf litter, and general soil layers) of a mature oak-hickory forest. Woody and leaf litter had thehighest nitrogen fixation and denitrification rates, but annually on a surface area basis, the largest nitrogen transformations occurred in soil. About 75% of total nitrogen input entered the forest floor via biological fixation. Potential denitrification losses exceeded streamwater losses 200-fold. Aqueous nitrogen inputs and outputs are major forest nitrogen cycle components and dominate total gains and losses. Total nitrogen input was 14 and output 18 kg/ha/year, suggesting that the watershed may be losing nitrogen slowly. The estimates did not include epiphytic N fixation in the aboveground vegetation nor particulate organic N input in bulk precipitation. These nitrogen fixation values are comparable to values for coniferous forests and may be applicable only for forests. Nitrogen fixation, denitrification, and total fluxes must be considered when examining forest nitrogen cycles. Existing nitrogen pools may not indicate the magnitude of gaseous transformations that are occurring. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10320

NUTRIENT RETURN IN THE STEMFLOW AND THROUGHFALL OF INDIVIDUAL TREES IN THE PIEDMONT DECIDUOUS FOREST,
Duke Univ., Durham, N. C. Dept. of Botany.
D. T. Patterson.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 800-812. 6 tab., 18 ref.

Descriptors: *Cycling nutrients, *Rainfall, *Stemflow, *Throughfall, *Deciduous forests, Hickory trees, Pine trees, Loblolly pine trees, Oak trees, North Carolina, Bark, Interception, Chemical analysis, Calcium, Potassium, Magnesium, Manganese, Forest soils, Hydrogen ion concentration.
Identifiers: Piedmont, American beech trees, Yellow poplar trees, Shortleaf pine trees.

Quantitative and qualitative aspects of rain stemflow and throughfall of individual mature trees (American beech, mockernut hickory, yellow poplar,shortleaf pine, loblolly pine, and white oak) in an oak-hickory forest in North Carolina were evaluated. Because of branching patterns and bark characteristics, stemflow varied widely. Beech produced the most stemflow, then hickories; interception loss was greatest with beech trees. Only under hickory and beech did stemflow conduct much water to the forest floor. Chemical analysis of stemflow and throughfall showed that more calcium and potassium were returned to soil, followed by magnesium and manganese. Nutrients were always higher in stemflow, but total nutrient returns were greater in throughfall because more water reached the soil. On a crown-area basis, beeches contributed the least calcium and potassium, loblolly pines the most calcium, and hickories the most potassium. Stemflow and throughfall pH values were lowest in pine and highest in hickories. Soil nutrient patterns near trees were related to stemflow distribution and nutrient content of the several species. Soil potassium under hardwoods was higher in the stemflow absorption zone than under the crown edge. Soil calcium was higher near hickory and oak trunks. (See alo W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10326

CATION FLUX IN HARDWOOD AND WHITE PINE WATERSHEDS,
Georgia Univ., Athens. Dept. of Botany.
G. R. Best, and C. D. Monk.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 847-861. 1 fig., 2 tab., 36 ref. NSF AG-199,40-193-69.

Descriptors: *Cycling nutrients, *Cations, *Hardwood, *White pine trees, Calcium, Magnesium, Potassium, Sodium, Forests, Rainfall, North Carolina, Precipitation(Atmospheric), Input-output analysis, Throughfall, Litter, Percolation, Forest soils, Leaching, Runoff.
Identifiers: Coweeta hydrologic laboratory(NC).

Flux of selected dissolved cations (potassium, sodium, calcium, magnesium) through various levels of a forest from input of ions in rainfall to output of ions from the watershed in stream discharge was followed in a mature hardwood forest and an eastern white pine plantation in the Coweeta Hydrologic Laboratory, North Carolina. Nutrient concentrations were determined in precipitation input, throughfall, litter flow through, soil percolation, and stream discharge. Nutrient flux was determined from concentration and volume measurements. Amounts of water passing through various forest ecosystem levels changed markedly from input to output. Cation leaching from vegetation showed seasonal changes; potassium, calcium, and magnesium leaching was lower during winter months and increased with start of spring growth. Most potassium was leached from leaves before leaf fall, but most calcium and magnesium losses occurred after leaf fall. A summer reduction of sodium in throughfall was observed in the white pines. Total leachate loss from vegetation was highest for potassium and lowest for sodium; magnesium and calcium losses were intermediate. When water became streamflow discharge, the cation load was similar to its original input level, indicating that the ecosystem was able to minimize external loss while maintaining a large internal flux. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10329

ACUTE TOXICITY OF SODIUM CHLORIDE, PENTACHLOROPHENOL, GUTHION(R), AND HEXAVALENT CHROMIUM TO FATHEAD MINNOWS (PIMEPHALES PROMELAS) AND GOLDFISH (CARASSIUS AURATUS),
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W76-10335

INCORPORATION OF 203HG INTO METHYLMERCURY IN FISH LIVER: STUDIES IN BIOCHEMICAL MECHANISMS IN VITRO,
Wisconsin Univ., Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W76-10347

DEEP-SEA BACTERIA: GROWTH AND UTILIZATION OF HYDROCARBONS AT AMBIENT AND IN SITU PRESSURE,
Maryland Univ., College Park. Dept. of Microbiology.
J. R. Schwarz, J. D. Walker, and R. R. Colwell.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A005 248, $3.50 in paper copy, $2.25 in microfiche. Applied Microbiology, Vol. 28, No. 6, p. 982-986, December, 1974. 3 tab., 1 fig., 12 ref.

Descriptors: *Atlantic Ocean, *Aquatic microorganisms, Oil, *Oil spills, Degradation(Decomposition), Deep water, Pressure, *Hydrostatic pressure, Sediments, Water pollution, Analytical techniques, Microbiology, Oil pollution, Growth, Waste disposal, *Biodegradation, *Bacteria.
Identifiers: n-hexadecane.

Microorganisms present in Atlantic Ocean sediment samples collected at a depth of 4,940 m were capable of utilizing hydrocarbons under both ambient and in situ pressures. The rate of utilization under in situ pressure (500 atm) and ambient temperature (20 C) was significantly less compared with hydrocarbon utilization examined under conditions of ambient temperature (20 C) and pressure (1 atm). (Katz)
W76-10349

MICROBIAL PETROLEUM DEGRADATION: USE OF MIXED HYDROCARBON SUBSTRATES,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, and R. R. Colwell.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A005 249, $3.50 in paper copy, $2.25 in microfiche. Applied Microbiology, Vol. 27, No. 6, p. 1053-1060, June, 1974, 4 fig., 7 tab., 14 ref.

Descriptors: *Water pollution sources, *Aquatic microorganisms, Oil, *Oil pollution, *Degradation(Decomposition), *Microbial degradation, *Chromatography, Analytical technology, Laboratory tests, Microbiology, Oil spills, Oil industry, Waste disposal, *Pollutant identification.
Identifiers: Gas-liquid chromatography, Model petroleum.

Methods of examining hydrocarbons to estimate the microbial degradation of petroleum are compared. Gas liquid chromatography with a mixed hydrocarbon substrate has been shown to be useful in evaluating microbial potential for degradation of a number of hydrocarbons. (Katz)
W76-10350

PROCEEDINGS OF THE CONFERENCE ON MARINE BIOLOGY IN ENVIRONMENTAL PROTECTION HELD AT SAN CLEMENTE ISLAND, CALIFORNIA ON 13-15 NOVEMBER, 1973.
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5C.
W76-10353

THE FOULING COMMUNITY AS A FIELD MONITORING TECHNIQUE,
Naval Ship Research and Development Center, Annapolis, Md.
For primary bibliographic entry see Field 5C.
W76-10354

CHEMICAL PROBLEMS ENCOUNTERED IN TOXICITY STUDIES,
Naval Ship Research and Development Center, Annapolis, Md.
W. B. Mercer.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973, December, 1974, p 125-138. 7 fig, 8 ref.

Descriptors: *Toxicity, *Bioassays, Water quality, *Metals, *Chelation, Chemical analysis, Pollutant identification, Water analysis, Solubility, Acidity, Bonding, Salinity, Water chemistry, Laboratory tests, Ions.
Identifiers: Free metal ions, Metal concentration, Tissue concentration, Complexation.

Divalent metal ions interact with the anions normally observed in natural waters. As a result, the concentration of free metal ions in a test solution made with these waters is markedly lower than the quantity added would lead one to expect. This leads to uncertainty regarding the identity and physical state of the causative agent of the observed response. Laboratory determination of metal concentration in natural waters and in marine animal tissue requires careful choice of analytical method and meticulous attention to detail in preparative method. (See also W76-10353) (Katz)
W76-10364

MARINE POLLUTION MONITORING (PETROLEUM). PROCEEDINGS OF A SYMPOSIUM AND WORKSHOP,
National Oceanographic and Atmospheric Administration, Rockville, Md.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $3.90. Department of Commerce, National Bureau of Standards, Special Publication 409, (December,1974). 316 p. Held at National Bureau of Standards, Gaithersburg, Md. May 13-17, 1974. R. C. Junghaus, Conference Coordinator.

Descriptors: *Analytical methods, *Oil spills, *Oil industry, Oil wastes, Data transmission, International waters, Water pollution, Water quality sampling, Monitoring, *Data collection, *Conferences.
Identifiers: *Marine pollution, Petroleum hydrocarbon measurement, Oil slicks, Tar balls.

These proceedings contain the invited plenary lectures representing pertinent scientific, environmental, and regulatory aspects of petroleum hydrocarbon measurements, the summaries of the contributed papers, dealing with specific scientific developments and recommendations, and the report of an international workshop which provides specific recommendations for the initiation of a coordinated Pilot Project for marine pollution (petroleum) monitoring. (See W76-10371 thru W76-10413) (Katz)
W76-10370

UNITED NATIONS ENVIRONMENT PROGRAM EARTHWATCH AND MARINE POLLUTION,
National Oceanic and Atmospheric Administration, Rockville, Md.
R. M. White.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum) Proceedings of a Symposium and Workshop, December, 1974, p. 3-7.

Descriptors: *International waters, Water pollution, Monitoring, Data collections, Water pollution Control, Federal government, United Nations.
Identifiers: *Marine pollution, *Earth watch.

The United Nations environment program realized the importance of monitoring ocean pollution and established monitoring as one of the seven major goals of the Global Environmental Monitoring System. It is hoped that the Intergovernmental Oceanographic Commission and the World Meteorological Organization, through the Integrated Global Ocean Station System (IGOSS) will be able to translate this general concern into a working international effort. (See also W76-10370) (Katz)
W76-10371

SCIENTIFIC PROBLEMS OF THE SYSTEMS FOR GLOBAL MONITORING AND INVESTIGATION OF OIL POLLUTION IN THE WORLD OCEAN,
State Oceanographic Inst., Moscow (USSR).
A. I. Simonov.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum). Proceedings of A Symposium and Workshop, December, 1974, p. 9-14.

Descriptors: *Hydrodynamics, *Dispersion, Oil pollution, Monitoring, International waters, Data collections, Oil wastes, Atlantic Ocean, Degradation(Decomposition).
Identifiers: Global monitoring, Marine pollution.

Discussion is presented of: (1) a continuous and systematic monitoring and evaluation of oil and oil product pollution conditions in the waters of the world oceans, (2) studies of the increasing utilization of oil and oil products as these uses affect the sea (3) the development of regulations concerning the discharge of substances containing petroleum originated hydrocarbons into the sea. (See also W76-10370) (Katz)
W76-10372

PILOT PROJECT ON MARINE POLLUTION MONITORING UNDER THE FRAMEWORK OF IGOSS,
Intergovernmental Oceanographic Commission, Paris (France).
A. Tolkachev.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop, December, 1974, p. 21-26.

Descriptors: *Monitoring, *Oil pollution, *Oil spills, Water pollution, Data transmission, International waters, Water quality, Sampling, Data collections, Pilot plants, Oily waters, Oceanography.
Identifiers: *Marine pollution.

The International Oceanographic Commission (IOC) emphasizes the need to undertake specific studies of various aspects of marine pollution and recommends specific action to achieve these goals. The outlines of a pilot project on marine pollution monitoring is presented. (See also W76-10370) (Katz)
W76-10373

SURVEY ANALYSES FOR PETROLEUM DERIVED HYDROCARBONS IN THE OCEAN,
Maritime Safety Agency, Tokyo (Japan). Oceanographic Div.
S. Hori.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop, p. 27-28.

Descriptors: Oil pollution, *Water pollution, *Water chemistry, *Analytical techniques, Monitoring, Oily water, Oil spills, Indian Ocean, Pacific Ocean, Surveys.
Identifiers: *Japan, Petroleum residues, Tokyo Bay, Marine sampling, *Marine pollution.

Fisheries training ships or fisheries research vessels collect samples for petroleum analyses as part of their operations. The Hydrographic Department of the (Japanese) Maritime Safety Agency conducts chemical analyses to study the present level of marine oil pollution. (See also W76-10370) (Katz)
W76-10374

MARITIME CONSIDERATION OF OIL TRANSPORTATION,
Maritime Administration, Washington, D. C.

For primary bibliographic entry see Field 5G.
W76-10375

MARINE POLLUTION DATA ARCHIVING AND EXCHANGE,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.
For primary bibliographic entry see Field 5A.
W76-10376

MARITIME CONSIDERATIONS,
Maritime Administration Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10377

QUANTITATIVE MONITORING AND VARIABILITY OF PELAGIC TAR IN THE NORTH ATLANTIC,
Harvard University, Cambridge, Mass. Dept. of Engineering and Applied Physics.
J. N. Butler, and B. F. Morris.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop, December, 1974. p. 75-78, 6 fig., 13 ref.

Descriptors: *Sampling, *Floating plants, Atlantic Ocean, Statistical analysis, Homogeneity, On-site data collections, Oil pollution, Oil spills, Plankton nets, Aquatic algae, Marine plants, *Monitoring.
Identifiers: *Sargassum, *Pelagic tar, *Tar, *Neuston, Oil residues, Bermuda, Sargasso Sea, Tar analysis, Marine pollution.

The variability of sampling by neuston net for either pelagic tar or Sargassum is very high, and even the results of successive tows may differ by a factor of ten. The standard deviation is of the order of 0.5 log units, a factor of 3. The standard deviation of the geometric mean of ten to fifteen neuston tows may be estimated to be approximately 0.15 log units, or 40%. In other words, a single neuston tow is representative of the general area where the tow is made only within a factor of ten. (See also W76-10370) (Katz)
W76-10378

TAR BALL LOADINGS ON GOLDEN BEACH, FLORIDA,
Coast Guard Research and Development Center, Groton, Conn.
W. A. Saner, and M. Curtis.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop, December, 1974, p. 79-81, 3 fig.

Descriptors: *Atlantic Ocean, *Oil pollution, *Beaches, *Sands, Winds, *Florida, Sampling method, Statistical analysis, Intertidal area, Weather patterns.
Identifiers: Fort Lauderdale(Fla), Miami(Fla), Tar balls, Tar ball loadings, Beach sampling methods, Beach time constant, Beach bias.

Data from the sampling of beach tar from a sandy coast was performed for one year. The objective was to evaluate the effect of sampling zones of various sizes and the effects of tar build-up on the beach with time. The effect of wind on tar deposition was also determined. (See also W76-10370) (Katz)
W76-10379

TAR BALL SAMPLING IN THE WESTERN NORTH ATLANTIC,
Coast Guard Research and Development Center, Groton, Conn.
W. E. McGowen, W. A. Saner, and G. L. Hufford.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 83-84, 1 tab., 11 fig.

Descriptors: *Atlantic Ocean, *Sampling, Oil pollution, Analytical techniques, On-site investigations, Oily water.
Identifiers: Oil sampling techniques, Oil identification, Bravo, Charlie, Delta, Echo, Marine pollution.

The U. S. Coast Guard conducted a sampling program in the western North Atlantic Ocean beginning in 1971 to determine the quantity and source of floating tar 'balls' in the marine environment. Most of the sampling was performed from Coast Guard weather ships deployed at four ocean station sites: Bravo (56 degrees 30' N, 51 degrees 00' E), Charlie (52 degrees 45' N, 35 degrees 30' W), Delta (44 degrees 00' N, 41 degrees 00' W) and Echo (35 degrees 00' N, 48 degrees 00' W). The series sampling at each location allowed a determination of variability and estimation of the average amount of tar present. (See also W76-10370) (Katz)
W76-10380

EVALUATION OF THIN FILM OIL SAMPLERS,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5A.
W76-10381

OIL SPILLAGE MONITORING, SAMPLING AND RECOVERY SYSTEMS,
Durham Associates, Inc., Milford, N. H.
J. G. Zahka.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 89-90.

Descriptors: *Oil pollution, *Monitoring, Methodology, *Oily water, *Physicochemical properties, Physical properties, Water analysis, On-site data collections, *Sampling.
Identifiers: Oil detection, Oil sampling, Oil recovery, Selective membrane.

Products have been developed by Durham Associates, Inc. for use in controlling marine pollution from petroleum. They incorporate a unique selectivity transmissive membrane which, while preventing the penetration of water, allows oil to flow through easily. Modifications of this membrane have been used in the construction of oil spill detection systems, oil recovery devices, and surface oil samplers. (See also W76-10370) (Katz)
W76-10382

SAMPLING OF OIL SPILLS AND FINGERPRINTING BY INFRARED SPECTROSCOPY,
Rhode Island Univ., Kingston, Dept. of Chemistry.
C. W. Brown, M. Ahmadjian, and P. Lynch.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 91-92, 1 fig., 3 ref.

Descriptors: *Oily water, Methodology, *Monitoring, *Spectroscopy, Water pollution, Analytical methods, Oil spills, Chemical analysis, Water pollution sources, *Secondary recovery(Oil), Pollutant identification.
Identifiers: Infrared spectroscopy, Oil slick, Narragansett Bay(RI), Fingerprinting.

Infrared spectra of crude oils and their various distillates in the 650 to 1200 cm-1 region provide unique fingerprints, which can be used to identify the source of oil slicks. (See also W76-10370) (Katz)
W76-10383

MAPPING AND IDENTIFICATION OF OIL ON WATER BY THE USE OF AN AIRBORNE LASER SYSTEM,
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Station.
G. K. Schwemmer, and H. H. Kim.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 95-96, 5 fig., 3 ref.

Descriptors: *Remote sensing, *Aerial reconnaissance, *Analytical techniques, Oily water, *Oil spills, *Aircraft, Methodology, *Photometry, *Oil pollution, Mapping, *Pollutant identification, Path of pollutants.
Identifiers: Oil on water, *Airborne laser system, Airborne laser sensor, Laser, Laser induced emission.

Airborne laser oil fluorosensor systems have been test flown both here and elsewhere for the detection of oil on water. Recently there has been increased interest in developing an advanced model which not only detects but also performs a broad classification of the target oils according to their grades. (See also W76-10370) (Katz)
W76-10384

MOVEMENT OF SPILLED OIL IN SAN FRANCISCO BAY AS PREDICTED BY ESTUARINE NONTIDAL DRIFT,
Geological Survey, Menlo Park, Calif.
T. J. Conomos.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 97-100, 5 fig., 16 ref.

Descriptors: *Oily water, *Aquatic drift, *Water currents, *Oil pollution, Estuarine environment, Straits, *Oil spills, California, *Path of pollutants, Bays, Forecasting.
Identifiers: Estuarine water circulation, Non-tidal drift, Sea bed drifters, Surface drifters, *San Francisco Bay, Continental shelf.

From March 1970 through April 1973, the U.S. Geological Survey released surface and seabed drifters every 2 months within San Francisco Bay and on the continental shelf of central California as a part of a study of seasonal nontidal drift patterns in the Bay. One of the routine release points was located at the site of a major oil spill which occurred on 18 January 1971 when two oil tankers collided at Golden Gate, San Francisco Bay, California. Approximately 3200 m3 (26,700 barrels) of Bunker C fuel oil spilled into the bay. Marked similarities between the drift patterns of the spilled oil and that of both the surface and seabed drifters became immediately obvious. These similarities, together with 3 years of data from the drifter study made it possible to predict the movement of spilled oil. (See also W76-10370) (Katz)
W76-10385

OIL POLLUTION ALONG THE INDIAN COASTLINE,
National Inst. of Oceanography, Panjim (India).
S. N. Dwivedi, and A. H. Parulekar.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workship, December, 1974. p. 101-105, 2 tab., 4 fig., 3 ref.

Descriptors: *Oil pollution, *Indian Ocean, Beaches, Marine algae, Polychaetes, *Oil spills, *Deposition(Sediments).
Identifiers: Tar balls, Tide levels, Rhozopora fruits, Physalia, Degradation products, Marine pollution.

Oil in the form of tar balls is washed ashore along the Indian beaches. These were first noticed in 1970. From 1971 to 1973, studies were undertaken along both east and the west coasts of India to determine the areas, seasons, and the intensity of deposition of tar balls and their possible origin. The size of the tar balls, places and seasons of deposition vary a great deal. Therefore, for com-

parison of data from selected beaches, duplicate samples were collected from 0.1 m2 surface at supra, high, mid and low tide marks and the weight of tar balls was determined and expressed as g/m2. (See also W76-10370) (Katz)
W76-10386

SAMPLING ERRORS IN THE QUANTIFICATION OF PETROLEUM IN BOSTON HARBOR WATER,
Massachusetts Inst. of Technology, Cambridge. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5A.
W76-10387

HYDROCARBON CONCENTRATIONS IN SEAWATER ALONG THE HALIFAX-BERMUDA SECTION: LESSONS LEARNED REGARDING SAMPLING AND SOME RESULTS,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5A.
W76-10388

HYDROCARBON CONTENT AND CHLOROPHYLL CORRELATION IN THE WATERS BETWEEN NOVA SCOTIA AND THE GULF STREAM,
Bermuda Biological Station for Research, St. George's West.
A. Zsolnay.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workship, December, 1974, p. 255-256, 9 ref.

Descriptors: *Atlantic Ocean, *Organic compounds, *Water quality, *Chlorophyll, Laboratory studies, Statistical analyses, Chemical analysis, *Canada, Eutrophication.
Identifiers: Euphotic zone, Nova Scotia, Gulf Stream, *Biogenic hydrocarbons.

Studies have indicated that a casual relationship exists between the hydrocarbon and chlorophyll concentration of the euphotic zones of the Atlantic between Nova Scotia and the Gulf Stream. One cannot assume, however, that phytoplankton are the sole source of this material. (See also W76-10370) (Katz)
W76-10389

DETERMINATION OF AROMATIC HYDROCARBONS IN SEA WATER USING AN ELECTROLYTIC STRIPPING CELL,
National Bureau of Standards, Washington, D.C., Inst. for Materials Research.
For primary bibliographic entry see Field 5A.
W76-10390

DETERMINATION OF AROMATIC AND TOTAL HYDROCARBON CONTENT IN SUBMICROGRAM AND MICROGRAM QUANTITIES IN AQUEOUS SYSTEMS BY MEANS OF HIGH PERFORMANCE LIQUID CHROMATOGRAPHY,
Bermuda Biological Station for Research, St. George's West.
For primary bibliographic entry see Field 5A.
W76-10391

DETERMINATION OF C1-C10 HYDROCARBONS IN WATER,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 5A.
W76-10392

SUSPENSIONS OF CRUDE OILS IN SEA WATER: RAPID METHODS OF CHARACTERIZING LIGHT HYDROCARBON SOLUTES,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 5A.
W76-10393

MEASUREMENT AND CHARACTERIZATION OF NONVOLATILE HYDROCARBONS IN OCEAN WATER,
Exxon Research and Engineering Co., Linden, N. J.
R. A. Brown, J. J. Elliott, and T. D. Searl.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p 131-135, 2 tab, 2 fig, 2 ref.

Descriptors: *Chromatography, *Oily water, Oil pollution, Methodology, Analytical techniques, Water quality, Gas chromatography, Transportation, Ships, Marine water, *Pollutant identification.
Identifiers: Hydrocarbons, Tanker routes, Lipids, Hydrocarbon measurements, Lipid measurements.

A method is described for the measurement and characterization of nonvolatile hydrocarbons, (C-14 and heavier) in ocean water. The method was applied to total dispersed hydrocarbons which generally occur in the concentration range, 0-20 ppb (wt.). (See also W76-10370) (Katz)
W76-10394

IDENTIFICATION, ESTIMATION AND MONITORING OF PETROLEUM IN MARINE WATERS BY LUMINESCENCE METHODS,
Baird-Atomic, Inc., Bedford, Mass.
A. W. Mornig.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p 135-144, 14 fig, 20 ref.

Descriptors: Analytical techniques, *Waste identification, *Spectroscopy, *Fluorescense, Oil pollution, Oily water, Methodology, Remote sensing, Tracers, Water pollution, *Monitoring, *Pollutant identification.
Identifiers: Oil classification, Oil fluoresence, Oil identification, Low temperature luminescence, Molecular luminescence, Phosphorescence, Total luminescence, Spectroscopy.

Fluorescence analysis is more sensitive and less subject to interference than the simple absorbance method and is therefore superior, especially when the concentration of residual oils in the sea water are less than 10 ppb. Luminescence offers a specific and sensitive method for the study of oil in water. (See also W76-10370) (Katz)
W76-10395

RECENT DEVELOPMENTS IN THE IDENTIFICATION OF ASPHALTS AND OTHER PETROLEUM PRODUCTS,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W76-10396

IDENTIFICATION OF HYDROCARBONS IN AN EXTRACT FROM ESTUARINE WATER ACCOMODATED NO. 2 FUEL OIL,
Virginia Inst. of Marine Sciences, Gloucester Point. Environmental Chemistry Section.
For primary bibliographic entry see Field 5A.
W76-10397

ANALYSES OF HYDROCARBONS IN MARINE ORGANISMS: RESULTS OF IDOE INTERCALIBRATION EXERCISES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-10398

IDOE-5 INTERCALIBRATION SAMPLE: RESULTS OF ANALYSIS AFTER SIXTEEN MONTHS STORAGE,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-10399

USE OF LOW MOLECULAR-WEIGHT-HYDROCARBON CONCENTRATIONS AS INDICATORS OF MARINE POLLUTION,
Texas A and M Univ. College Station, Dept. of Oceanography.
W. M. Sackett, and J. M. Brooks.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 171-173, 1 fig., 5 ref.

Descriptors: *Oily water, *Oil pollution, *Gulf of Mexico, Indicators, Marine organisms, Environmental effects, Industrial wastes, Path of pollutants, Pollutant identification, Water quality, *Bioindicators.
Identifiers: *Hydrocarbon sniffer, *Low-Molecular-Weight hydrocarbons, *Pollution indicators, Petroleum production platforms, Dissolved ethane, Exposed well heads, *Marine pollution.

Large areas of coastal water offshore Texas and Louisiana have up to six orders of magnitude higher concentrations of low-molecular-weight hydrocarbons than open ocean surface water. These high levels are most certainly petroleum-derived and due to offshore petroleum production operations. The observed high levels of C1 to C3 hydrocarbons do not seem to be detrimental to marine life, but nevertheless serve as sensitive indicators of the more toxic components of petroleum which usually are being simultaneously introduced to the ocean. (See also W76-10370) (Katz)
W76-10400

SAMPLING MARINE ORGANISMS AND SEDIMENTS FOR HIGH PRECISION GAS CHROMATOGRAPHIC ANALYSIS OF AROMATIC HYDROCARBONS,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab.
For primary bibliographic entry see Field 5A.
W76-10401

FIELD SAMPLING METHODS AND TECHNIQUES FOR MARINE ORGANISMS AND SEDIMENTS,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 5A.
W76-10402

METHODS FOR ESTABLISHING LEVELS OF PETROLEUM CONTAMINATION IN ORGANISMS AND SEDIMENT AS RELATED TO MARINE POLLUTION MONITORING,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. C. Clark, Jr.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974. p. 189-194, 5 tab., 2 fig., 15 ref.

Descriptors: Methodology, *Monitoring, *Sampling, *Gas chromatography, *Sediments, *International waters, Oily waters, Oil pollution, Analytical techniques, Spectrometry, On-the-site investigations, Statistical analysis, Marine animals.
Identifiers: Paraffin residual patterns, Petroleum contamination, Marine pollution monitoring.

In order to plan a global pollution monitoring program for petroleum, it is necessary to standardize

sample collection, preservation and preparation of samples. It is necessary to standardize extractive and chromatographic procedures and data reduction techniques so that the resulting data are compatible worldwide. (See also W76-10370) (Katz)
W76-10403

QUANTITATIVE DETERMINATION OF HYDROCARBONS IN MARINE ORGANISMS,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5A.
W76-10404

LONG TERM WEATHERING CHARACTERISTICS OF IRANIAN CRUDE OIL: THE WRECK OF THE 'NORTHERN GULF',
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
D. W. Mayo, D. J. Donovan, and L. Jiang.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974. p. 201-208, 3 tab., 4 fig., 6 ref.

Descriptors: *Oil pollution, *Mollusks, *Sediments, *Gas chromatography, *Oil spill, *Experimental animals, *Toxicity, Atlantic Ocean, Environmental effects, Weathering, Bioassay, Maine, Analytical techniques, Marine animals.
Identifiers: *Scot columns, Isoprenoids, *Weathered oil, *Oil absorption, *Mya arenaria, *Iranian crude oil, *Penobscot Bay(Maine), Commercial shellfish, 'Northern Gulf' wreck, Marine pollution.

A study was instituted in the summer of 1972 to establish the present state of the hydrocarbon residues in the sediments and marine life of the area of lower Penobscot Bay affected by the Iranian crude oil resulting from the wreck of the Northern Gulf. Hydrocarbon sampling of experimental transplanted clams and controls indicated that there was a rapid absorption of hydrocarbon residues by the animals. (See also W76-10370) (Katz)
W76-10405

ANALYTICAL TECHNIQUES FOR ISOLATING AND QUANTIFYING PETROLEUM PARAFFIN HYDROCARBONS IN MARINE ORGANISMS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5A.
W76-10406

DETERMINATION OF HYDROCARBONS IN MARINE ORGANISMS AND SEDIMENTS BY THIN LAYER CHROMATOGRAPHY,
California Univ., Berkeley. Naval Biomedical Research Lab.
For primary bibliographic entry see Field 5A.
W76-10407

HYDROCARBONS IN BLUE MUSSELS FROM THE KIEL BIGHT,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
M. Erhardt, and J. Heinemann.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 221-225, 1 tab., 6 fig., 5 ref.

Descriptors: *Benthic organisms, *Marine animals, *Mollusks, *Mussels, *Oil pollution, *Gas chromatography, *Waste identification, Oily water, Water quality, Mass spectrometry, On-site investigations, *Pollutant identification.
Identifiers: *Fossil hydrocarbon, *Tissue accumulation, *Hydrocarbon exchange, *Biogenic hydrocarbons, Degrading hydrocarbons.

Blue mussels (Mytilus edulis) from a location in the Kiel Bight, contain fossil hydrocarbons in concentrations somewhat above the natural background of recent biogenic hydrocarbons. The composition of the hydrocarbon fraction is not constant. Mussels collected after the spring phytoplankton bloom contain relatively large amounts of recent biogenic hydrocarbons whose concentrations in mussels collected in January are quite low. On the other hand, concentrations of cycloalkanes, mono-, di-, and tri-aromatics as well as mixed types of fossil origin have a tendency to rise. (See also W76-10370) (Katz)
W76-10408

PELAGIC TAR IN THE GULF OF MEXICO AND CARIBBEAN SEA,
Texas A and M Univ., College Station. Dept. of Oceanography.
L. M. Jeffrey, W. E. Pequegnat, E. A. Kennedy, A. Vos, and B. M. James.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974. p. 233-235, 1 tab., 3 fig., 3 ref.

Descriptors: *Oil pollution,l *Oil-water interfaces, Ships, *Gulf of Mexico, Waste identification, Transportation, Organic compounds, *Pollutant identification.
Identifiers: Gulf Stream, *Pelagic tar, Tar balls, *Caribbean Sea, Sulfur or tar balls, Asphaltene of tar balls, Marine pollution.

The Gulf of Mexico apparently has less pelagic tar than the Mediterranean and Sargasso Sea, but more than the Caribbean and northeast Pacific but about the same amount as the Gulf Stream. Some of the pelagic tar is swept into the Gulf of Mexico through the Yucatan Straits and out through Florida Straits and is derived primarily from shipping and tanker cleaning operations. Specific sources are difficult to ascertain of these obviously weathered materials, so a multi-parameter approach is necessary. See also W76-10370) (Katz)
W76-10409

DISTRIBUTION OF TAR BALLS AND NEUSTON SAMPLING IN THE GULF STREAM SYSTEM,
National Marine Fisheries Service, Narragansett, R. I. Narragansett Lab.
K. Sherman, J. B. Colton, R. L. Dryfoos, K. D. Knapp, and B. S. Kinnear.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 243-244. 1 fig., 1 tab., 7 ref.

Descriptors: *Oil pollution, *Environmental effects, *Reproduction, *Plankton, *Marine organisms, *Juvenile fish, Atlantic Ocean, Aquatic productivity, Marine fish, Fish eggs, Oily water, *Sampling, Distribution.
Identifiers: *Neuston, MARMAP, *Tar balls, Gulf Stream, Tar ball distribution, Tar ball composition.

Significant amounts of tar balls were observed off the east coast of the United States during surveys of larval fishes and their environment in the summer of 1972 and winter of 1973. The effect of petroleum residues on marine productivity is unclear. (See also W76-10370) (Katz)
W76-10410

EFFECTS OF OILS ON BALTIC LITTORAL COMMUNITY, AS STUDIED IN AN OUTDOOR MODEL TEST SYSTEM,
Swedish Water and Air Pollution Research Lab., Studsvik (Sweden). Baltic Lab.
For primary bibliographic entry see Field 5C.
W76-10411

EFFECT OF AN OIL SPILL ON BENTHIC ANIMALS IN THE LOWER YORK RIVER, VIRGINIA,
Virginia Inst. of Marine Sciences, Gloucester Point. Div. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5C.
W76-10412

MARINE POLLUTION BY CARCINOGENIC HYDROCARBONS,
Center for Science in the Public Interest, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-10413

OHIO RIVER COOLING WATER STUDY,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W76-10414

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME II.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 8B.
W76-10415

TIME-DEPENDENT MASS DISPERSION IN NATURAL STREAMS,
Dames and Moore, Bethesda, Md.
F. M. Holly, Jr., and J. A. Cunge.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1121-1137, 1975. 7 fig, 12 ref.

Descriptors: *Model studies, *Streams, *Dispersion, *Diffusion, Mathematical models, Rivers, Mass transfer, Water pollution, Pollutants, *Path of pollutants, Water quality, Computer models, *Virginia.
Identifiers: *Finite difference model, *Clinch River(Va).

A finite-difference model for the prediction of time-dependent mass dispersion in steady but nonuniform river flow was presented. Specific attention was devoted to problems of convergence in the computation of convection. The model is non-diffusive and unconditionally stable, and is applicable to mixing from sources of arbitrary configuration. Application of the model to field measurements of one-dimensional mixing in Clinch River, Virginia, demonstrated its ability to provide good estimates of dispersion using relatively little computer time and with minimum calibration. (See also W76-10415) (Sims-ISWS)
W76-10436

SCALING AND SIZING CRITERIA FOR THERMAL-HYDRAULIC MODELS,
Acres Consulting Services Ltd., Niagara Falls (Ontario).
S. T. Lavender, and J. E. Cowley.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1156-1164, 1975. 4 ref, 1 append.

Descriptors: *Model studies, *Thermal pollution, *Thermal powerplants, Hydraulic models, Powerplants, Diffusion, Dispersion, Jets, Buoyancy, Mass transfer, Cooling, Cooling water, Hydraulics.
Identifiers: *Model scaling, Boundary influence.

The principles of scaling for models of heated water flows have been expounded by a number of

authors. These fall short of defining explicit requirements for scale and boundary selection for a specific model. Criteria which recognize established principles and which have been applied in choosing scales and model sizes for several very large thermal-hydraulic models were presented. (See also W76-10415) (Sims-ISWS)
W76-10437

APPLICATION OF A WATER QUALITY MODEL TO THE DENVER METROPOLITAN AREA,
Black and Veatch, Denver, Colo.
V. P. Soice.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1165-1182, 1975. 9 fig, 1 tab, 3 ref.

Descriptors: *Model studies, *Urban hydrology, *Water quality, *Colorado, Mathematical models, Computer models, Water pollution, Pollutants, Streams, Rivers, Urban runoff, Urban drainage, Watersheds(Basins), Rainfall.
Identifiers: *Denver(Colo).

The utilization of sophisticated digital computer models for analyzing alternative wastewater treatment systems is a relatively recent innovation in water resources engineering. Because of the complexity of the stream system and water use patterns in the Denver Metropolitan area, full dynamic simulation of water quantity and quality was utilized in a study of regional water quality management. Complicating water quality and quantity factors and a desire to effect a regional approach to management of the region's quality resulted in selection of the hydrologic and water quality programming packages offered by Hydrocomp International, Palo Alto, California. The model as adapted to the Denver area is known as the Hydro-Quality Model and is characterized as a nonuniform, unsteady state model that provides continuous dynamic simulation of water quality and quantity constituents. The model was calibrated utilizing an extensive meteorological data base, adjusting basin parameters to produce simulated stream flow and water quality and comparing this result with historically recorded values. A satisfactory calibration achieved, the model was utilized as an analytical tool to determine through simulation the resultant water quality in the stream network under various alternative wastewater management systems. Model results for the various alternatives were compared against one another and against predetermined water quality goals. This paper discussed the procedures utilized in applying this particular model and evaluated its effectiveness as a tool to manage regional water quality. (See also W76-10415) (Sims-ISWS)
W76-10438

COMBINED USE OF PHYSICAL AND MATHEMATICAL MODELS FOR ANALYSIS OF RESERVOIR WATER QUALITY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. P. Bohan, and B. Loftis.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1183-1195, 1975. 3 fig, 10 ref.

Descriptors: *Model studies, *Water quality, *Hydraulic models, *Mathematical models, Reservoirs, Heat transfer, Dissolved oxygen, Biochemical oxygen demand, Discharge(Water), Withdrawal, Inflow, Mixing, Water circulation, Pollutants, Path of pollutants, Water pollution, Analytical techniques.

Numerical simulation models for predicting reservoir water quality have emerged rapidly during the past few years. Unfortunately, the description in these models of the hydrodynamics of a density stratified reservoir has not progressed as rapidly as the need to predict water quality. This paper described the concepts of the numerical simulation model and the use of the physical models to improve the mathematical descriptions. An accurate determination of reservoir water quality is dependent upon the ability to describe water movement through a reservoir and account for retention times of various layers. The physical model provides a means of determining this information. The information gained from the physical model can be used to modify the mathematical model. Entrainment currents, exchanges between layers, inflow placement and distribution, currents created by withdrawal, and travel times can be accounted for satisfactorily in a one-dimensional reservoir simulation model. This technique provides a more accurate description of the water budget which contributes to the accuracy of the water quality predictions. (See also W76-10415) (Sims-ISWS)
W76-10439

APPLICATION OF A DYNAMIC NETWORK MODEL TO HYDRAULIC AND WATER QUALITY STUDIES OF THE ST. LAWRENCE RIVER,
M. L. Thatcher, H. W. Pearson, and R. E. Mayor-Mora.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1196-1219, 1975. 15 fig, 4 tab, 9 ref.

Descriptors: *Model studies, *Water quality, *St Lawrence River, *Mathematical models, Hydrodynamics, Hydraulics, Pollutants, Path of pollutants, Nutrients, Dissolved oxygen, Biochemical oxygen demand, Coliforms, Zooplankton, Phytoplankton, Inflow, Discharge(Water), Water levels, Rivers, Water quality control.

A network-type numerical model of hydraulics and water quality has been implemented to provide predictive capability in the study of the St. Lawrence River from Cornwall, Ontario, past Montreal and downstream into the tidal region as far as Montmagny, Quebec. The M.I.T. Dynamic Network Model was adopted for this study. It consists of a coupled solution to the governing equations of transient hydraulics and mass transport for a network of one-dimensional reaches of variable cross-sectional area. Modifications were made to the original model to adapt it for ice cover, to provide for continuity across control structures, and to include additional water quality parameters including an interactive nutrient model. Verification was made to steady-state conditions in the non-tidal region and to transient conditions in the tidal region. The model represents a management tool for predicting the results of different hydraulic and water quality conditions. These conditions can be natural ones such as floods, icing, storm tides and storm water runoff, or they can be related to human activity such as dam regulation, changes in river geometry, degrees of waste water treatment, and the location of outfalls. (See also W76-10415) (Sims-ISWS)
W76-10440

FINITE DIFFERENCE APPROXIMATION TO THE CONVECTIVE TRANSPORT EQUATION,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
R. B. Gordon, and M. L. Spaulding.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1220-1236, 1975. 12 fig, 1 tab, 8 ref.

Descriptors: *Model studies, *Water quality, *Path of pollutants, Water pollution, Rivers, Liquid wastes, Pollutants, Convection, Mathematical models, Mathematics, Equations, Analytical techniques, Massachusetts.
Identifiers: Charles River(Mass).

A rapidly converging, implicit finite difference approximation to the steady, one-dimensional convective transport equation has been developed. A mathematical analysis of the dispersive and dissipative characteristics of the finite difference approximatio for the linear case has been conducted, as well as numerical experiments to study accuracy and convergence rate as a function of dispersion coefficient, velocity, and grid spacing. The purpose of this study has been to make available a numerical solution of steady, convective transport problems that will use a minimum of computer time and storage so as to be economical enough to be readily used in water quality studies. Guidelines for the most efficient use of the model were suggested, and the results of an application to the distribution of phosphorous in the Charles River was included. (See also W76-10415) (Sims-ISWS)
W76-10441

SIMULATION OF THE SALINITY DISTRIBUTION IN THE ST. LAWRENCE ESTUARY BY A TWO-DIMENSIONAL MATHEMATICAL MODEL,
Laval Univ., Quebec. Dept. of Civil Engineering.
Y. Ouellet, and J. Cerceau.
In: Symposium On Nodeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1249-1269, 1975. 13 fig, 19 ref.

Descriptors: *Model studies, *Estuaries, St. Lawrence River, Mathematical models, *Salinity, Freshwater, Sea water, Temperature, Saline water-freshwater interfaces, Sediments, Erosion, Hydrodynamics, Tides, Water levels, Water circulation.
Identifiers: *St. Lawrence estuary.

The estuary of the St. Lawrence River is a large fluvio-maritime complex extending from the Gulf of St. Lawrence to Montreal. This system is subdivided into the maritime estuary, the lower estuary of a length of approximately 150 miles characterized by great depths (of the order of 1000 ft or more), by a stratification of saline waters and by a width varying from 15 to 30 miles, and the fresh water estuary, the upper estuary of a length of approximately 100 miles where there exist only fresh water tides. In between, the fresh water from upland sources mixes with saline waters from the Atlantic Ocean. This is the region of interest for the present study. The knowledge of the salinity distribution in the estuary is important, considering the flocculation phenomena which are then indirectly related to sedimentation and water quality problerosion patterns with respect to salne and suspension concentrations. These phenomena depend also also on the fresh water inflow and in a cycle way on tides. Two numerical models have been developed, a hydrodynamical model and a transport model, the former serving as support to the latter. It has thus been possible to obtain a better representation of the distribution of salinity concentration and to see the influence of the tide and Coriolis force on the penetration of salt water in the estuary. However, the two-dimensional approach has not made possible the differentiation between superficial fresh water flow and deep salt water flow, a most important aspect in sedimentation mechanisms. (See also W76-10415) (Sims-ISWS)
W76-10443

ODELLING OF SUSPENSION CURRENTS,
ondheim Univ. (Norway). Vassdrags-og Hav-laboratoriet.
Tesaker.
Symposium on Modeling Techniques, Volume 2nd Annual Symposium of the Waterways, arbors and Coastal Engineering Division of SCE (2 Vol.), San Francisco, California, Sep-nber 3-5, 1975. American Society of Civil En-neers, New York, p 1385-1401, 1975. 7 fig, 9 ref.

scriptors: *Model studies, *Sediment transport, eposition(Sediments), Mathematical models, draulic models, Erosion, Sedimentation, spended solids, Mine wastes, Currents(Water), s, Fluid mechanics, Hydraulics, *Path of pollu-nts.

e transport and deposition of particles by spension currents and jets were discussed. The per described experience with the transfer of sults from ideal laboratory studies to practical ses, and discussed the limitations of physical odelling of suspension currents. Model laws for nsity currents can be used as long as the particle l velocity is small compared to the flow locity. To model the particle motion, Lacey's le for distortion of movable bed models must be lfilled. Field measurements in a suspension cur-nt carrying mine waste have shown that the ex-nal flow mechanics of field and laboratory cur-nts can be directly compared, even if full nilarity is not satisfied. No presently known odel technique can reproduce the internal densi-conditions of a field current with particles finer an sand, because of complex problems involved scaling settling velocity and sediment diffusion. odels can be used to compare alternative solu-ons, however. A study of red mud discharge into ep water was described. A study of the coupling tween fluid and the particles in a horizontal jet as described. Such information is useful for aluation of scale effects due to distortion of par-al diameters in models. The deposition patterns ere compared with observed deposition of ore aste into a lake. (See also W76-10415) (Sims-WS)
76-10449

WO-DIMENSIONAL FINITE ELEMENT ISPERSION MODEL,
ames and Moore, Cranford, N.J.
. Leimkuhler, J. Connor, J. Wang, G.
hristodoulou, and S. Sundgren.
: Symposium On Modeling Techniques, Volume ; 2nd Annual Symposium of the Waterways, arbors and Coastal Engineering Division of SCE (2 Vol.), San Francisco, California, Sep-mber 3-5, 1975. American Society of Civil En-neers, New York, p 1467-1486, 1975. 11 fig, 9 ref.

escriptors: *Model studies, *Dispersion, *Finite ement analysis, Mathematical models, Circula-on, Water circulation, Bays, Sediments, spended solids, Pollutants, Path of pollutants, assachusetts.
entifiers: *Massachusetts Bay(Mass).

he development of a finite element model to lve the vertically integrated form of the convec-on-diffusion equation was described. The verti-l integration of the governing equation reduces e problem to two dimensions. This limits the odel's predictive capability in problems having gh variation of velocity over depth. However, e greatly reduced storage and computation costs this approach make it a worthwhile alternative a full three-dimensional model. The Galerkin ethod with the linear weighting function was ed in the finite element formulation. Variable epth was included in the arbitrarily shaped solu-on field. Along with the water body geometry, e model inputs required are water velocities, spersion coefficients and decay factors at vari-us points in the solution field. These values may e given as constants or as functions of space and me. The model was verified by comparison with several analytical solutions. The model was then applied to the dispersion of suspended sediments in Massachusetts Bay. A recently developed finite element circulation model was employed to generate velocities for the model. Certain stability problems that occasionally arise with the use of the model were discussed and techniques to avoid such problems were presented. (See also W76-10415) (Sims-ISWS)
W76-10453

EXCHANGE FLOW BETWEEN LAKE ONTARIO AND HAMILTON HARBOUR,
Canada Centre for Inland Waters,Burlington (Ontario).
T. M. Dick, and J. Marsalek.
Canada Centre for Inland Waters, Scientific Series No. 36, 1973, 22 p. 9 fig., 14 ref., 6 tab.

Descriptors: *Mixing, *Lake Ontario, Water level fluctuations, Density, Currents, Landfills, Operations, Water quality, *Canada, Industrial wastes, Lakes, Flow characteristics, Water pollution sources, *Path of pollutants.
Identifiers: *Hamilton Harbour(Ontario), Burlington Canal(Ontario), Industrial pollution, *Exchange flow(Lakes).

A hydraulic study of the exchange flow between Hamilton Harbour and Lake Ontario reveals the necessity to consider short term transitory water level fluctuations to estimate mass exchange. Field studies identified the development of a strong thermal wedge and density current which increases the mass exchange. Data on the thermal wedge were used to examine the two dimensional wedge theory. Some calculations were also done on the effect of harbour land filling on the mass exchange. (Environment Canada)
W76-10496

5C. Effects Of Pollution

HIGHWAY-WILDLIFE RELATIONSHIPS VOLUME 1. A STATE-OF-THE-ART REPORT,
Urban Wildlife Research Center, Inc., Ellicott City, Md.
For primary bibliographic entry see Field 4C.
W76-10003

HIGHWAY-WILDLIFE RELATIONSHIPS VOLUME 2. AN ANNOTATED BIBLIOGRAPHY,
Urban Wildlife Research Center, Inc., Ellicott City, Md.
For primary bibliographic entry see Field 4C.
W76-10004

SELECTIVE RENOVATION OF EUTROPHIC WASTES PHOSPHATE REMOVAL,
Consiglio Nazionale delle Ricerche, Bari (Italy). Instituto di Ricercha sulle Acque.
For primary bibliographic entry see Field 5D.
W76-10026

BIOLOGICAL SURVEY OF THE SAVANNAH RIVER IN THE VICINITY OF THE SAVANNAH RIVER PROJECT. PART I - REPORT ON THE WORK DONE AND TENTATIVE CONCLUSIONS ON THE SUMMER SURVEY,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
J. E. Cole, R. R. Palmer, R. Patrick, and T. Dolan.
Available from the National Technical Information Service, Springfield, Va 22161 as TID-26669-P1, $4.00 in paper copy, $2.25 in microfiche. Report ACADOF-51-VSR, Pt. I, September 24, 1951. 28 p, 1 tab.

Descriptors: *South Carolina, Surface waters, *Sewage, *Water pollution, Flora, Aquatic fauna, *Aquatic microorganisms, *Biochemical oxygen demand, *Coliforms, *Georgia, Domestic wastes, Water pollution sources, Aquatic bacteria, On-the-site survey, Microbiology.
Identifiers: *Savannah River(SC-Geo), Upper Three Run, Augusta(Geo).

The Savannah River is a normal river of low biological productivity. This limited life is due to physical circumstances causing unfavorable ecological conditions rather than pollution. The only noticeable effects of pollution resulting from the Augusta sewage are the very high bacteria and coliform counts. Upper Three Run also shows a similar condition, which is probably due to the trailer camp and swimming area which is located at and just above the station. (See also W76-10042 and W76-10043) (Katz)
W76-10041

BIOLOGICAL SURVEY OF THE SAVANNAH RIVER IN THE VICINITY OF THE SAVANNAH RIVER PROJECT, PART II - REPORT ON WORK DONE AND TENTATIVE CONCLUSIONS ON THE FALL SURVEY,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
F. L. Carter, T. Dolan, IV, G. McCammon, S. Roback, and J. H. Wallace.
Available from the National Technical Information Service, Springfield, Va 22161 as TID-26669-P2, $4.00 in paper copy, $2.25 in microfiche. Report ACADOF-51-VSR, Pt II, (1952). 46 p, 15 fig, 1 tab.

Descriptors: *Georgia, *South Carolina, *Ecology, *Primary productivity, Aquatic productivity, *Water quality, *Coliforms, Stream, Natural stream, On-the-site survey, Food chain, Water temperature, Aquatic microorganisms, Biochemical oxygen demand.
Identifiers: *Savannah River(SC-Geo), Stream survey, Upper Three Run.

The Savannah River in the vicinity of the Savannah River Project as measured by its diversity of species is a healthy natural river. Certain adverse ecological factors limit its productivity, but it has a well balanced biodynamic cycle. The results of the fall survey substantiate for the most part the conclusion of the summer survey. The main deviation is that for some groups it seems more productive than thought at first. Upper Three Run is also a natural stream with a well balanced pattern of life. (See also W76-10041 and W76-10043) (Katz)
W76-10042

BIOLOGICAL SURVEY OF THE SAVANNAH RIVER IN THE VICINITY OF THE SAVANNAH RIVER PROJECT. PART III - REPORT ON THE WORK DONE AND TENTATIVE CONCLUSIONS ON THE WINTER SURVEY,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
F. L. Carter, T. Dolan, IV, G. McCammon, S. Roback, and J. H. Wallace.
Available from the National Technical Information Service, Springfield, Va 22161 as TID-26669-P3, $4.50 in paper copy, $2.25 in microfiche. Report ACADOF-51-VSR (Pt. III), April, 1952. 60 p, 1 tab, 25 fig.

Descriptors: *Stream, *Surveys, *Freshwater fish, Aquatic plants, Aquatic insects, *Aquatic life, *Coliforms, *Georgia, Ecology, Primary productivity, Biochemical oxygen demand, Natural stream, Water quality, *South Carolina.
Identifiers: *Savannah River(SC-Geo).

The Savannah River was studied during the third survey under winter conditions. The total amount of aquatic life was probably much the same for most groups at this time as during the time of the previous surveys. High water and the resulting ecological conditions caused a decrease in the numbers of organisms collected and the apparent population was less. There had been an apparent

seasonal change in species in most of the groups. However, in the case of the insects and fish this was more apparent than real, for during the previous surveys the organisms had been too small to be readily collected. Among the algae there had been an actual change in the common species. The number of species in the various groups remained quite comparable. According to the method used for measuring the health of a river, all stations continued to be rated as 'healthy'. (See also W76-10041 and W76-10042) (Katz)
W76-10043

SAVANNAH RIVER BIOLOGICAL SURVEY, SOUTH CAROLINA AND GEORGIA, AUGUST, 1954.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
May, 1955. 63 p, 3 fig, 1 tab, 4 ref.

Descriptors: *South Carolina, *Georgia, *Surveys, *Freshwater fish, *Sediments, Natural stream, *Water quality, *Diatoms, *Aquatic plants, *Aquatic animals, Aquatic insects, Water quality, Protozoa.
Identifiers: Aquatic protozoa, Savannah River(SC-Geo).

A survey of two stations in the Savannah River in the vicinity of the Savannah River Plant of the Atomic Energy Commission was made. The purpose was to determine the effects on aquatic life of the functioning of Clark Hill Dam. This investigation was made at the end of August, 1954. The study indicated a considerable increase of life in the river both as to numbers of species and size of populations. This increase was especially notable as compared with the summer survey made in 1951. Only in the invertebrate fauna was there no conspicuous change in total populations. The operation of the dam has reduced the silt load and stabilized the water flow. Clearer water has deepened the photosynthetic zone. The resultant greatly increased growth of plants is furnishing more food for animals. The more stable water level has enabled many of the shallower-water areas to be occupied continuously by a variety of organisms. The banks of the river, which had been continually eroding, have become more stabilized. No deleterious effects from the operation of the Savannah River Projects were observed. At the stations studied the Savannah River is classified as 'healthy'. (Katz)
W76-10044

EFFECTS OF LARGE SCALE FOREST FIRES ON WATER QUALITY IN INTERIOR ALASKA,
National Environmental Research Center, College, Alaska. Arctic Environmental Research Lab.
F. B. Lotspeich, E. W. Mueller, and P. J. Frey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 922, $5.50 in paper copy, $2.25 in microfiche. Report EPA-660/3-75-020, February, 1970. 116 p, 18 tab, 13 fig.

Descriptors: *Water quality, *Alaska, *Sediments, Aquatic environment, *Degradation(Stream), *Forest fires, *Erosion control, Water chemistry, Sediment discharge, Sediment load, Water quality, Forests, Soils, Aquatic insects, Benthos, On-the-site survey.
Identifiers: Erosion protection, Interior Alaska, Soil saturation, *Taiga(Alas), Lightning fires.

Large and frequent fires are not new to the Taiga of Alaska, nor is Alaska unique among northern regions in this respect. Interior Alaska was very dry in the summer of 1966 and thunderstorms were frequent. The fire, on which this report is based, was caused by lightning on July 23, 1966, and burned into September covering a total of over 1/4 million acres. The objectives of this study were: to develop sufficient understanding of the effects of forest fires on water quality of Alaskan streams so that it may be possible to make rational decisions for allocating manpower and funds for controlling specific fires and to develop an understanding of needs for rehabilitation (revegetation, erosion prevention, etc.) to control immediate and future polluting effects of the fire on the aquatic environment. (Katz)
W76-10045

ECOSYSTEMS ANALYSIS OF THE BIG CYPRESS SWAMP AND ESTUATIES,
Environmental Protection Agency, Athens, Ga. Surveillance and analysis Div.
For primary bibliographic entry see Field 6G.
W76-10046

CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM, A CONDENSED GUIDE TO CHEMICAL HAZARDS,
Coast Guard, Washington, D. C. Office of Marine Environment and Systems.
For primary bibliographic entry see Field 5A.
W76-10047

CHEMICAL IMPACT OF SNOW DUMPING PRACTICES,
Little (Arthur D.), Inc., Cambridge, Mass.
P. J. O'Brien, P. L. Levins, and C. H. Summers.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 764, $4.00 in paper copy, $2.25 in microfiche. Report EPA-670/2-74-086, December 1974, 39 p, 11 tab, 15 fig, 3 ref.

Descriptors: *Calcium chloride, *Chlorides, Surface waters, Runoff, *Snow removal, Snow, *Melt water, Water quality, *Lead, Water supply, Snow management, Roads, Snow melt, Nitrates, Phosphates, Chromium, Iron, New York, Massachusetts.
Identifiers: *Mohawk River(NY), *Concord River(Mass), Highway deicing chemicals.

A study was conducted to evaluate the chemical effects of dumping of snow collected from the municipal streets into watercourses or waterbodies in three selected areas: a large river (Mohawk at Schenectady, N. Y.), a smaller river (Concord at Lowell, Mass), and a small pond (Horn at Woburn, Mass.). Unusually low snowfall during the winters of 1972-73 and 1973-74 together with a nationwide gasoline shortage (which limited or curtailed snow dumping operations) resulted in insufficient data. The following conclusions are, therefore, based on limited observations and tests: 1. Little effect of snow dumping was observed in the downstream concentration of any species examined. 2. Increased chemical concentrations observed during the late summer low-flow period were as great as any effect related to salt use examined in this study. 3. The maximum possible increase in concentration of chloride was calculated to be no more than 0.04 mg/l in the waterbody of lowest dilution volume (Horn Pond). This concentration is less than precision of the assay technique used. (Katz)
W76-10049

AN ANALYSIS OF THE DYNAMICS OF DDT AND ITS DERIVATIVES, DDD AND DDE, IN MARINE SEDIMENTS
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
J. H. Phillips, E. E. Haderlie, and W. L. Lee.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 511, $5.50 in paper copy, $2.25 in microfiche. Report EPA-660/3-75-013, May 1974, 97 p., 24 tab., 6 fig., 11 ref.

Descriptors: *DDT, *DDE, *DDD, Pesticides, Laboratory analysis, Bays, Statistical methods, *Pesticide kinetics, *California, Pacific Ocean, Microorganism, *Sediments, Aquatic soils, Bottom sediments, Methodology, Sampling, *Chlorinated hydrocarbon pesticides, Pollutant identification.
Identifiers: *Monterey Bay(Calif).

Concentrations of the three chlorinated hydrocarbons, DDT, DDD, and DDE, were measured in sediments at 57 stations in Monterey Bay on the Central California coast during 1970 and 1971. Mean concentration in parts per billion was DDT 3.1, DDD 2.3, and DDE 5.4. Maximum concentrations were DDT 19.3, DDD 8.7, DDE, 20.5 parts per billion. The distribution of the three compounds within South Monterey Bay was charted. During 1973 nineteen of the original stations, representing locations that had low intermediate, and high concentration in the original survey, were resampled. The mean concentrations approximately three years later were DDT 15.5, DDD 2.3, and DDE 5.4 parts per billion with maximum levels of DDT 83.1, DDD 11.4 and DDE 17.5 parts per billion. A chart of the concentrations in South Monterey Bay revealed essentially the same distribution of chlorinated hydrocarbons. Laboratory assays were developed to determine the relative rate of decomposition in sediment placed under conditions selective for various physiologically different kinds of microorganisms. 14-C ring labelled substrates wer used in all assays. Decay of the three chlorinated hydrocarbons under aerobic conditions without additional nutrients was greater than decay under anaerobic conditions. (Katz)
W76-10050

EFFECTS OF THERMAL AND CHEMICAL DISCHARGES FROM NUCLEAR POWER PLANTS,
Battelle Pacific Northwest Labs., Richland, Wash.
W. L. Templeton, M. J. Schneider, and C. I. Gibson.
Available from NTIS, Springfield, Va 22161 as BNWL SA5206 $5.00 in paper copy, $2.25 in microfiche. Presented at I.A.E.A. Research Coordination Meeting on the Physical and Biological Effects on the Environment of Cooling Systems and Thermal Discharges atC Nuclear Power Stations, Oak Ridge National Laboratory, 18-22 November, 1974, 33 p, 7 tab, 6 fig, 14 ref.

Descriptors: *Bioassay, *Toxicity, *Water temperature, Inland waterways, Thermal power, Nuclear energy, *Columbia River, *Salmonids, Fish physiology, *Fish diseases, Physiological ecology, Animal physiology, Freshwater fish, *Thermal pollution, Pacific northwest, Heat resistance, Water pollution effects, *Chemical wastes.
Identifiers: *Gas Bubble disease, Hanford works(Wash), Biochemical responses, Blood glucose, Blood lactate, Cold shock.

Effects of the thermal discharges of nuclear power plants on the aquatic environment are reviewed, with particular emphasis of the salmonid and other fish species of the Pacific Northwest that are present near the Hanford works Washington. (Katz).
W76-10051

A REVIEW OF THE LITERATURE ON THE USE OF SIMAZINE IN FISHERIES,
Fish and Wildlife Service, LaCrosse, Wis. Fish Pesticide Research Unit.
W. L. Mauck.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-235 455, $4.50 in paper copy, $2.25 in microfiche. Report No. FWS-LR-74-16, March, 1974. 46 p., 2 tab., 78 ref.

Descriptors: *Toxicity, *Marsh management, *Reviews, *Bibliographies, *Biocides, Freshwater fish, Habitat improvement, Wildlife habitat, *Herbicides, Fish establishment, Fish farming, Aquatic fauna, Aquatic plants, Aquiculture, Water pollution effects.
Identifiers: *Simazine, Aquatic herbicides, Literature reviews.

LIBRARY U. OF I. URBANA-CHAMP.

Simazine is a systemic herbicide that has been registered and used for many years for weed control in crops and industrial areas. In recent years, the use of simazine as an aquatic herbicide has been extensively investigated. Simazine was found to be efficaceous, to have relatively low toxicity to aquatic fauna, and to be residual, but it did not accumulate in non-target organisms. Most of the required information for simazine registration as an aquatic herbicide has been acquired. Additional data for registration are needed in the areas of fish and water tolerances. Registration could be completed by late 1974 or early 1975 according to Ciba-Geigy Chemical Corporation. (Katz)
W76-10052

BIODEGRADABILITY AND TOXICITY STUDIES OF PHOTOGRAPHIC PROCESSING WASTES AT OFFUTT AFB, NEBRASKA,
Environmental Health Lab., Kelly AFB, Tex.
J. F. Thomas, and E. E. Lefebvre.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-784 786, $4.00 in paper copy, $2.25 in microfiche. EHL(K) 74-16, July, 1974, 31 p., 9 tab., 4 fig., 9 ref.

Descriptors: *Toxicity, *Bioassays, *Minnows, *Silver, *Biochemical oxygen demand, *Sludge digestion, *Chemical oxygen demand, Laboratory studies, *Biodegradation, Metahodology, Sewage treatment Oxygen, Nebraska, Water pollution effects.
Identifiers: *Fathead minnow, Pimephales promelas, *Photographic processing wastes, Offutt AFB(Neb), Respirometer, Warburg.

Biodegradation and toxicity studies were completed for photographic processing wastewaters generated by the 544th Aerospace Reconnaissance Technical Wing (SAC) Photo Plant at Offutt AFB, Nebraska. Two sets of samples were collected from the generated wastewaters, one in March and the other in September 1972. Composite samples were prepared from each of the sets and evaluated for biodegradability and toxicity. The toxicity studies were performed by using Pimephales promelas (Fathead Minnow) as test animals and the effluent from a bench-scale activated sludge plant treating the composite photowaste samples. The toxicity of the photowaste composite prepared from the March set of samples was approximately 20 times that of the composite prepared from the September set of samples after treatment. The biodegradation and toxicity potentials of photo processing wastewaters will be dependent upon the type of processing, quantity of processing, silver recovery, reprocessing and recycling of the generated wastes prior to entering the biodegradation system. (Katz)
W76-10053

WATER QUALITY DATA FROM TRUCKEE AND CARSON RIVERS. PYRAMID LAKE AND LAHONTAN RESERVOIR, A WORKING PAPER.
Environmental Protection Agency, San Francisco, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 930 $5.00 in paper copy $2.25 in microfiche. October, 1971. 74 p., 27 tab., 13 fig.

Descriptors: *Water quality, *Navada, Surface waters, *Irrigation design, *Waste water disposal, *Phosphates, *Water temperature, *Eutrophication, Lake Basin, Irrigation, Water management(Applied), Land development, Water rights, Irrigation practices, Benthic organisms.
Identifiers: Truckee River(Nev), Carson River(Nev), Pyramid Lake(Nev), Lahontan Reservoir(Nev).

Recommendation are made for operating criteria and procedures that would maximize the use of flows required to meet the water entitlement of the Truckee-Carson Irrigation District (TCID) and to minimize diversion of the Truckee River so that as much water as possible could be provided to Pyramid Lake. Developing such recommendations involved maing economic, population, and waste load projections; predicting the effects of planned development projects and proposed management plans, and determining water needs within the river basins. (Katz)
W76-10054

CONSIDERATIONS ON THE EFFECTS OF HIGH TEMPERATURES ON ALGAE AND FISHES, A LITERATURE REVIEW, 1954,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
E. L. Verplanck, N. M. Wallace, and J. Cairns, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as TID 26670 $5.00 in paper copy, $2.25 in microfiche. May, 1954. 82 p., 7 tab., 212 ref.

Descriptors: *Review, *Bibliographies, *Thermal pollution, Water pollution effects, *Nuclear power plants, Temperature, Environmental effects, Laboratory analysis, Freshwater fish, Algae, *Water temperature, Electric power, Diatoms, *Lethal limit, Georgia, South Carolina.
Identifiers: *Savannah River(SC-Geo), Upper-lethal temperature, Acclimation, Literature reviews.

This review of the literature demonstrates that prolonged and uniform heating of a body of water to 33 to 55C would be deleterious to the fish and algae characteristic of southern temperate rivers such as the Savannah. However, if certain areas of the river could be maintained below this temperature the fishes could retreat to such areas provided the oxygen content and other environmental characteristics were suitable. Likewise, if certain chregions in shallow water could be maintained with temperatues of 30C or lower a diversified algal flora would survive in such areas. (Katz)
W76-10055

PRELIMINARY ENVIRONMENTAL SURVEY, NEWPORT ARMY AMMUNITION PLANT, NEWPORT, INDIANA, JANUARY, 1973,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Lab.
J. G. Pearson, D. A. Stiles, E. S. Bender, and J. S. Gibson.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A001 537, $3.50 in paper copy, $2.25 in microfiche. Special Publication, EB-SP-74010, October, 1974. 67 p, 14 fig, 68 ref.

Descriptors: Environment, Aquatic environment, Terrestrial habitats, *Wildlife habitats, Chemical industries, Mammals, Birds, Freshwater fish, Environmental control, Balance of nature, Habitats, Industries, *Indiana, Reptiles, Amphibians, Invertebrates, Wildlife, *Chemical wastes, Surveys.
Identifiers: Newport Army Ammunition Plant(Ind), *Ammunition industry wastes, Vermilion County(Ind), Woodlands, Rare species, Endangered species.

The information compiled was used to design and interpret results from an ecological survey initiated at Newport Army Ammunition Plant, Newport, Indiana in November 1972 to biologically assess the effects of installation operation. This report contains background information on the nature of Newport Army Ammunition Plant and the surrounding county, the natural resources at the installation, and actual or potential environmental impact on these resources from operations at Newport Army Ammunition Plant. (Katz)
W76-10056

ZINC PHOSPHATE GRANULES IN TISSUE SURROUNDING THE MIDGUT OF THE BARNACLE BALANUS BALANOIDES,
Natural Environment Research Council, Anglesey (Wales). Unit of Marine Invertebrate Biology; and University Coll. of North Wales, Menai Bridge. Marine Science Labs.
G. Walker, P. S. Rainbow, P. Foster, and D. L. Holland.
Marine Biology, Vol. 33, No. 2, p. 161-166, 1975. 1 fig., 2 tab., 21 ref.

Descriptors: Inorganic Compounds, *Phosphates, *Crustaceans, Animal physiology, Zinc, *Cytological studies, *X-ray analysis, Metals, *Absorption, *Chemical analysis, Analytical techniques, Magnesium, Calcium, Potassium, Iron, Invertebrates, Methodology, Spectrophotometry, Electron microscopy, Environmental effects, Trace elements, *Pollutant identification.
Identifiers: Balanus balanoides, Bioaccumulation, *Barnacles, *Tissue analysis, *Zinc phosphate.

The chemical composition of inorganic granules found in parenchyma cells surrounding the midgut of adult Balanus balanoides (L.) was determined. X-ray microanalysis indicated the presence of magnesium, phosphorous, potassium, calcium, iron and zinc in the granules. A quantitative analysis of granule-rich pellets isolated from the midguts of adult barnacles showed that the granules were composed mainly of zinc phosphate, the remaining elements being minor constituents only. (Katz)
W76-10057

SOME ASPECTS OF RECOLONIZATION OF CORAL ROCKS IN EILAT (GULF OF AQABA) BY FISH POPULATIONS AFTER POISONING,
Tel-Aviv Univ., (Israel). Dept. of Zoology.
N. Gundermann, and D. Popper.
Marine Biology, Vol. 33, No. 2, p. 109-118, 1975. 1 tab., 6 fig., 13 ref.

Descriptors: *Fishkill, *Poisons, *Toxicants, Coral, Fish populations, Water pollution effects, *Pesticides, Aquatic habitats, *Juvenile fish, *Food webs, *Benthos, Tropical regions, Aquatic environments, Fish behavior, Algae, Endrin, *Chemical wastes, Growth rates, Reefs.
Identifiers: Recolonization, Tropical fish, *Coral fish, Damsel fish, Barracuda, Lion fish, Scaridae, Labridae, Sparidae, Ciandrin, Ariosal, Kavion, *Red Sea.

As a result of an accident, a limited strip of the coast of Eilat (Gulf of Aqaba, Red-Sea) was affected by pesticides and chemicals that killed all fishes. The area was observed monthly for the following year, to study the recovery of fish populations. The study also included observations on growth rate of fish and size populations. Recovery of fish populations was complete 10 to 12 months after the poisoning. It is believed that this is due to the relatively small size of the contaminated area and the survival of most invertebrates that constitute an important part of the biotope of the fish. (Katz)
W76-10058

EFFECT OF TEMPERATURE AND TEMPERATURE ADAPTATION ON CALCIFICATION RATE IN THE HERMATYPIC CORAL POCILLOPORA DAMICORNIS,
Loma Linda Univ., Calif. Dept. of Biology.
C. D. Clausen, and A. A. Roth.
Marine Biology, Vol. 33, No. 2, p. 93-100, 1975. 3 fig., 4 tab., 17 ref.

Descriptors: Environmental effects, Animal physiology, *Radioisotopes, Coral, Reefs, Temperature, *Calcium, Analytical techniques, *Growth rates, *Adaptation, Calcium compounds, Marking techniques, Tracers, Aquatic animals, Benthic fauna, Laboratory tests, Calcium car-

bonate, Invertebrates, Animal growth, *Water temperature, *Thermal pollution, Pollutant identification, Water pollution effects.
Identifiers: *Pocillopora sp., *Calcification rate.

Using 45Ca incorporation into the coral skeleton as a measure of calcification rate, the effect of temperature on calcification rate was studied in the hermatypic coral Pocillopora damicornis. Both immediate and longterm (adaptation) effects were investigated. Temperature has a marked effect on rate - an effect that varies depending on the temperature history of the coral (i.e., temperature adaptation occurs). P. damicornis showed both 27 and 31 C temperature optima, one or the other being dominant depending on the natural water temperature to which the coral was adapted. The two optimum temperatures may indicate two isoenzymes or two alternate metabolic pathways involved in the calcification process. (Katz)
W76-10059

PHOTOSYNTHETIC STUDIES OF CHONDRUS CRISPUS,
New Hampshire Univ., Durham. Dept. of Botany.
A. C. Mathieson, and T. L. Norall.
Marine Biology, vol. 33, No. 3, p. 208-213, 1975. 2 fig., 20 ref.

Descriptors: Plant physiology, *Photosynthesis, Temperature, Genetics, *Seasonal, *Light, Environmental effects, *Respiration, *Spatial distribution, *Intertidal areas. *Adaptation, Energy conversion, Primary productivity, Laboratory tests, Carbon cycle, Plant breeding, Summer, Reproduction, Aquatic plants.
Identifiers: Net photosynthesis, *Chondrus crispus, Irish moss.

The net photosynthesis of intertidal, subtidal, carposporic, tetrasporic, and winter versus summer acclimatized plants of Chondrus crispus were evaluated under different temperatures and quantities of light. The optimum temperature and light conditions for net photosynthesis are seasonally and spatially variable, and there is an adaptive shift in the photosynthetic capacity at different seasons and positions on the shore. Plants collected during the fall and winter had lower light optima (465 to 747 ft-c) for net photosynthesis than spring and summer specimens (about 1000 ft-c). Intertidal populations exhibited a higher rate of net photosynthesis between 250 and 2819 ft-c than subtidal plants. Temperature tolerance was greater in summer plants and shallow subtidal plants, than in winter plants and deep subtidal plants. Tetrasponic plants (diploid) showed a higher rate of net photosynthesis than carposporic plants (haploid) and may extend deeper in the subtidal zone because of this. (Katz)
W76-10060

TUBE-WORM-SEDIMENT RELATIONSHIPS IN POPULATIONS OF PECTINARIA GOULDII (POLYCHAETA: PECTINARIIDAE) FROM BARNEGAT BAY, NEW JERSEY,
Rutgers-The State Univ., New Brunswick, N. J. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W76-10061

ULTRASTRUCTURAL CHANGES IN THE HEPATOCYTES OF GREEN SUNFISH, LEPOMIS CYANELLUS RAFINESQUE, EXPOSED TO SOLUTIONS OF SODIUM ARSENATE,
Texas Univ. at Austin. Dept. of Zoology.
E. M. B. Sorensen.
Journal of Fish Biology, Vol. 8, No. 3, p. 229-240, 1976. 8 fig., 1 tab., 37 ref.

Descriptors: *Sunfishes, *Bioassay, Laboratory tests, *Arsenic compounds, *Absorption, *Cytological studies, Morphology, *Toxicity, Water pollution effects, Pathology, Fish physiology, Methodology, Analytical techniques, Electron microscopy, *Fish diseases, *Pollutant identification.
Identifiers: Lepomis cyanellus, Bioaccumulation, Hepatocytes, Liver, Sublethal effects, *Sodium arsenate.

The rate and level of arsenic accumulation in the liver of green sunfish is greater than that in the other organs examined. The level to which arsenic is concentrated is positively associated with the concentration of arsenic in solution in the immediate environment of a fish, the duration of exposure to arsenic, and water temperature. Since it was found that accumulation causes histopathological changes, a study was made to examine the appearance of and rate of change in hepatocyte ultrastructure morphology, following exposure to arsenic concentrations of 0, 30, or 60 ppm and after exposure times of one, two, or three weeks at 20 C. As arsenic concentration and exposure time increased, electron dense particles were observed, and the numbers of intranuclear and cytoplasmic electron dense particles and aberrant mitochondria increased. Also, lysosomes and smooth endoplasmic reticulum increased in number, while the number of myelin figures decreased. (Katz)
W76-10062

INFLUENCE OF TEMPERATURE AND SALINITY ON ROUTINE METABOLIC RATE AND GROWTH OF YOUNG ATLANTIC MENHADEN,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
W. F. Hettler.
Journal of Fish Biology, Vol. 8, No. 1, p. 55-65, 1976. 7 fig., 4 tab., 21 ref.

Descriptors: *Salinity, *Temperature, *Growth rates, Environmental effects, Laboratory tests, *Juvenile fish, *Fish behavior, *Metabolism, Respiration, Analytical techniques, Saline water fish, Estuaries, Juvenile growth stage, Larvae, Aquatic environment, Feeding rates, Water pollution effects.
Identifiers: *Menhaden, Sublethal effects.

Factors affecting the metabolic rate of schooling juvenile menhaden were examined. Temperature had little effect on routine metabolic rates of juveniles. Variations in salinity affected metabolic rate with a possible indication that metabolic rate is lowest at intermediate salinities. The metabolic cost of maintaining water balance and ion exchange may account for the increased oxygen consumption at high and low salinities. Feeding caused a twofold increase in metabolic rate due in part to rapid swimming during the feeding period. Starvation resulted in a decreased metabolic rate. Larvae raised at high salinity (28-34 ppt) were found to grow at a significantly slower rate than menhaden larvae raised at low salinity (5-10 ppt). Results may be due to differences in activity and additional replications are necessary. (Katz)
W76-10063

A COMPARISON OF GROWTH AND ABUNDANCE FOR TIDAL POOL FISHES IN CALIFORNIA AND BRITISH COLUMBIA,
Guelph Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W76-10064

EFFECTS OF HYPERBARIC PRESSURE ON OXYGEN CONCENTRATION IN THE SWIM BLADDER OF POECILIA LATIPINNA,
Miami Univ., Fla. Dept. of Anesthesiology.
S. Ross.
Journal of Fish Biology, Vol. 8, No. 1, p. 1-4, 1976. 1 fig., 16 ref.

Descriptors: *Pressure, Depth, *Laboratory tests, *Fish physiology, *Oxygen, *Hydrostatic pressure, Environmental effects, *Hydrogen ion concentration, Teleosts, Gases, Methodology, Analytical techniques, Aquatic environment, Water pollution effects.
Identifiers: *Poecilia latipinna, Swim bladder, Gas gland, Blood chemistry.

Poecilia latipinna was subjected to varying hydrostatic pressures in the laboratory. The hyperbaric chamber is suitable apparatus for testing gas gland secretion in this teleostean fish. Oxygen concentration within a swim bladder increased with increasing hydrostatic pressure. Pressures encountered by fishes at various levels of the water column and their effects on oxygen concentration in the swim bladder may be simulated in the laboratory. (Katz)
W76-10066

IRRADIANCE REDUCTION: EFFECTS ON STANDING CROPS OF THE EELGRASS, ZOSTERA MARINA IN A COASTAL LAGOON,
San Diego State Univ., Calif. Dept. of Botany.
T. W. Backman, and D. C. Barilotti.
Marine Biology, Vol. 34, No. 1, p 33-40, 1976. 6 fig., 3 tab., 26 ref.

Descriptors: *Environmental effects, *Plant growth, *Growth rates, *Light intensity, *Productivity, *Light penetration, *Lagoons, *Marine plants, *On-Site investigations, Shallow water, Standing crops, Primary productivity, Population, Methodology, Biomass, Seasonal.
Identifiers: *Zostera sp., *Eelgrass, *Shade, *Irradiance.

Abundance of the eelgrass Zostera marina was studied in a coastal lagoon in southern California and was found to correlate with the level of irradiance at depths greater than 0.5 m below tidal datum. Results of controlled field experiments, using canopies to reduce downwelling illuminance by 63%, confirmed that turion density is a function of the irradiance the plants receive. By Day 18 of the experiment, turion density in the shaded experimental areas had decreased compared to the density of unshaded controls. Flowering in the experimenal areas was also inhibited by shading. The biological implications are discussed in terms of seasonal changes and man's intervention in the natural process of coastal lagoons. (Katz)
W76-10067

PETROLEUM HYDROCARBONS: DEGRADATION AND GROWTH POTENTIAL FOR ATLANTIC OCEAN SEDIMENT BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, J. J. Calomiris, T. L. Herbert, and R. R. Colwell.
Marine Biology, Vol. 34, No. 1, p 1-9, 1976. 4 fig., 6 tab., 20 ref.

Descriptors: *Biodegradation, *Growth rates, Aquatic bacteria, Organic compounds, *Sediments, *Bacteria, *Degradation(Decomposition), *Pseudomonas, Nutrient requirements, Sampling, Laboratory test, Analytical techniques, Microorganisms, Environmental effects, Marine bacteria, Methodology, *Oil pollution, Water pollution effects, Atlantic Ocean.
Identifiers: *Petroleum Hydrocarbons.

Water, sediment, and microorganisms were sampled at stations along a trackline in the Atlantic Ocean off the North Carolina Coast at depth of 9 to 5,000 m. Selected chemical and physical parameters were measured. At three of the stations, microorganisms isolated from sediment were examined for ability to degrade a number of petroleum hydrocarbons. Media made up with seawater or salts solution supplemented nitrate and phosphate were employed in the degradation study; significant growth and hydrocarbon degradation was observed. Bacteria from sediment

amples collected at a depth of 5,000 m showed greater growth and and hydrocarbon degradation when cultured in a sea-water medium than in nedia made up with salts solution. Growth of bacteria in sediment samples collected at two stations vas found to be suppressed in seawater medium vhen a 1% (v/v) mixture of 19 different petroleum ıydrocarbons was added. The hydrocarbon mixure was useful in determining the hydrocarbons legrading potential of microorganisms isolated rom the ocean environment. (Katz)
V76-10068

PHYSICAL FACTORS CONTROLLING ABUNDANCE OF MEIOFAUNA ON TIDAL AND ATIDAL BEACHES,
ordan Univ., Amman. Marine Science Proramme.
For primary bibliographic entry see Field 5A.
V76-10069

ASPECTS OF PHYSIOLOGICAL CONDITION N MYTILUS EDULIS L., WITH SPECIAL REFERENCE TO THE EFFECTS OF OXYGEN TENSION AND SALINITY,
nstitute for Marine Environmental Research, Plymouth (England).
. L. Bayne.
n: Proceedings, 9th European Marine Biology Symposium, H. Barnes, ed, Aberdeen University Press, p. 213-238, 1975. 2 tab., 12 fig., 60 ref.

Descriptors: * Salinity, *Dissolved oxygen, Amino acids, Stress, Animal physiology, Environmental effects, Adaptation, *Mussels, Temperature, *Feeding rates, Compensation, Reviews, Invertebrtes, Laboratory tests, Nitrogen, Crustaceans, Marine animals.
Identifiers: Mytilus edulis, Sublethal effects.

A definition of stress, as applied to marine bivalves, is offered. Experiments on the physiological responses of Mytilus edulis to reduced oxygen tension and reduced salinity are described. Mechanisms of compensation for reduced oxygen tension include a reduction in the ventilation relative perfusion ratio and an increase n the extraction efficiency for oxygen; these rocesses result in complete acclimation of the ate of oxygen consumption at an oxygen tension f 80 mm Hg, and partial acclimation at 40 mm Hg. Compensation for reduced salinity involves increased rates of excretion of ammonia, loss of certain amino acids, and a decline in the concentraon of free amino acids in the mantle tissue consistent with previous studies of volume regulation. The physiological condition of the animal may be ssessed in terms of simple, integrated physiologial measurements, such as the 'scope for growth' nd the 'O:N ratio.' Linked to measurements of ne degree of 'disadvantage' the results of a stress ondition, they may be used to further understand ne ecology of the species. (Katz)
V76-10070

THE IMPORTANCE OF DISSOLVED ORGANIC COMPOUNDS IN SEA WATER FOR THE NUTRITION OF ANEMONIA SULCATA PENANT (COELENTERATA),
Cologne Univ. (West Germany). Zoological Institut.
. Schlichter.
n: Proceedings 9th European Marine Biology ymposium, H. Barnes, ed. Aberdeen University ress, p. 395-406, 1975. 10 fig., 21 ref.

Descriptors: *Nutrients, *Cytological studies, Nutrient removal, *Nutrition, Tracers, Animal hysiology, Temperature, *Animal metabolism, Absorption, *Organic compounds, *Amino acids, Carbohydrates energy, Biological membranes, Mode of action, Analytical techniques, Methodology, Laboratory tests, Pollutant identification, Water pollution effects.
Identifiers: *Anemonia sp., Bioaccumulation, Dissolved organic compounds.

Anemonia sulcata absorbs and accumulates tritiated L-amino acids and D-glucose dissolved in artificial sea water in their natural concentrations. Absorption occurs through the apical membrane of the ectoderm due to cytological structures. The cells can concentrate the free organic compounds by a factor of 106 the concentration found in the medium. Absorption is affected by temperature and inhibitors and uptake is dependent on energy available. Naturally occurring changes in abiotic environmental factors do not adversely influence the capacity to take up organic compounds. Glucose does not influence the uptake of amino acids while the amino acids can interfere with each other. This suggests absorption by different 'carrier systems.' Calculations show that actinians satisfy a substantial portion of their metabolic requirement by absorbing dissolved organic material from the environment. (Katz)
W76-10071

ON THE RELATIONSHIP BETWEEN OXYGEN CONSUMPTION AND FEEDING LEVEL IN DECAPODS,
London Univ. (England). Dept. of Zoology and Comparative Physiology.
J. C. Aldrich.
In: Proceedings 9th European Marine Biology Symposium, H. Barnes, ed. Aberdeen University Press, p. 407-418, 1975. 3 fig., 25 ref.

Descriptors: *Respiration, *Oxygen requirements, *Animal physiology, *Metabolism, *Feeding rates, Size, Laboratory tests, *Crustaceans, *Crabs, Animal behavior, Temperature, Invertebrates, Energy conversion, Biorhythms, Diurnal.
Identifiers: *Hepatopancreas, Libinia sp., Carcinus sp., Cancer sp., Decapods.

Feeding level has been shown to affect the rate of oxygen consumption in some decapods, namely, an oxyrhynchous crab, Libinia emarginata, and two brachyrhynchous crabs, Cancer pagurus and Carcinus maenus. The size of the hepatopancreas suggests the relative rate of energy flow, a relationship apparently paralleled by the rate of food consumption. On a population basis, the average maximum rate of oxygen consumption appears to indicate the average level of feeding. On an individual basis, the analysis is complicated by great variability with a 3-5 times range of oxygen consumption rate in non-motile crabs kept at constant temperature, both fed and starved. An attempt has been made to distinguish between effects attributable to single meals and excitement and those due to hepatopancreas size and nutritive levels. The possibility of correlating individual oxygen consumption rates and nutritive levels is discussed. (Katz)
W76-10072

AUTUMN MIGRATION AND VERTICAL DISTRIBUTION OF THE BROWN SHRIMP CRANGON CRANGON L. IN RELATION TO ENVIRONMENTAL CONDITIONS,
Rijsinstituut voor Visserijonderzoek, Ymuiden (Netherlands).
R. Boddeke.
In: Proceedings 9th European Marine Biology Symposium, H. Barnes, ed. Aberdeen University Press, p. 483-494, 1975. 10 fig, 12 ref.

Descriptors: *Shrimp, *Reproduction, Seasonal, *Temperature, On-site investigation, Environmental effects, *Autumn, Migration, *Migration patterns, Sexual maturity, *Mature growth stage, *Immature growth stage, *Salinity, Tidal waters, Shellfish, Animal behavior, *Spatial distribution, Temporal distribution, Life cycles, Movement, Population.
Identifiers: Crangon crangon, *Brown shrimp.

The causes of the autumnal migration of the brown shrimp are induced by fluctuations of the water temperature, especially those in the tidal zone, caused by seasonal differences between air and water temperatures. Sexually mature shrimps are more sensitive to temperature fluctuations than sexually less mature shrimp. The autumn migration parallels a period of increasing sexual activity and appears to be a regular process in which waves of shrimps in decreasing stages of sexual ripeness migrate to the open sea one after another. By this rigid patterned process of migration the density of the inshore population is reduced in a regular way, leaving the sexually least mature animals in the areas with the richest food supplies and returning the sexually more mature animals to more or less the same area where they hatched. (Katz)
W76-10073

DIFFERENCES IN LOW PH TOLERANCE AMONG STRAINS OF BROOK TROUT (SALVELINUS FONTINALIS),
Pennsylvania State Univ., University Park. Dept. of Biology.
G. D. Robinson, W. A. Dunson, J. E. Wright, and G. E. Mamolito.
Journal of Fish Biology, Vol. 8, No. 1, p. 5-17, 1976. 2 tab., 5 fig., 24 ref.

Descriptors: *Hydrogen ion concentration, *Acidic water, *Bioassay, *Brook trout, *Temperature, Size, *Fish genetics, Resistance, *Mortality, Acidity, Water quality, Environmental effects, Laboratory tests, Fish physiology, Salmonids, Genetics, Breeding, Water pollution effects, Seasonal.
Identifiers: Salvelinus fontinalis.

Survival time of brook trout (Salvelinus fontinalis) at low pH was directly related to size, and inversely related to temperature. Between pH 2.50 and 3.25 each increase in pH by increments of 0.25 led to a 2-3 fold increase in survival time. At higher pH's (3.25-3.75) elevations in pH by the same increments produced a 3-5 fold increase. Members of seven inbred lines of brook trout were tested for acid tolerance; the lines differed markedly providing strong evidence that acid tolerance is hereditary. Differences in survival of inbred lines were the most marked at pH 3.25. Exposure for 1 week at pH 3.75 resulted in a 20-25% decrease in survival time of 18 fish tested at pH 2.50 and 3.00. Out of a total of 24 trout tested at pH 3.75, two highly tolerant individuals were still alive after 6.1 weeks. Thus it is likely that a strain resistant to a pH below 4.1, the previously recorded lower limit, can be developed by selective breeding. (Katz)
W76-10074

TOXICITY OF POLYCHLORINATED BIPHENYLS (AROCLOR 1254) TO ADULT, JUVENILE AND LARVAL STAGES OF THE SHRIMP PALAEMONETES PUGIO,
Texas A and M Univ., College Station. Dept. of Biology.
G. Roesijadi, S. R. Petrocelli, J. W. Anderson, C. S. Giam, and G. E. Neff.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 3, p. 297-304, 1976. 1 fig., 3 tab., 16 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclor, *Lethal limit, *Bioassay, *Shrimp, Water pollution effects, *Mortality, Estuarine environment, *Larval growth stage, *Immature growth stage, *Toxicity, Chlorinated hydrocarbon pesticides, Laboratory tests, Pesticides, Estuarines, Invertebrates, Aquatic animals, Analytical techniques, *Pollutant identification.
Identifiers: *Palaemonetes sp., Sublethal effects.

Juvenile grass shrimp (Palaemonetes pugio) exposed in a laboratory test to Aroclor 1254 had 96 h LC-50 values from 6.1 to 7.8 micrograms/liter. Adult shrimp had 96 h LC-50 values from 41 to 86 micrograms/liter, showing less sensitivity to the PCB than was observed in juvenile shrimp. The effect of Aroclor 1254 on grass shrimp larvae was evident both as mortalities at 15.6 micrograms/liter

and increased duration to the post larval stage at lower exposure levels. (Katz)
W76-10075

SOME EFFECTS OF ACIDIFIED WATER ON THE EARLY DEVELOPMENT OF ROACH (RUTILUS RUTILUS L.) AND PERCH (PERCA FLUVIATILIS L.),
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
N. Johansson, and G. Milbrink.
Water Resources Bulletin, Vol 12, No 1, p 39-48, February, 1976. 2 fig, 6 tab, 7 ref.

Descriptors: *Hydrogen ion concentration, Laboratory tests, On-site investigations, Adaptation, Environmental effects, Reproduction, *Fish eggs, *Immature growth stage, Fish reproduction, Hatching, *Perches, *Acidic water, Mortality.
Identifiers: Perca sp, Rutilus sp, *Roach.

Fertilized eggs of perch (Perca fluviatilus) and roach (Rutilus rutilus) were reared at different pH values in the field and in the laboratory. The results from the laboratory tests revealed that both species showed at least a 50% decrease in hatching frequencies when reared at pH values below 5.6. At pH values below 4.6 both species studied show an almost complete lack of reproduction. The field studies with eggs from different lakes indicated that there might be an adaptation, manifesting itself as a higher frequency of hatching in water with a composition similar to that of the natural habitat. Field experiments also showed that the roach is more sensitive than perch to low pH values. (Katz)
W76-10076

EFFECTS OF KRAFT MILL EFFLUENTS ON BENTHIC MACROPHYTE ASSEMBLAGES IN A SHALLOW-BAY SYSTEM (APALACHEE BAY, NORTH FLORIDA, U.S.A.),
Florida State Univ., Tallahassee. Dept. of Biological Science.
M. S. Zimmerman, and R. J. Livingston.
Marine Biology, Vol 34, p 297-312, 1976. 8 fig, 4 tab.

Descriptors: *Distribution patterns, Plant groupings, Bays, *Biomass, Water pollution sources, Water pollution effects, Benthic fauna, Benthic flora, Biological communities, *Pulp wastes, Shallow water, *Dominant organisms, *Benthos, Biota, Population, Turbidity, Water quality, Aquatic plants, Sampling, Methodology, Statistical models.
Identifiers: Species diversity, *Apalachee Bay(Florida), Kraft mill effluents, Macrophytes.

A 14-month study was carried out to determine the impact of kraft-mill effluents on the offshore benthic macrophyte distribution in a shallow north Florida bay. A polluted river drainage system was compared to an adjoining unpolluted one. Affected areas were characterized by elevated levels of color and turbidity, reduced benthic macrophyte biomass, reduced species diversity and altered species composition. Areas of chronic impact had reduced biomass. On either side of the drainage system uniform increases in number of species were observed. Benthic macrophyte distribution, in terms of biomass and species composition, was considered an important indicator of the impact of KME on this shallow-bay system. Species normally inhabiting deeper water were found in areas of increased turbidity and color, thus explaining the maintenance of species diversity with reduced biomass. Benthic plant assemblages reflected variations in dominance and the occurrence of opportunistic species. (Katz)
W76-10077

EFFECTS OF CALCIUM, STRONTIUM, AND MAGNESIUM ON THE COCCOLITHOPHORID CRICOSPHAERA (HYMENOMONAS) CARTERAE. I. CALCIFICATION,
South Carolina Univ., Columbia. Electron Microscope Lab.
R. L. Blackwelder, R. E. Weiss, and K. M. Wilbur.
Marine Biology, Vol. 34, No. 1, p 17-22, 1976. 3 fig, 2 tab, 17 ref.

Descriptors: *Calcite, *Algae, Environmental effects, *Calcium, *Magnesium, *Strontium, Plant morphology, Mineralogy, Nutrient requirements, Analytical techniques, Laboratory tests, *X-ray diffraction, Pollutant identification.
Identifiers: *Coccolithophorids, *Calcification, *Cricosphaera sp, Coccoliths, Aragonite.

The capacity of cells to calcify in various concentrations of calcium, strontium and magnesium ions was examined following preliminary decalcification in CO2. At a concentration of .01 M Ca, 75% of the cells formed coccoliths within 24 h and almost all cells were recalcified after 2 days. At .001 and .0001 M Ca no recalcification occurred. With the addition of Sr to the Ca-deficient media, calcification took place and the percentage of calcified cells increased with increasing concentrations of Sr. Strontium added to Ca-deficient media was much more effective than an equivalent concentration of Ca. No Sr was deposited in the coccoliths. X-ray analysis demonstrated that calcite was deposited by cells in all concentrations of Ca and Sr at which calcification took place. At concentrations of Mg in the media of 0.0 to .042 M, the cells retained their ability to calcify, although calcification was reduced in the absence of Mg and only calcite was formed. (See also W76-10079) (Katz)
W76-10078

EFFECTS OF CALCIUM, STRONTIUM AND MAGNESIUM ON THE COCCOLITHOPHORID CRICOSPHAERA (HYMENOMONAS) CARTERAE. II. CELL DIVISION,
Duke Univ., Durham, N.C. Dept. of Zoology.
R. E. Weiss, P. L. Blackwelder, and K. M. Wilbur.
Marine Biology, Vol. 34, No. 1, p 17-22, 1976. 6 fig, 12 ref, 1 tab.

Descriptors: *Algae, Plant morphology, *Growth rates, *Calcium, *Strontium, *Magnesium, *Cytological studies, Plant morphology, Marine algae, Mineralogy, Nutrient requirements, Environmental effects, Marine biology, Nutrients.
Identifiers: *Coccolithophorids, *Cricosphaera carterae, *Cell division, Cell organelles.

Calcium at low levels of .001 M caused reduced growth in the alga Cricosphaera (Hymenomonas) carterae and growth was absent at .0005 M Ca. The addition of Sr to Ca-deficient media enabled cells to divide, the effect increasing with Sr concentration. When 4.6 x 1/10,000 M Sr was added to media containing 1/10,000 M Ca, the rate of division and the final cell concentration were comparable to the control (1/100 M Ca). Strontium was 20 times more effective than Ca. Cell division was nearly absent in Mg concentrations below 4.2 x 1/100,000 M. Cell size increased as the Mg concentration decreased. The lowest protein concentration was found in the absence of Mg. In media lacking Mg, cells exhibited changes in ultrastructure. Fragmentation of chloroplasts and mitochondria was also observed. (See also W76-10078) (Katz)
W76-10079

INFLUENCE OF TEMPERATURE ON BEHAVIOUR, ENERGY METABOLISM AND GROWTH OF MACOMA BALTHICA (L.),
Nederlands Instituut voor Onderzoek der Zee, Texel.
P. A. W. J. de Wilde.
In: Proceedings, 9th European Marine Biology Symposium, H. Barnes, ed. Aberdeen University Press, p 239-256, 1975. 2 tab, 8 fig.

Descriptors: *Temperature, *Growth rates, *Biomass, *Metabolism, Seasonal, Food abundance, *Benthic fauna, *Invertebrates, Animal behavior, Diurnal, Laboratory tests, *Mortality, Energy, *Feeding rates, Food chains, Food webs, Biorhythms, Methodology, Reproduction, Tidal waters, Nutrition.
Identifiers: *Macoma balthica.

Long-term laboratory experiments were conducted to determine the relationships between temperature, food availability, and internal rhythms on seasonal growth irregularities of benthic macro-invertebrates. Macoma balthica thrived best at temperatures from 0-15 C with expulsion of gametes in spring triggered by water temperatures of 10 C. Diurnal behavior patterns were observed which effected energy uptake and expenditure. At higher temperatures deposit-feeding slows down as does food intake. At 15 C the energy balance between food uptake and energy expenditure becomes negative, resulting in emaciation and mortality. Irregular growth in Macoma in its natural habitats is determined by temperature and the availability of living food. (Katz)
W76-10080

BODILY DISTRIBUTION, ACCUMULATION AND EXCRETION OF MERCURY IN A FRESHWATER MUSSEL,
Siena Univ. (Italy). Inst. of Comparative Anatomy.
S. Renzoni, and E. Bacci.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 3, p. 366-373, 1976. 2 fig., 1 tab., 14 ref.

Descriptors: *Mercury, *Bioindicators, *Mussels, Benthic fauna, *Absorption, Water pollution sources, Analytical techniques, Benthos, Shellfish, Invertebrates, Metals, Laboratory tests, *Pollutant identification.
Identifiers: Bioaccumulation, Tissue analysis, Excretion, *Paglia River(Italy).

Mussels collected from the Paglia River, which receives runoff from a mercury extraction operation, were analyzed for mercury content. The whole soft tissue of small mussels (3 cm) contained mercury in concentrations from 0.192 ppm to 0.385 ppm. The digestive gland, gonad and gill of larger mussels contained high concentrations of mercury while the mantle, foot, and adductor muscle contained little. Mercury accumulated in the adductor muscle to greater degrees as the age of the mussel increased. Excretion experiments showed the biological half-life ranged from 15 to 35 days in the gill, gonad, and digestive gland and 60 days for the other tissues. (Katz)
W76-10081

DISTRIBUTION OF SELECTED METALS IN TISSUE SAMPLES OF CARP, CYPRINUS CARPIO,
Marist College, Marist Coll., Poughkeepsie, N. Y. Environmental Science Program
R. Rehwoldt, D. Karimian-Teherani, and H. Altmann.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 3, p. 374-377, 1976. 1 fig., 2 tab., 8 ref.

Descriptors: *Metals, Absorption, Analytical techniques, Cobalt, Chromium, Iron, Zinc, *Carp, Methodology, Fish, Path of pollutants, Fish physiology, *Pollutant identification, Distribution patterns.
Identifiers: Scandium, Lanthium, *Tissue analysis, Bioaccumulation, *Danube River.

Samples of gill, liver, kidney, bone and flesh from carp taken from the Danube River were analyzed for distribution of cobalt, chromium, iron, zinc, lanthium and scandium. Homogenated samples were also analyzed to give total body burden. The

istribution of Co, Cr, Fe and Zn follow the dis-ibution for these metals in mammals, concentrat-ıg in the liver and kidneys. Co accumulates omewhat in bone tissue. Lanthium and scandium oncentrate in bone tissue. Data seem to indicate ıat though the distribution in the fish is not niform, the metals concentrate in edible portions. Katz)
/76-10082

/ATER, ITS EFFECTS ON LIFE QUALITY.
/ater Quality Research Council, Lombard, Ill.
or primary bibliographic entry see Field 5F.
/76-10087

OLLUTION EFFECTS ON SURFACE WATERS ND GROUND WATERS, (LITERATURE EVIEW),
ntario Ministry of the Environment (Toronto).
. D. Terry, and G. M. Hughes.
ournal of Water Pollution Control Federation, ol. 48, No. 6, p 1420-1433, June, 1976. 141 ref.

escriptors: *Water pollution effects, Thermal ollution, Aquatic microbiology, Biochemical ox-gen demand, Pollutant identification, Toxins, /astes, Chlorides, Heavy metals, Zinc, Copper, admium, Phenols, Nutrients, Pesticides, Herbi-des, DDT, Nitrogen Nitrate, Phosphorus, Tur-idity, Strip mine wastes, Waste treatment, lathematical models, Leaching, Landfills, Surface waters, *Groundwater, *Reviews, Bibliographies.
lentifiers: Sediment contaminants, Basin studies, /ater quality models, Lechates, Oil-field brines, ıdustrial effluents.

urface and ground water quality study were com-iled by the Ministry of the Environment of anada. The water quality perameters included in ese studies were, (1) trace metals in stream and ke sediments, (2) herbicides and pesticides, in-uding DDT, PCB's, phenoxy-acid herbicides, opper sulfate solutions, Fenthion and Dicamba,) nutrients including dissolved oxygen, nitrates nd phosphates, (4) land-use effects, including iochemical oxygen demand (BOD), heavy etals, asbestos, petroleum products, rubber, trogen and phosphorus, (5) industrial effects, in-uding contamination by chloride, pickling quors, phenolic effluent, thermal effluents and annery wastes, (6) basin studies and river pollu-on, (7) water quality models and indices, and (8) ontamination of ground water. (Heiss-NWWA)
/76-10104

LUORIDE TOLERANCE OF JAPANESE UAIL,
alifornia Univ., Davis. Dept. of Avian Science.
Vohra.
oult Sci. 52(1), p 391-393, 1973.

escriptors: *Fluorine, *Game birds, *Potable ater, Environmental effects, Mortality, Re-stance, *Lethal limit, Toxicity, Salt tolerance, /ater pollution effects, Public health.
entifiers: *Japanese quail, Toxicology.

level of 50 ppm F- in the form of NaF in the inking water of Japanese quail had no effect on ody weight, mortality, tibia weight/100 gm body eight, bone ash or egg shell thickness as com-ıred to distilled water. Levels of F- up to 200 ppm ere well-tolerated in drinking water, but a level 500 ppm was lethal.--Copyright 1973, Biological bstracts, Inc.
76-10120

SYMMETRY ANALYSIS IN FISHES: A POSSI-LE STATISTICAL INDICATOR OF ENVIRON-ENTAL STRESS,
ames and Moore, San Francisco, Calif.
W. Valentine, M. E. Soule, and P. Samollow.
S Nat Mar Fish Serv Fish Bull. 71(2), p 357-370, 73.

Descriptors: *Statistical methods, *Analytical techniques, Environmental effects, *Fish toxins, *Fish behavior, Aquatic environment, Water pollution effects, *Pollutant identification, Bioindicators, California, Mexico.
Identifiers: Amphistichus-argenteus, *Asymmetry analysis, Leuresthes-tenuis, Paralabrax-nebulifer.

One of the more difficult tasks in evaluating the possible deleterious effects of multiple toxicants on natural communities is in defining subtle effects before the onset of chronic morbidity. Before detectable changes in either species diversity or species abundance occur subtle changes must take place in a number of important processes ranging from molecular to behavioral changes. Unfortunately, changes in these parameters have proven most difficult to detect with current methodology. The possible use of fluctuating asymmetry as a possible measure of environmental stress was examined. Fluctuating asymmetry is simply the random deviation from perfect symmetry of any bilateral anatomical character. It is, therefore, a nonspecific measure of developmental perturbation. Using asymmetry analysis on 3 species of marine teleost-barred sand bass, Paralabrax nebulifer; grunion, Leuresthes tenuis; and barred surfperch, Amphistichus argenteus-from southern California and Baja California (Mexico), 2 possible asymmetry trends, historical and geographic are defined. Asymmetry values are shown to increase as we approach highly populated areas (southern California) both from the north and south and also with time within southern California. Such increased in asymmetry correlate well with the known distribution of various toxicants from this same area.--Copyright 1973, Biological Abstracts, Inc.
W76-10121

A MATHEMATICAL MODEL OF BLOOMS OF PLANKTON DIATOMS, (IN GERMAN),
Deutsche Akademie der Wissenschaften zu Berlin (East Germany). Forschungsstelle fuer Umweltgestaltung.
H. P. Kozerski.
Int Rev Gesamten Hydrobiol. 59(3), p 367-394, 1974.

Descriptors: Eutrophication, Mathematical models, Diatoms, Potable water, Europe, Plankton, Reservoirs.
Identifiers: Asterionella-formosa, *Germany.

Blooms of plankton diatoms are important to the management of drinking water reservoirs in southern East Germany. A mathematical model was developed to find optimal management alternatives. The model consists of coupled differential equations. The 1st step is a very simple model which is compared with a mass development of Asterionella formosa in the Saidenbach reservoir in the Erzgebirge. The dynamic properties of the improved model are examined with respect to various ecological parameters and initial values. Loss rate and initial biomass of phytoplankton exert the greatest influence in bloom dynamics. The results of the model are compared with a bloom of Asterionella in laboratory cultures and with recent data obtained from the reservoir. A qualitative comparison between model behavior and observations in the lake gives information about the validity range of the model parameters and provides ideas for further development. The applicability to water quality management of the model is considered.--Copyright 1975, Biological Abstracts, Inc.
W76-10127

WATER QUALITY IMPLICATIONS OF CATTLE GRAZING ON A SEMIARID WATERSHED IN SOUTHEASTERN UTAH,
Oregon State Univ., Corvallis. Rangeland Resources Program.
For primary bibliographic entry see Field 5G.
W76-10171

MODELS FOR EVALUATION OF HAZARDOUS WASTES,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5B.
W76-10190

MINERAL CYCLING IN SOUTHEASTERN ECOSYSTEMS.
Savannah River Ecology Lab., Aiken, S.C.
Available from N.T.I.S., Springfield, Va 22161 as CONF-740513, $24.75 foreign, $27.25. Proceedings of a symposium held at Augusta, Georgia May 1-3, 1974. Published by U.S. Energy Research and Development Administration, Technical Information Center, Office of Public Affairs, 1975, 898 p, CONF-740513. Edited by Fred G. Howell, John B. Gentry, and Michael H. Smith.

Descriptors: *Ecosystems, *Cycling nutrients, *Nutrients, *Southeast US, Aquatic productivity, Food chains, Estuarine environment, *Environmental effects, *Ecology, Recycling, Model studies, Path of pollutants, Biota, Marine fish, Ecological distribution, Water pollution effects, Balance of nature.
Identifiers: *Mineral cycling, Marine environment.

Papers presented during the meeting covered mineral cycling in terrestrial, freshwater, and marine environments, as well as current ideas on modeling. A plenary session examined present knowledge of the principles governing elemental flow, and contributed-paper sessions described recent advances in mineral-cycling research. A panel discussion was devoted to radiocesium in natural environments, especially those in the southeastern United States. (See W76-10267 thru W76-10331)
W76-10266

NUTRIENT RECYCLING AND THE STABILITY OF ECOSYSTEMS,
Georgia Univ., Athens. Dept. of Zoology.
J. R. Webster, J. B. Waide, and B. C. Patten.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, p 1-27. 3 fig, 4 tab, 80 ref, (CONF-740513).

Descriptors: *Stability, *Ecosystems, *Balance of nature, *Cycling nutrients, Resistance, Adaptation, Energy budget, Mathematical models.

This perspective attempts to account for alternatives for persistence at the ecosystem level and at the same time to relate ecosystem response to specific observable and measurable ecosystem attributes. The asymptotic stability of ecosystems is illustrated by equations showing that ecosystem stability is guaranteed by limitations on resource mobilization and by their dissipative character. Resistance, the ability of an ecosystem to resist perturbation, results from the accumulated structure of the ecosystem. Resilience, the ability of an ecosystem to return to a normal trajectory once displaced, reflects inherent dissipative forces. These concepts are shown to be implicit within the linear donor-based model formulations, from which four relative stability indexes were derived: Critical root measures of the system's margin of stability. Mean root is an index of system response time. Natural frequency measures resistance to displacement, and damping ratio measures resilience following displacement. Stochastic analyses indicated that an increase in the amount of recycling relative to input resulted in a decreased margin of stability, faster mean response time, greater resistance, and less resilience. Results also revealed that increased storage and turnover times paralled the relationships as those of recycling. Increase in both recycling and turnover rates produced opposite results, however, leading to a larger stability margin, faster response time, smaller resistance, and greater resilience. (See also W76-10266) (Auen-Wisconsin)

W76-10267

A THEORETICAL BASIS FOR ECOSYSTEM ANALYSIS WITH PARTICULAR REFERENCE TO ELEMENT CYCLING,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
R. V. O'Neill, W. F. Harris, B. S. Ausmus, and D. E. Teichle.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, p 28-40. 3 tab, 43 ref, (CONF-740513).

Descriptors: *Ecosystems, *Theoretical analysis, *Equilibrium, Balance of nature, Biomass, Energy budget, Energy conversion, Energy transfer, Nitrogen, Carbon, *Cycling nutrients.
Identifiers: Terrestrial ecosystems, Aquatic ecosystems.

A conceptualization of ecosystem functions considers: (1) The significance of ecosystem processes, such as element cycling, to the persistence of systems in a fluctuating environment; (2) the control mechanisms regulating these processes; and (3) the construction of a theoretical framework to synthesize available information. The theory assumes that the central strategy of ecosystems is to maintain maximum persistent organic matter, identified by a minimal set of state variables (an autotrophic base, a complex heterotrophic regulators, and a detrital pool) which are the key to the ecosystem's interactions between the components. Although other chemical species are conserved and cycled, nitrogen is of particular interest since it exists naturally in gaseous form and ordinarily must be bound in organic form to be utilized. In addition, since there are no large nitrogen reservoirs in soil minerals, conservation mechanisms would be well developed. Carbon residence times of 50 to 150 years in woody structure and soil organic matter are consistent with the potential role of accumulated organic matter as an alternate energy base to support element release essential to establish new populations after a catastrophe. The small but rapid fluxes of nitrogen through the heterotrophs are sufficient to maintain autotroph processes. (See also W76-10266) (Auen-Wisconsin)
W76-10268

A PRELIMINARY COMPARTMENT MODEL OF THE NITROGEN CYCLE IN A DECIDUOUS FOREST ECOSYSTEM,
Idaho Univ., Moscow. College of Forestry, Wildlife and Range Sciences.
For primary bibliographic entry see Field 5B.
W76-10269

A MODEL OF WATER CONTENT AND EVAPORATION FOR HARDWOOD LEAF LITTER,
Western Carolina Univ., Cullowhee, N.C. Dept. of Biology.
For primary bibliographic entry see Field 2D.
W76-10270

SIMULATION OF NITROGEN DISTRIBUTION AND ITS EFFECT ON PRODUCTIVITY IN EVEN-AGED LOBLOLLY PINE PLANTATIONS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Theoretical Production Ecology.
For primary bibliographic entry see Field 5B.
W76-10271

A MODEL OF MINERAL-ELEMENT CYCLING FOR AN INVERTEBRATE FOOD WEB IN A SOUTHEASTERN HARDWOOD FOREST LITTER COMMUNITY,
Georgia Univ., Athens. Inst. of Ecology.
C. S. Gist, and D. A. Crossley.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, p 84-106. 5 fig, 58 ref, (CONF-740513). NSF AG-199, 40-1-3-69, AEC AT(38-1)641, NSF GB-7918.

Descriptors: *Model studies, *Decomposing organic matter, *Cycling nutrients, *Forests, *Potassium, *Calcium, Litter, Biodegradation, Invertebrates, Hardwood, Deciduous forests, North Carolina, *Food webs.
Identifiers: Forest litter.

A 10-compartment model of the movement of calcium and potassium in a hardwood forest floor through a cryptozoan food web substantiates the idea that fauna may regulate the litter breakdown on the forest floor without making any great demands on the content of the material itself. The compartments were litter and microflora, Diplopoda, Cryptostigmata, Orthoptera, Pulmonata, Collembola, medium Araneida, Coleoptera, small Araneida, and Mesostigmata. Two sets of models for each element were constructed: time-varying-coefficient models based on the summer state of the system and constant-coefficient models that used the annual integrated fluxes from the first set of models. The nutrient models were supplemented by two biomass models based on the annual potassium and calcium fluxes. Results indicated that the models based on the summer states overemphasized the contribution of mesofauna to litter decomposition. On the basis of the annual nutrient models, Cryptostigmata and Collembola were the most important saprovores and small Araneida and Mesostigmata were the most important predators. The biomass model, based on calcium fluxes, showed that saprovores accounted for possibly 20% of the total annual input. The saprovores in the potassium model accounted for only 1% of the total potassium flux from the litter compartment. (See also W76-10266) (Auen-Wisconsin)
W76-10272

FREQUENCY DISTRIBUTIONS OF RADIOCESIUM CONCENTRATIONS IN SOIL AND BIOTA,
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5B.
W76-10273

FACTOR ANALYSIS: AN EXPLORATORY TECHNIQUE APPLIED TO MINERAL CYCLING,
Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 5B.
W76-10274

A SPECIFIC-ACTIVITY AND CONCENTRATION MODEL APPLIED TO CESIUM MOVEMENT IN AN OLIGOTROPHIC LAKE,
Oak Ridge National Lab., Tenn.
H. A. Vanderploeg, R. S. Booth, and F. H. Clark.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 142-165. 7 fig, 2 tab, 23 ref.

Descriptors: *Mathematical models, *Radioisotopes, *Systems analysis, Movement, Dynamics, Cesium, Lakes, Sediment-water interfaces, Biological communities, Equations, *Oligotrophy, Eutrophication, Path of pollutants.
Identifiers: *Specific activity, Cs-137.

A linear systems-analysis model is designed to simulate the time-dependent dynamics of specific activity and concentration of radionuclides in aquatic systems. Transfer coefficients were determined for movement of Cs-137 in the components of an oligotrophic lake. These coefficients were defined in terms of basic environmental and ecological data so that the model can be applied to a wide variety of sites. Simulations with a model that ignored sediment-water interactions predicted much higher Cs-137 specific activities in the lake water and biota than did those with the complete model. Comparing Cs-137 concentrations predicted by the model with concentrations reported for the biota of an experimentally contaminated oligotrophic lake indicated that the transfer coefficients derived for the biota are adequate. A control diagram for simulating the flow of specific activity in a hypothetical oligotrophic lake is given. Specific activity in a compartment is controlled only by the flows entering the compartment and by loss of specific activity because of radioactive decay. In contrast, the amount of radionuclide in a lake compartment is regulated by both inflow and outflow. All organisms in the model, except fishes, can be treated as single compartments. Fishes are characterized by collective rate coefficients representing fast and slow compartments. (See also W76-10266) (Auen-Wisconsin)
W76-10275

THE ROLE OF PHYSICAL MODELING IN MARSH-ESTUARINE MINERAL-CYCLING RESEARCH,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5B.
W76-10276

SYSTEMS MODELS FOR PHOSPHORUS MANAGEMENT IN FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
M. W. Gilliland
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems' 1975, (CONF-740513), p. 179-208. 7 fig, 2 tab, 38 ref. NOAA SG R/EA-3.

Descriptors: *Model studies, *Florida, *Phosphorus, *Systems analysis, Cycling nutrients, Estuaries, Mining, Aquatic productivity, Management.
Identifiers: Peace River(Fla), Phosphorus budget, Phosphorus mining, Phosphorus cycle, Charlotte Harbor(Fla).

The percent effect on the overall geochemical cycle of the phosphorus flows in peninsular Florida was determined by evaluating an overall state phosphorus budget model. Through mining, Florida is draining its phosphorus supply 125 times as fast as it is replaced. Phosphorus mobilized by mining was three orders of magnitude higher than the phosphorus cycling through its waterways. Digital computer simulation of the phosphorus flux in the Peace River Estuary showed the relative importance of projected changes in mining and population. Total phosphorus in the system ranged from 0.3 to 1.0 mg/l. Simulations indicated that daily mining-water discharges had little effect on total P concentrations and that periodic spills from slime ponds in the mining district elevated P levels for many years. Analog computer simulations of a productivity model for the Peace River mouth (Charlotte Harbor) indicated that high phosphorus levels keep nitrogen levels low (less than 0.1 mg/l), which limits productivity; if this conclusion is valid could the extreme excess of one nutrient make an aquatic system more oligotrophic. The other question posited is whether water quality control based on the percent effect of a given flow on the overall chemical cycle may be more effective than effluent standards based on concentrations. The research implies several P management contingencies in Florida. (See also W76-10266) (Auen-Wisconsin)
W76-10277

MINERAL CYCLING IN MARINE ECOSYSTEMS,
Georgia Univ., Athens. Dept. of Zoology.
L. R. Pomeroy.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 209-223. 2 fig., 60 ref.

LIBRARY U. S. ENVIRONMENTAL ...

Descriptors: *Biological communities, *Oceans, *Stability, *Succession, *Cycling nutrients, Marine algae, Coral, Niches, Tidal marshes, Marine plants, Estuaries, Reefs, Nitrogen, Phosphorus, Ecosystems.
Identifiers: *Marine ecosystems, Sea grass meadows.

The concept that abiotic spatial variables produce a mosaic of responses, reflected by stability and diversity of marine communities, is discussed. Considered are two marine grasses, coral reefs and oceanic plankton. The net diversity of a community, therefore, is the result of population interactions taking place under temporally and spatially varying nutrient regimes and constantly interrupted by physical destruction of portions of the community which will have varying degrees of insularity with respect to repopulation. It is postulated that the most diverse communities are not necessarily the most stable; rather they have moderate resistance and resiliency. Where essential elements are present in excess of needs, populations of high stability develop; where nutrients are adequate, communities of intermediate stability develop; where nutrients are inadequate and where the specific limiting elements may change with time and space, communities are unstable. Disturbance is a significant cause of diversity in coral reefs and their successional response is comparatively slow; in planktonic communities adjacent patches of water differing in nutrient-limitation states may produce a successional mosaic. Thus, intertidal Spartina meadows are the most stable and least diverse; coral reefs are the most diverse, and appear to have intermediate stability; planktonic communities are the most unstable, have moderate to high diversity. (See also W76-10266) (Auen-Wisconsin)
W76-10278

DISTRIBUTION OF COPPER AND ZINC IN OYSTERS AND SEDIMENTS FROM THREE COASTAL-PLAIN ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
R. J. Huggett, F. A. Cross, and M. E. Bender.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 224-238, 7 fig, 21 ref. NSF-RANN GI-34-869, AT(49-7)-5.

Descriptors: *Shellfish, *Metals, *Estuaries, Oysters, Copper, Zinc, Bottom sediments, North Carolina, Virginia, Salinity, Trace elements, Rivers, Chesapeake Bay, Saline water-freshwater interfaces.
Identifiers: Newport River(NC), Rappahannock River(Va), York River(Va), Bogue Sound(NC).

A concentration gradient exists in oyster samples from the Newport River estuary, North Carolina, and in the Rappahannock and York estuaries, Virginia, with progressively higher concentrations of either copper or zinc being found in progressively fresher waters, suggesting that a natural phenomenon is responsible. Limited data did not show a concentration gradient for copper, cadmium or zinc in water as a function of salinity. That the sediments serve as a copper and zinc source to oysters was not substantiated. If gradients in concentration of dissolved and particulate copper and zinc are eliminated as possible factors controlling the inverse relationship between salinity and Cu-Zn concentrations in oysters, the following hypotheses are postulated: (1) That zinc may be assimilated from the environment along with calcium by a relative nonspecific ion-transport mechanism to satisfy the organisms' large calcium requirements; (2) at higher salinities the more abundant cations in seawater may be outcompeting the less abundant Cu and Zn for binding sites in the soft tissues; (3) that chelation or complexation of the metals in solution by natural organics, such as fulvic acids, make the elements more available to oysters. As none of these hypotheses can be validated, the metals' bioavailability to organisms, and the consequences of increased releases of metals to estuarine systems cannot be evaluated. (See also W76-10266) (Auen-Wisconsin)
W76-10279

EFFECTS OF ENVIRONMENTAL LEVELS OF MERCURY AND CADMIUM ON RATES OF METAL UPTAKE AND GROWTH PHYSIOLOGY OF SELECTED GENERA OF MARINE PHYTOPLANKTON,
Skidaway Inst. of Oceanography, Savannah, Ga.
L. B. Sick, and H. L. Windom.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 239-249, 3 fig, 2 tab, 18 ref. NSF GX-33615.

Descriptors: *Marine algae, *Heavy metals, *Absorption, Mercury, Cadmium, Toxicity, Inhibition, Georgia, Growth rates.
Identifiers: Nitzschia closterium, Carteria, Dunaliella tertiolecta.

This investigation was conducted on Nitzschia closterium, Carteria, and Dunaliella tertiolecta to determine both uptake rates and biological effects of mercury and cadmium to the levels presently occurring in the estuarine and coastal waters of Georgia. Uptake rates of labeled mercury and cadmium were found to be dependent on metal concentrations, length of exposure, and algal genus. Mercury concentrations above 40 ng/l did not significantly increase uptake rates. Cadmium uptake rates were one to two orders of magnitude lower than Hg and were directly proportional to the metal concentration between 20 to 80 ng/l. Nitzschia had higher uptake rates for both metals than Carteria or Dunaliella. Mercuric ion concentration between 30 and 350 ng/l significantly depressed algal growth. Lowered cell-division rates were accompanied by decrease in total cellular nitrogen and lipid and increases in carbon and Hg concentrations. The kinetic processes involved in metal adsorption into algal cells were probably inhibited by exposure to Hg. Differences to metal uptake rates may be attributed to enzyme kinetics, relative surface area to weight ratio of the populations, and/or general physiological adaptations of each genus to culture conditions. Changes in the algal cell chemical composition and decreased productivity caused by naturally occurring Hg levels could conceivably affect growth and productivity at higher trophic levels. (See also W76-10266) (Auen-Wisconsin)
W76-10280

THE ROLE OF SPARTINA ALTERNIFLORA IN THE FLOW OF LEAD, CADMIUM, AND COPPER THROUGH THE SALT-MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
W. M. Dunstan, H. L. Windom, and G. L. McIntire.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 250-256. 2 fig., 1 tab., 8 ref. NSF GX-33615, SG R/EE-2 (04-3-158-6).

Descriptors: *Heavy metals, *Rooted aquatic plants, *Salt marshes, *Estuaries, Lead, Cadmium, Copper, Georgia, Southeast U.S. Path of Pollutants.
Identifiers: *Spartina alterniflora.

Laboratory measurements indicated that Spartina alterniflora plays only a minor role in the cycle of lead, cadmium and copper in estuarine systems. The plants' response to high concentrations of these metals was: complete mortality to copper; inhibition and growth modification to lead; and no growth modification due to cadmium. The role of Spartina in controlling the flux of metals through the systems is negligible, as a very small portion of the metals discharged by rivers is trapped in the marsh mud or in Spartina. Above 17% the Cd is deposited in the sediment and about 3% occurs in the Spartina crop; 80% of the Cd bypasses the marsh system and enters coastal waters. About 3% of Cu was in Spartina, 22% in the sediment, and 7% flowing through the marsh system. The mean concentration of Cd in sediments surrounding Spartina was 1.19 ppm, whereas the leached fraction contained 0.45 ppm, which is close to the mean of 0.61 ppm found in the plant. The amount available to Spartina represents a very small portion of Cd and Cu in the total system. Toxic levels of lead are an order of magnitude higher than those now occurring in the environment. Increased levels of these metals would have little effect on Spartina. (See also W76-10266) (Auen-Wisconsin).
W76-10281

HEAVY-METAL CONCENTRATIONS IN SELECTED GEORGIA ESTUARINE ORGANISMS WITH COMPARATIVE FOOD-HABIT DATA,
Skidaway Inst. of Oceanography, Savannah, Ga.
R. R. Stickney, H. L. Windom, D. B. White, and F. E. Taylor.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystem,' 1975. (CONF-740513), p. 257-267. 1 fig., 3 tab., 22 ref. NSF GX-33615.

Descriptors: *Heavy metals, *Absorption, *Fish, *Estuary, Fish food organisms, Fish diets, Crustaceans, South Carolina, Georgia, Florida, Cadmium, Copper, Lead, Zinc.
Identifiers: Silver perch, Weakfish, Spot, Atlantic croaker, Star drum, Oscillated flounder, Bay whiff, Fringed flounder, Windowpane, Oyster toadfish, Blackcheck tonguefish.

Tissue levels of cadmium, copper, lead, mercury, and zinc were determined for 11 common benthic fishes in estuaries between Georgetown, South Carolina and Jacksonville, Florida, specifically, the families of Sciaenidae, Bothidae, Batrachoididae and Cynoglossidae. Analyses for the same metals were run on selected invertebrates that are important food organisms to the fishes studied. Comparison between heavy metals levels and food habits of the fishes generally indicated no positive correlation, although high levels of mercury and lead in Opsanus tau (oyster toadfish) appeared to be associated with elevated levels in crabs, its major food source. Copper and zinc were commonly higher in the tissues of invertebrates than in the fish that fed upon them. The level of trace metals in organisms from different trophic levels apparently depends more on physiological processes within each organism than on the metal concentration in the food. This relationship probably will not apply in instances where pollution loads of heavy metal concentrations high enough to overcome homeostatic mechanisms. (See also W76-10266) (Auen-Wisconsin).
W76-10282

CONCENTRATIONS OF TOTAL MERCURY AND METHYL MERCURY IN FISH AND OTHER COASTAL ORGANISMS: IMPLICATIONS TO MERCURY CYCLING,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W76-10283

NITROGEN REGENERATION BY THE CTENOPHORE MNEMIOPSIS LEIDYI,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. Kremer.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975 (CONF-740513), p. 279-290. 4 fig., 3 tab., 31 ref.

Descriptors: *Cycling nutrients, *Nitrogen, *Estuaries, *Zooplankton, Rhode Island, Ammonia, North Carolina, Virginia, Florida.
Identifiers: *Ctenophores, Comb jelly, Narragansett Bay(RI), York River estuary(VA), Pamlico River estuary(NC), Biscayne Bay(Fla).

Investigative results of nitrogen excretion rates for the comb jelly (Mnemiopsis leidyi) in Narragansett Bay, R. I., and their effect on nitrogen flux are discussed. The flux is compared with other zooplankton excretion rates in the York River estuary (Va.), Pamlico River estuary (N.C.), and Biscayne Bay (Fla.), and evaluated with respect to other nitrogen sources. Respiration is not discussed except to note that oxygen consumption and ammonia excretion agreed closely at all temperatures, yielding an oxygen to nitrogen ratio by atoms of 13:1 with an overall correlation coefficient for all observations of 0.98. Based on biomass, nitrogen excretion, primarily ammonia, was constant over time for individuals, and a direct linear function of population sample at a given temperature. The excretion rates were temperature dependent, ranging from 0.4 to 1.5 microgram atoms of ammonia, per gram of dry weight per hour between 15.8 and 24.5C. The 1971 maximum was about 60 microgram atoms ammonia/cu m/day compared to a 1972 peak of 10 microgram atoms cu m/day. The excretion rates for the four estuaries were comparable to that of other zooplankton during ctenophore abundance. However, both these nitrogen sources are small when compared with the estimated flux from the Narragansett Bay benthos in late summer. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10284

THE ROLE OF BENTHIC COMMUNITIES IN THE NITROGEN AND PHOSPHORUS CYCLES OF AN ESTUARY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
S. S. Hale.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 291-308. 7 fig., 1 tab., 42 ref. EPA T900140-04.

Descriptors: *Crustaceans, *Cycling nutrients, *Estuaries, *Benthos, *Nitrogen cycle, Metabolism, Ammonia, Nitrates, Nitrites, Phosphates, Water temperature, Amphipoda, Clams, Sediment-water interfaces, Rhode Island, Annelids, Phosphorus.
Identifiers: Narragansett Bay(RI), Bivalves.

The net sediment-water flux of ammonia, nitrate, nitrite, and inorganic phosphate in Narragansett Bay, R. I., was quantified by the nutrient regeneration role of the benthos. Preliminary attempts were made to determine the factors controlling the fluxes. Bottom chambers were used to obtain in situ measurements from an Ampelisca abdita (amphipod) community on coarse sand, a Nepthys incisa-Nucula annulata (polychaete-bivalve) community on a sandy-silt bottom, and a Mercenaria mercenaria (bivalve) community on sandy silt. Oxygen uptake was used as a measure of metabolism. Over a temperature range from 3.2 to 22.4C, ammonia flux at the sediment surface varied from -4.28 to 276.10 micromoles sq m/hr. Nitrate was transported in both directions across the sediment-water interface, varying from -66.31 to 43.43 micromoles/hr. Nitrite flux was relatively unimportant. Phosphate uptake and release ranged from -9.43 to 41.63 micromoles sq m/hr. Few significant differences were found among the three communities. Temperature exerted a strong influence on the fluxes of ammonia and phosphate. No strong correlations were found between nutrient fluxes and the concentrations of nutrients in the overlying water (with the possible exception of phosphate flux in December and January). The fluxes measured can have significant effects on the nutrient concentrations of the overlying water. (See also W76-10266) (Auen-Wisconsin).
W76-10285

RIVER INPUT OF INORGANIC PHOSPHORUS AND NITROGEN TO THE SOUTHEASTERN SALT-MARSH ESTUARINE ENVIRONMENT,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom, W. M. Dunstan, and W. S. Gardner.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' (CONF-740513), p. 309-313. 1 fig, 1 tab, 12 ref. EPA R-800372.

Descriptors: *Salt marshes, *Phosphorus, *Nitrogen, *Rivers, South Carolina, Florida, Southeast U.S., Georgia, Rooted aquatic plants, Runoff.
Identifiers: Spartina alterniflora, Nutrient sources, Pee Dee River(SC), Black River(SC), Santee River(SC), Cooper River(SC), Savannah River(Ga), Ogeechee River(Ga), Altamaha River(Ga), Satilla River(Ga), St. Johns River(Fla), Cord grass.

The Pee Dee, Black, Santee, and Cooper Rivers in South Carolina; the Savannah, Ogeechee, Altamaha, and Satilla Rivers in Georgia; and the St. Johns River in Florida account for 95% of the total discharge of fresh water to the salt-marsh estuaries between Georgetown, South Carolina and Jacksonville, Florida. The supply of inorganic phosphorus and nitrogen to the ecosystem was determined by bimonthly analyses of phosphorus, ammonia, and nitrate content of the rivers. The annual supply of inorganic phosphorus is adequate to supply the total phosphorus required by the approximately one million acres of Spartina salt marsh. The annual supply of inorganic nitrogen can supply only about 20% of that required, suggesting that much of the nitrogen in the vegetation is recycled. Input of nitrogen by atmospheric fallout is probably insignificant, as is the river supply of organic and particulate nitrogen. Computations indicated that the annual river inputs of N and P to the marshes are 220 and 10 mg atoms/sq m, respectively. If it assumed that the suspended load (averaging 15 mg/l) contains about 1% of available N, the total annual supply of N is estimated at 375 mg atoms/N sq m in addition to that supplied as dissolved nitrate and ammonia. The indication is that nitrogen limits productivity in these environments. (See also W76-10266) (Auen-Wisconsin).
W76-10286

NUTRIENT FLUX AND CYCLING IN FRESHWATER ECOSYSTEMS,
Cornell Univ., Ithaca, N. Y. Section of Ecology and Systematics.
G. E. Likens.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 314-348. 8 fig., 10 tab., 96 ref.

Descriptors: *Cycling nutrients, *Lakes, *Streams, *Input-output analysis, Biochemistry, Geochemistry, Gases, Air-water interfaces, Nitrogen, Phosphorus, Carbon, Precipitation(Atmospheric), Runoff, Sedimentation.
Identifiers: *Nutrient flux, *Nutrient budget.

The flux and cycling of nutrients, the contribution of nutrients by biogeochemistry, and their impact on an aquatic ecosystem nutrient budget are discussed. The ecological implications of adding nutrients in intermittent large concentrations and in small volumes as opposed to adding the same total imput in continuously smaller concentrations but in large volumes and over long periods are not well known, but have important ramifications for the management of point and nonpoint sources of nutrients and pollutants. To gain maximum understanding, studies should be done of nutrient fluxes for whole ecosystems. Real progress in understanding aquatic ecosystems will depend on the ability to relate and integrate nutrient-flux and cycling parameters, e.g., knowledge of internal nutrient-turnover rates is critical to understanding nurient availability in lakes, but these rates must be dynamic--linked to the continuous flux of ecosystem inputs and outputs. Turnover rates for seston vary from minutes for phosphorus to hours and days for nitrogen, and hours and weeks for carbon. In contrast, nutrient residence times for total ecosystems usually range from weeks to years, depending on rates of sedimentation, mixing, and throughput. Integrating these variables should lead to new levels of sophistication in diagnosing and managing aquatic ecosystems. (See also W76-10266) (Auen-Wisconsin).
W76-10287

THE SANTEE SWAMP AS A NUTRIENT SINK,
South Carolina Univ., Columbia. Dept. of Biology.
W. M. Kitchens, J. M. Dean, L. H. Stevenson, and J. H. Cooper.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975 (CONF-740513), p. 349-366. 7 fig, 25 ref.

Descriptors: *Nutrient removal, *Water purification, *Swamps, Southeast U.S., Streams, Freshwater marshes, Phosphorus compounds, Nitrogen compounds, Coliforms, Self-purification, Pollution abatement, South Carolina.
Identifiers: *Santee Swamp(SC), Nutrient sink, Wateree River(SC), Congaree River(SC).

The Upper Santee Swamp, South Carolina, extending from the confluence of the Congaree and Wateree Rivers, was studied for its role in the reduction of nutrient loads and fecal coliforms. The two rivers are heavily polluted from sewage discharges and agricultural runoff but Lake Marion, an impoundment five miles downstream of the rivers' confluence has not shown eutrophication symptoms typical of shallow impoundments receiving comparable nutrient loads. The general trend observed, for both total and reactive phosphates, a 50% reduction in concentrations as the water passed from the rivers to the lower swamp provinces, depending on flow. Nitrate concentrations, consistently high in both rivers, was essentially unaltered in passage through the swamp. The flow through the swamp during the study period was usually a mass sheet over the floodplain floor, with no additional stream runoff inputs, therefore concentration changes are definitely not due to dilution. The nutrient sink is considered primarily biological, with possible total phosphates adsorbed to suspended silts and clays. There was also a significant reduction in bacterial counts, including fecal coliforms, with little or no oxygen depletion as the waters coursed over the swamp. (See also W76-10266) (Auen-Wisconsin).
W76-10288

THE ROLE OF EMERGENT MACROPHYTES IN MINERAL CYCLING IN A FRESHWATER MARSH,
Wisconsin Univ., Milwaukee. Dept. of Botany.
J. M. Klopatek.
In: Proceedings of a symposium 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 367-393. 9 fig., 5 tab., 53 ref.

Descriptors: *Cycling nutrients, *Rooted aquatic plants, *Freshwater marshes, *Nutrient removal, Productivity, Wisconsin, Wetlands, Nitrogen, Phosphorus, Soil chemistry, Water chemistry, Cattails, Energy transfer, Bullrushes, Willow trees.
Identifiers: Theresa Marsh(Wis), Emergent macrophytes, Burr reed, Sedge, Canary grass.

Theresa Marsh, Wisconsin, was investigated by examining both the ontogeny of the species and their patterns of nutrient uptake and release. Three variable linear regression equations were employed to compare the changes in the amount of nutrients (g/sq m) in the belowground and the aboveground standing crops and the level of soil nutrients in monotypic stands of Typha latifolia, Scirpus fluviatilis, and Carex lacustris. The highly significant correlation values between both Scirpus and Carex (and to a lesser extent Typha) and total soil nitrogen was somewhat surprising since, in continually waterlogged soils, ammonia is regarded as the sole plant-available nitrogen. The magnitude of correlations with phosphorus indicated that the emergent macrophytes are per-

haps the factor controlling the flux of phosphorus n the soil during the growing season. Total nitrogen and available phosphorus in the marsh soil appear to be adequate; the macrophytes are acquiring their nutrients from the soil, and control he nutrients within the soil during the growing season. Denitrification reactions appeared to occur throughout the year, especially during summer. Potassium, calcium, and magnesium concentrations throughout the year appeared dependent on the macrophyte uptake and leaching osses, total respiration in the marsh, and the physical and chemical characteristics of the water. See also W76-10266) (Auen-Wisconsin).
W76-10289

CHANGES IN WATER CHEMISTRY AND PRIMARY PRODUCTIVITY OF A REACTOR COOLING RESERVOIR (PAR POND),
DuPont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
. J. Tilly.
n: Proceedings of a symposium 'Mineral Cycling n Southeastern Ecosystems,' 1975, (CONF-40513), p. 394-407. 4 fig., 5 tab., 25 ref.

Descriptors: *Primary productivity, *Water hemistry, *Impoundments, *Water cooling, Nuclear reactors, Eutrophication, Ions, South Carolina, Eutrophication.
dentifiers: *Par Pond(SC), Savannah River(SC).

Unsuspected changes in Par Pond, South Carolina, in its characteristics, primary productivity, and water chemistry, which are apparently related to reactor operations are summarized and possible connections to reactor operations and consequences for the reservoir community are discussed. Initially the primary productivity increased sixfold, and the dissolved solids doubled. The dissolved solids increase appears to have been caused by addition of makeup water from the Savannah River and by evaporative concentration during the cooling process. As the dissolved solids concentrations and the conductivity of makeup water leveled off, the primary productivity stabilized. Major cation and anion concentrations generally followed total dissolved solids through the increase and plateau; however, silica concentrations declined steadily during the initial periods of increased plankton productivity. Standing crops of net seston and centrifuge seston did not increase during this initial period. The collective data show the effects of thermal input to a cooling reservoir, illustrate the need for limnological studies before reactor siting, and suggest the possibility of using makeup water additions to power reactor cooling basins as a reservoir management tool. Continuing observations will be made of the growth rates of top carnivores during the current leveling and decline in plankton productivity to explain the turnover increases of the lower trophic levels but not in the standing crops. (See also W76-10266) (Auen-Wisconsin).
W76-10290

MINERAL PATHWAYS IN SMALL APPALACHIAN STREAMS,
Georgia Power Co., Atlanta. Environmental Div.
For primary bibliographic entry see Field 5B.
W76-10291

ORGANICALLY COMPLEXED COPPER, ZINC, AND CHELATING AGENTS IN RIVERS OF WESTERN PUERTO RICO,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 5B.
W76-10292

UPTAKE AND ELIMINATION OF RADIOTUNGSTEN IN BLACK BULLHEADS,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
R. Reed.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 435-444. 2 fig., 2 tab., 12 ref.

Descriptors: *Radioisotopes, *Bullheads, *Animal metabolism, *Absorption, Fish, Exudation, Persistence.
Identifiers: *Tungsten, Elimination.

Radiotungsten uptake and turnover were studied in a poikilothermic vertebrate, the black bullhead, Ictaluras melas after accumulation from water and food. Whole-body activity reached a plateau after the fish were in labeled water for 4 days at 14C with elimination varying according to the manner of uptake. Fish which accumulated radiotungsten from water had a single exponential component of elimination with a biological half-life of 2.75 days. When fish received the radioisotope in a single feeding, activity was lost at two rates: one component had a biological half-life of 14 hours and the second, six days. The bones, flesh, skin, gills, guts and blood contained the greatest percentage of whole-body activity after one day of uptake from water. When activity losses were followed for 16 days, all tissues examined showed a rapid decrease, with biological half-lives of 2.1-8.0 days. Bone had the longest biological half-life (8.0 days). Flesh, gills, bones, and guts contained 78.6% of the total activity after 8 days. Bone contained 32.2% of the whole-body activity initially and 69.8% after 16 days elimination. Radiotungsten distribution in bullheads is similar to the distribution in rats. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10293

MOBILIZATION OF MERCURY FROM FRESHWATER SEDIMENTS BY HUMIC ACID,
Georgia Univ., Athens. Dept. of Zoology.
R. W. Miller, J. E. Schindler, and J. J. Alberts.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 445-451. 2 fig., 1 tab., 12 ref. EPA R-800427.

Descriptors: *Mercury, *Freshwater, *Sediments, *Humic acids, Sulfides, Translocation, Estuaries, Absorption, Hydrogen ion concentration.
Identifiers: Mercury mobilization.

Sediments rapidly absorb inorganic mercury. When sulfides are present, insoluble mercuric sulfide is formed. Bacteria may form methylmercury, which may be released or changed by demethylating bacteria to elemental mercury. Humic materials in sediment reduce mercury. With excess humic acid, elemental mercury is released from sediments; decreases in humic acid decrease the rate and amount of elemental mercury released. Large increases in humic acids relative to mercury inhibit the reaction. Reduction of ionic to elemental mercury is mediated by humic acids. Strong complexation of mercury by humic acid may also occur. Excess humic acid binds all mercury, immobilizing it in ionic or elemental forms. When sediment humic acid concentrations are high, small amounts of mercury are complexed and elemental mercury is not released. Sediments with lower organic contents release elemental mercury. When sediment humic acid concentrations remain constant, mercury increases more than can be complexed and elemental mercury is released. If mercury additions cease, excess mercury is reduced and mercury bound to humic acid remains in sediment. Sulfides probably cause permanent removal of mercury to the sediment. Usually mercury is immobilized in sediment with only small amount available for release as elemental or methylmercury. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10294

REDISTRIBUTION OF CESIUM-137 IN SOUTHEASTERN WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W76-10295

RADIOCESIUM CYCLING IN VEGETATION AND SOIL,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W76-10296

ACCUMULATION AND MOBILITY OF CESIUM IN ROOTS OF TULIP POPLAR SEEDLINGS,
Tennessee Valley Authority, Norris. Div. of Forestry, Fisheries, and Wildlife Development.
For primary bibliographic entry see Field 5B.
W76-10297

RADIOCESIUM LEVELS IN VEGETATION COLONIZING A CONTAMINATED FLOOD PLAIN,
Savannah River Ecology Lab., Aiken, S.C.
C. T. Garten, L. A. Briese, R. A. Geiger, R. R. Sharitz, and M. H. Smith.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 489-497, 2 fig, 1 tab, 17 ref. AT(38-1)-819, AT(38-1)-310, AT(38-1)-708.

Descriptors: *Cesium, *Radioisotopes, *Vegetation, Soil contamination, Environmental effects, Radioactive wastes, Water pollution, South Carolina, Nuclear reactors, Leaves, Regression analysis, Sediments, Coastal Plains, Bulrushes, Willow trees, Shrubs, Absorption, Southeast U.S.
Identifiers: *Steel Creek(SC), Herbaceous plants, Stems, Fruits.

Radionuclides had been released into Steel Creek at the Atomic Energy Commission's Savannah River Plant, South Carolina, from 1961 to 1970. Cesium-137 is considered to have the greatest biological significance because of its long half-life. Steel Creek soils had low radiocesium fixing capacities but cesium might be concentrated by vegetation, so radiocesium levels were measured in dominant plant species. Radiocesium concentrations in component parts of woody and herbaceous plants were log normally distributed. Leaves and stems of herbaceous plants (Andropogon and Scirpus cyperinus) contained more radiocesium than those of woody plants (Alnus serruleta, Myrica cerifera, and Salix nigra). Andropogon and Alnus fruits had higher concentration than leaves or stems. Fruit and leaf concentrations could be significantly correlated with stem levels in most species sampled. Levels in plant species and their component parts were highly variable but predictable at local levels. Mean levels in plant parts exceeded mean soil concentrations, indicating radiocesium concentration by vegetation. Simple regression equations were adequate predictors of leaf concentrations from stem concentrations in all plant species studied. With large radiocesium releases, uptake by vegetation from contaminated sediments might be a greater environmental problem in southeastern coastal plain streams than in ecosystems where radiocesium would be more actively fixed by soils. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10298

SEASONAL VARIATION IN RADIOCESIUM CONCENTRATIONS IN THREE TREE SPECIES,
Savannah River Ecology Lab., Aiken, S.C.
C. T. Garten, L. A. Briese, R. R. Sharitz, and J. B. Gentry.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 498-508. 1 fig., 2 tab., 15 ref. AT(38-1)-708, AT(38-1)-819.

Descriptors: *Cesium, *Radioisotopes, *Trees, Leaves, Willow trees, Distribution, South

Carolina, Root systems, Nuclear wastes, Nuclear reactors, Seasonal, Soil contamination, Southeast U.S., Absorption, Leaching, Translocation, Statistical methods, Food chains, Environmental effects.
Identifiers: *Steel Creek(SC), Stems, Wax myrtle, Black willow, Tag alder.

Radiocesium dynamics were studied in leaves and stems of black willow (Salix nigra), wax myrtle (Myrica cerifera), and tag alder (Alnus serrulata) inhabiting the vicinity of Steel Creek, which received production-reactor effluents from the Savannah River Plant, South Carolina. Willow and myrtle leaf radiocesium levels were highest in spring, then declined during the growing season; stem levels remained unchanged or increased slightly. Seasonal changes occurred in alder parts and varied with site studied. Relationships between parts were consistent within species and collecting sites in summer. Radiocesium was highest in roots, then leaves, and lowest in stems. Mean soil to plant-part concentration factors in summer ranged from 0.9-7.6 and species means across leaves, stems, and roots averaged 2.1, 3.8, and 6.2 for alder, willow, and myrtle, respectively. Radiocesium transport from foliage to roots and soil was not demonstrated, but increasing concentrations in willow and some alder stems during the growing season suggested that stem tissue resorb from leaves. Leaching from willow and alder leaves was probably more important than translocation in reducing concentrations in spring and summer. Due to high leaf concentrations in spring and summer, herbivores ingest more radiocesium. Translocation bark into woody tissues in fall retains radiocesium in the ecosystem and reduces cesium loss in leaf fall. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10299

DISTRIBUTION OF RADIOCESIUM IN VEGETATION ALONG A CONTAMINATED STREAM,
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5B.
W76-10300

EFFECTS OF AGE, SEX, AND PELAGE PHENOTYPE ON THE ELEMENTAL COMPOSITION OF THE OLD-FIELD MOUSE,
Savannah River Ecology Lab., Aiken, S. C.
For primary bibliographic entry see Field 5A.
W76-10301

PREDICTION OF ELEMENTAL CONTENT IN THE OLD-FIELD MOUSE,
Savannah River Ecology Lab., Aiken, S. C.
For primary bibliographic entry see Field 5A.
W76-10302

CHEMICAL COMPOSITION OF WHITE-TAILED DEER: WHOLE-BODY CONCENTRATIONS OF MACRO- AND MICRONUTRIENTS,
Savannah River Ecology Lab., Aiken, S. C.
J. G. Wiener, I. L. Brisbin, and M. H. Smith.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 536-541. 1 tab., 20 ref. AT(38-1)-819, AT(38-1)-708.

Descriptors: *Deer, *Chemical properties, *Trace elements, Calcium, Potassium, Magnesium, Sodium, Phosphorus, Copper, Iron, Manganese, Molybdenus, Zinc, Nitrogen, Regression analysis, Energy budget, South Carolina, Hunting, Biomass, Cycling nutrients, Forests.
Identifiers: White-tailed deer.

The wet- and dry-weight concentrations of macronutrients (calcium, potassium, magnesium, nitrogen, sodium, and phosphorus) and micronutrients (copper, iron, maganese, molybdenum, and zinc) were measured in whole-body samples of 27 white-tailed deer (Odocoileus virginianus). Linear regression of nutrient concentrations on body weight indicated no significant change in concentration with respect to body weight. Coefficients of variation for the macronutrient concentrations averaged less than those for micronutrient concentrations. Only magnesium, manganese, and molybdenum had coefficients of variation greater than 25%. Coefficients of variation for wet- and dry-weight concentrations were similar for each element. In the vicinity of Savannah River Plant, South Carolina, there are approximately 0.16 deer/ha with a wet value of approximately 44.54 kg/deer, producing a wet-weight biomass density of 7.13 kg/ha. Since 1967 deer hunts have removed about 1.15 deer/sq km/year or 0.52 kg wet-weight biomass/ha/year. Nutrient exportation was calculated on a per hectare scale using wet-weight concentrations and the above biomass value. Nutrient standing crops of deer are small compared to those of primary producer components of temperate forest ecosystems. Annual loss of nutrients by deer harvest is negligible compared with annual nutrient budgets of southeastern forests. (See also W76-10266) (Buchanan-Davidson-Wisconsin)
W76-10303

RADIOCESIUM CONCENTRATIONS IN WHOLE-BODY HOMOGENATES AND SEVERAL BODY COMPARTMENTS OF NATURALLY CONTAMINATED WHITE-TAILED DEER,
Savannah River Ecology Lab., Aiken, S. C.
I. L. Brisbin, and M. H. Smith.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 542-556. 2 fig., 3 tab., 20 ref. AEC AT(38-1)-310, AT(38-1)-708.

Descriptors: *Cesium, *Radioisotopes, *Absorption, *Deer, *Distribution, South Carolina, Correlation analysis, Analytical techniques, Retention.
Identifiers: White-tailed deer, Deer tissues, Bone, Organs, Muscle.

Radiocesium concentrations were studied in body compartments of white-tailed deer at the Atomic Energy Commission's Savannah River Plant, South Carolina. The highest levels (average of 50-70 picocuries radiocesium/g dry weight) were in skeletal muscle, feces, kidneys, and adrenal tissue; bone and liver had the lowest values. Except for feces and rumen contents, most tissues and organs showed positive linear correlations between their radiocesium levels. Radiocesium in brain, liver, and lungs increased at slower rates than the whole body, while adrenal and kidney tissues increased at faster rates. Analyses of whole-body homogenates showed that deer averaged 9.91 picocuries radiocesium/g whole body wet weight. These values were best predicted from skeletal muscle radiocesium contents using the relationship: picocuries radiocesium/g dry Whole body weight equals 3.33 + 0.60 picuries/g dry skeletal muscle. Calculation of a weighted predictive index indicated that skeletal muscle concentrations best predicted the overall pattern and levels of radiocesium distribution in all body compartments. Radiocesium concentrations in brain, heart,and liver followed muscle in order of predictive ability. Use of a single organ or tissue sample to estimate body contents and distribution of other environmental contaminants is discussed. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10304

RELATIONSHIP BETWEEN POTASSIUM INTAKE AND RADIOCESIUM RETENTION IN THE REINDEER,
Alaska Univ., College. Inst. of Arctic Biology.
D. G. Holleman, and J. R. Luick.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 557-563. 2 fig., 1 tab., 12 ref. AEC AT(45-1)-2229

Descriptors: *Potassium, *Cesium, *Radioisotopes, Lichens, Food habits, Sorption, Fallout, Retardants, Retention, Summer, Winter, *Absorption.
Identifiers: *Reindeer.

To determine the effects of potassium intake on radiocesium retention in reindeer when the animals were maintained on a winter diet of lichens, several reindeer (Rangifer tarandus sibericus) were fed lichen plus potassium ad libitum then injected intravenously with cesium-134. Potassium added to the diet markedly decreased radiocesium retention, suggesting that seasonal changes in cesium retention observed earlier in reindeer might be largely caused by nutritional factors. A 20-fold increase in dietary potassium caused a 2-fold decrease in radiocesium retention. An equation describes cesium retention as the sum of a fast exponential component and a slow exponential component. The increased potassium intake affected the slow component, especially. A decrease in cesium retention due only to increase in potassium intake would necessitate a 20 to 100-fold increase in intake from winter to summer; this could be achieved by consuming food with higher potassium contents, increasing food intake, and/or using high potassium mineral licks. Normally free grazing reindeer consume more than ten times as much potassium in the summer; also food intake probably increases in the summer. Mineral licks would also be more available and used more in the summer when reindeer graze on ranges free of snow and ice. (See also W76-10266) (Buchanan-Davidson-Wisconsin))
W76-10305

SEASONAL AND ANNUAL VARIATIONS IN THE QUANTITIES OF NITROGEN, POTASSIUM, PHOSPHORUS, MAGNESIUM, CALCIUM AND MANGANESE REACHING THE FOREST FLOOR AS MAST IN PENNSYLVANIA AND VERMONT FORESTS,
Massachusetts Univ., Amherst. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W76-10306

FALLOUT CESIUM-137 AND MINERAL-ELEMENT DISTRIBUTION IN FOOD CHAINS OF GRANITIC-OUTCROP ECOSYSTEMS,
Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 5B.
W76-10307

RESOURCE PARTITIONING IN LEAF-LITTER FAUNAS FROM HARDWOOD AND HARDWOOD-CONVERTED-TO-PINE FORESTS,
Battelle-Columbus Labs., Ohio. Ecology and Ecosystems Analysis Section.
For primary bibliographic entry see Field 5B.
W76-10308

FOREST-FLOOR NUTRIENT DYNAMICS IN SOUTHERN APPALACHIAN HARDWOOD AND WHITE PINE PLANTATION ECOSYSTEMS,
Environmental Protection Agency, Washington, D. C. Office of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W76-10309

LITTER PRODUCTION, DECOMPOSITION AND NUTRIENT CYCLING IN A MIXED HARDWOOD WATERSHED AND A WHITE PINE WATERSHED.
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W76-10310

CERIUM AND COBALT MOVEMENT WITH LITTER LEACHATE IN A FOREST SOIL,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.

LIBRARY U. OF I. URBANA-CHAMPAIGN

W76-10311

LEACHING OF NUTRIENTS FROM LEAVES OF SELECTED TREE SPECIES IN NEW HAMPSHIRE,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W76-10312

PHOSPHORUS CYCLING IN A MARYLAND DECIDUOUS FOREST SUBJECTED TO VARIOUS LEVELS OF MINERAL-NUTRIENT LOADING,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
For primary bibliographic entry see Field 5B.
W76-10313

BASE-LINE DATA ON EVERGLADES SOIL-PLANT SYSTEMS: ELEMENTAL COMPOSITION, BIOMASS, AND SOIL DEPTH,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
B. G. Volk, S. D. Schemnitz, J. F. Gamble, and J. B. Sartain.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 658-672. 1 fig, 3 tab, 21 ref.

Descriptors: *Chemical properties, *Florida, *Freshwater marshes, *Trace elements, *Heavy metals, *Marsh plants, Soil types, Baseline studies, Muck soils, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sodium, Copper, Iron, Manganese, Zinc, Cobalt, Strontium, Lead, Nickel, Chromium, Aluminum, Silica, Cesium.
Identifiers: *Everglades(Fla).

Baseline data on biomass production and elemental composition of plants from locations representative of Everglades saw-grass (Cladium jamaicense) ecosystems (burned and unburned), a wet prairie community, and a burned muck site of saw-grass were collected in the Everglades Wildlife Management Area, Florida. Chemical compositions (Nitrogen, phosphorus, potassium calcium, magnesium, sodium, copper, iron, manganese, zinc, cobalt, strontium, lead, nickel, chromium, aluminum, and silica) were determined in plant and soil digests. Saw-grass was predominant and contributed to biomass in all plots except in the wet prairie where Rhynchospora and Panicum hemitomon were the most common. Dead saw-grass biomass was greater than that of living plants in unburned saw-grass plots. In burned saw-grass, muck burn, and wet prairie, there were a large number of plant species but biomass production was less than in unburned saw-grass locations. Levels of copper, manganese, calcium, magnesium, potassium, and nitrogen varied in different locations. Significant differences in chemical composition were observed between plant species. Zinc, calcium, magnesium, phosphorus, and nitrogen concentrations were low in live saw-grass, compared to other species. Fallout cesium-137 levels ranged from 670 to 3100 picocuries/kg in sandy and organic soils, respectively. The Polygonum Cs-137 level was 11,600 picocuries/kg. Rapid Cs-137 leaching was observed from dead saw-grass. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10314

EFFECTS OF CLEAR-CUTTING ON NUTRIENT LOSSES IN ASPEN FORESTS ON THREE SOIL TYPES IN MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 4C.
W76-10315

MOBILIZATION OF NUTRIENTS IN SOIL BY ACIDS OF SULFUR AND CHELATING AGENTS,
California Univ., Los Angeles, Lab., of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 5B.
W76-10316

EFFECTS OF TREE SPECIES, TEMPERATURE, AND SOIL ON TRANSFER OF MANGANESE-54 FROM LITTER TO ROOTS IN A MICROCOSM,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
M. Witkamp, and B. Ausmus.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 694-699. 1 fig., 1 tab., 10 ref. NSF AG-199, 40-193-69.

Descriptors: *Cycling nutrients, *Sorption, *Trees, *Manganese, *Soil microorganisms, Litter, Roots, Decomposing organic matter, Black locust trees, Loblolly pine trees, Limestones, Shales, Leaching, Movement, Percolation, Hydrogen ion concentration, Detritus, Model studies.

Litter, soil, and microbial effects on manganese-54 transfer from litter to roots were compared to two litter decomposability levels (black locust-rapid and loblolly pine-slow), two soils (dolomitic limestone and sandstone-shale), and microbial activity levels at 2C and 25C. Mn-54 leachability and mobility were high during the first week. Pine litter was greater and affected more by temperature. Litter species affected Mn-54 downward percolation and seedling uptake. Locust leachate was viscous, black, with a pH of 8.4 and high organic content. Adsorption to leached organics and microbial immobilization kept Mn-54 in the top layer. Pine needles showed no decomposition; leachate color was light and viscosity, bacterial content, soil infiltration by leachate, and microbial blooms low, suggesting little microbial immobilization in topsoil. Temperature effects were evident in pine leachate Mn-54 content; there was no microbial growth on pine needles at 2C. Temperature effects were reversed with locust litter and topsoil; at 25C decay mineralized more litter Mn-54 than was immobilized by microflora. Topsoil Mn-54 retention prevented it from reaching leachate. Litter species and microbial activity rates were dominating factors in Mn-54 recycling from detritus-plants. Soils types had no effect on transfer from litter-topsoil-bottom soil, but affected uptake by trees. Element transfer models should consider microbial action. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10317

ASPECTS OF MINERAL-NUTRIENT CYCLING IN A SOUTHERN MIXED-HARDWOOD FOREST IN NORTH CENTRAL FLORIDA,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W76-10318

THE QUANTITY AND DISTRIBUTION OF FOUR NUTRIENT ELEMENTS IN HIGH-ELEVATION FOREST ECOSYSTEMS, BALSAM MOUNTAINS, NORTH CAROLINA,
Southern Illinois Univ., Carbondale, Dept. of Forestry.
For primary bibliographic entry see Field 5B.
W76-10319

SIGNIFICANCE OF BIOLOGICAL NITROGEN FIXATION AND DENITRIFICATION IN A DECIDUOUS FOREST ECOSYSTEM,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-10320

MINERAL CYCLING STRATEGIES OF TWO DECIDUOUS AND TWO EVERGREEN TREE SPECIES ON A SOUTHERN APPALACHIAN WATERSHED,
Georgia Univ., Athens. Dept. of Botany.
F. P. Day, and D. T. McGinty.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 736-743. 3 tab, 10 ref. NSF AG 199,40-193-69.

Descriptors: *Cycling nutrients, *Hardwood, *Trees, North Carolina, Oak trees, Hemlock trees, Biomass, Primary productivity, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Bark, Leaves, Shrubs, Southeast US.
Identifiers: *Evergreen trees, Coweeta Hydrological Laboratory(NC), Dogwood, Rhododendron maximum.

The mineral-cycling strategies of two canopy species (one deciduous, Quercus prinus, and one evergreen, Tauga canadensis) and two subcanopy trees (one deciduous, Cornus florida, and one evergreen, Rhododendron maximum) at the Coweeta Hydrological Laboratory, North Carolina, were compared, based on biomass production and nutrient standing crops. Phosphorus, potassium, calcium, nitrogen, and magnesium were determined in the wood, bark, current twigs, and leaves of each species. The largest total nutrient standing crop was in Quercus because of its large biomass. The greatest proportion of leaf calcium and magnesium was in Rhododendron. Cornus was important in the annual nutrient cycle, because of its large number of nutrient-rich leaves. Quercus was important in the annual and in the long-term nutrient cycle. Rhododendron was important in an intermediate length cycle, because its turnover time is about seven years. In a mature forest, nutrients are stored in the vegetation and recycled at time intervals of a year to several hundred years, depending on the plant component. Depending on species growth habits, individual species may be more important in one or more phases of the cycling scheme. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10321

THE EFFECT OF NONREMOVAL CLEAR-CUTTING AND PINE REFORESTATION OF THE CATION COMPOSITION OF A HARDWOOD FOREST SOIL,
Environmental Protection Agency, Washington, D.C. Office of Environmental Sciences.
For primary bibliographic entry see Field 4C.
W76-10322

SOME EFFECTS OF FERTILIZATION ON MINERAL CYCLING IN LOBLOLLY PINE,
Southeastern Forest Experiment Station, Research Triangle Park, N.C. Forestry Sciences Lab.
C. G. Wells, A. L. Nicholas, and S. W. Buol.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 754-764. 5 tab, 7 ref. NSF AG 199,40-193-69.

Descriptors: *Fertilization, *Cycling nutrients, *Loblolly pine trees, Nitrogen, Phosphorus, Potassium, Litter, Throughfall, Soil water, Nitrates, Precipitation(Atmospheric), Southeast US, Forest soils, Leaching, Manganese, Sodium, Calcium, Magnesium, Zinc, Copper, Aluminum.

Effects of nitrogen, phosphorus, and potassium fertilization of a 14-year-old loblolly pine plantation on nutrients in litterfall and throughfall, on mineral accumulation in the forest floor, and on minerals in soil water were studied. Nitrogen, phosphorus, and potassium applied at rates of 226, 60, and 136 kg/ha as ammonium nitrate, triple superphosphate, and muriate of potash, respectively, were not immobilized in the forest floor. Some nitrate-nitrogen leached 120 cm into the soil to levels of 7 ppm at some points, but its concentra-

tion declined to about 0.5 ppm three years later. Nitrate-nitrogen loss below 120 cm was approximately balanced by precipitation input. The first year after fertilization increased mineral elements in litterfall and throughfall accounted for about 5% of nitrogen and 10% of potassium applied. The second year increased litterfall and increased concentrations in litterfall and throughfall amounted to 10% of the nitrogen plus phosphorus applied. Differences between fertilized and nonfertilized plots indicated that 25% of the applied nitrogen was in the forest floor two years after fertilization, but litterfall rather than immobilization of applied nitrogen appeared to be the major source of additional nitrogen. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10323

INFLUENCE OF NUTRIENT AVAILABILITY ON ECOSYSTEM STRUCTURE,
Mansfield State College, Pa. Dept. of Biology.
K. A. Meyer, J. F. McCormick, and C. G. Wells.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p 765-779. 2 fig, 3 tab, 31 ref. AEC AT(110-1)-3299.

Descriptors: *Granites, *Cycling nutrients, *Plant populations, Productivity, Biomass, Distribution patterns, Succession, Soil density, Limiting factors, Calcium, Magnesium, Potassium, Phosphorus, Nitrogen, Nitrates, Ammonia, Rainfall, Leaching, Organic matter, Hydrogen ion concentration, Cation exchange, Southeast US, Trace elements.
Identifiers: *Granite outcrops, Sedum smallii, Minuartia uniflora, Viguiera porteri, Herbaceous plants, Mt Arabia(Ga).

Ecosystem structure (production distributions, densities, and biomass) was analyzed in island ecosystems of annual perennial herb type plants on granite outcrop soils on Mt. Arabia, Georgia. Availability of nutrients (calcium, magnesium, potassium, phosphorus, nitrogen, nitrates, ammonia) in soil of each species habitat, including contributions from rain, groundflow, soil pools, soil organic matter mineralization, and leaching from dead vegetation was determined. Nutrient uptake was estimated for Sedum smallii, Minuartia uniflora, and Viguiera porteri. From comparisons of nutrient availability in different habitats with nutrient levels required by the dominant populations, an hypothesis is developed suggesting that species population distribution in outcrop ecosystems is influenced by nutrient availability and/or competition for available nutrients. The shallow sandy soils with a low pH were relatively infertile. Soil organic matter, cation-exchange capacity, and soil nutrients (except phosphorus) increased toward the ecosystem center. Comparisons of nutrient uptakes by each species with estimated annual nutrient availability showed the growth potential of each species in areas outside its natural occurrence. Soil nutrients became limiting to growth and distribution of the dominant plants, thus affecting the ecosystem structure. Calcium, magnesium, and nitrogen availability plus interspecific competition for these elements limited species growth and distribution when there was adequate moisture. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10324

NUTRIENT BUDGETS FOR UNDISTURBED ECOSYSTEMS ALONG AN ELEVATIONAL GRADIENT IN NEW MEXICO,
New Mexico Univ., Albuquerque. Dept. of Biology.
J. R. Gosz.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 780-799. 3 fig., 7 tab., 28 ref.

Descriptors: *Energy budget, *Cycling nutrients, *Ecosystems, *Biomes, New Mexico, Watersheds(Basins), Vegetation, Calcium, Sodium, Magnesium, Potassium, Confierous trees, Bedrock, Alpine, Precipitation, Mountains, Dusts, Slopes, Input-output analysis, Evapotranspiration, Primary productivity, Elevation, Juniper trees, Grasslands, Semiarid climates, Runoff.
Identifiers: Tesuque Watersheds(NM), Sangre de Cristo Mountains(NM), Santa Fe National Forest(NM), Aspen trees.

The Tesuque watersheds in the Sangre de Cristo Mountains of New Mexico were selected for ecosystem studies in which nutrient flux was determined in different vegetational zones and biomes along an elevational gradient on a common bedrock. Nutrient budgets for calcium, magnesium, sodium, and potassium were determined during 1972-1973 for watershed ecosystems with vegetation ranging from pinion-juniper to spruce-fir and alpine tundra. Nutrient inputs varied with elevation due to precipitation at high elevations and dust at low elevations. Seasonal quatity and distribution of precipitation affected relationships between nutrient inputs from dust and precipitation. Stream chemistry and nutrient output (dissolved loss) varied with elevation and involved evapotranspiration, nutrient uptake, throughfall, discharge volume, carbon dioxide production in soil, and soil chemistry. The nutrient budgets indicated that the smallest loss or greatest accumulation usually occurred on intermediate elevations which had a mixed conifer vegetation. This zone had the greatest plant and animal diversity. The high evapotranspiration rate of this zone suggested that it had the highest primary production rate. The results supported the hypothesis that a high efficiency of nutrient cycling (nutrient conservation) is associated with high productivity and community complexity. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10325

NUTRIENT RETURN IN THE STEMFLOW AND THROUGHFALL OF INDIVIDUAL TREES IN THE PIEDMONT DECIDUOUS FOREST,
Duke Univ., Durham, N. C. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W76-10326

NITROGEN FIXATION BY LICHENS OF THE NORTHERN PIEDMONT,
Wake Forest Univ., Winston-Salem, N. C.
J. C. Murphy, and V. E. Becker.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p. 824-832. 3 tab., 23 ref.

Descriptors: *Nitrogen fixation, *Lichens, *Cyanophyta, *Symbiosis, Light, Moisture, North Carolina, Forests, Varieties, Deciduous trees, Temperature.
Identifiers: Northern Piedmont(NC), Leptogium cyanescens, Leptogium corticola, Collema subfurvum, Collema conglomeratum, Sticta weigelii, Lobaria pulmonaria, Lobaria quercizans.

Nitrogen fixation by lichens containing blue-green algae phycobionts was determined with an acetylene-reduction method in presence of light and high moisture. Specimens collected in mature forests in the northern Piedmont, North Carolina, included lichen containing blue-green algae as primary phycobionts (Leptogium cyanescens, Leptogium corticola, Collema subfurvum, Collema conglomeratum, and Sticta weigelii) and lichens containing blue-green algae in cephalodia (Lobaria pulmonaria and Lobaria quercizans). Lichens with blue-green algae as primary phycobionts had higher nitrogen contents than Lobaria, perhaps due to a higher fixation rate. Collema conglomeratum had a lower nitrogen content, lower fixation rate, and was covered with apothecia. Most lichens with blue-green algae as their primary phycobiont fixed nitrogen more rapidly than lichens with algae incephalodia. Nitrogen contents/unit surface area were less variable than fixation data and were related to the thickness or lobe compactness. Lichens with many apothecia or blue-green algae in cephalodia had lower fixation rates/unit surface area. Fixation rates did not account for total thallus nitrogen replacement each year, but because of lichens' slow growth appeared to be adequate to account for thallus nitrogen. If the fixation rate is only equivalent to nitrogen in the thallus, reduced nitrogen will be added to the ecosystem when the lichen dies. (See also W76-10266) (Buchanan-Davidson--Wisconsin)
W76-10327

EFFECTS OF FOREST FIRES ON ATMOSPHERIC LOADS OF SOLUBLE NUTRIENTS,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
For primary bibliographic entry see Field 4C.
W76-10328

CATION FLUX IN HARDWOOD AND WHITE PINE WATERSHEDS,
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W76-10329

NUTRIENT LOSSES IN PARTICULATE FORM AS WEIR POND SEDIMENTS FROM FOUR UNIT WATERSHEDS IN THE SOUTHERN APPALACHIANS,
Georgia Univ., Athens. Dept. of Botany.
C. D. Monk.
In: 'Mineral Cycling in Southeastern Ecosystems,' 1975, (CONF-740513), p, 862-867. 2 tab., 6 ref. NSF AG-199, BMS69-01147.

Descriptors: *Vegetation effects, *Nutrients, *Sediments, *Erosion rates, *Watersheds(Basins), Appalachian Mountain Region, North Carolina, Hardwood, Pine trees, Forest management, Clays, Sands, Silts, Organic matter, Nitrogen, Calcium, Magnesium, Potassium, Sodium, Phosphorus, Annual, Weirs.
Identifiers: Coweeta Hydrologic Laboratory(NC).

Weir-pond sediments were collected at three-month intervals for two years from four watersheds with contrasting vegetation in the Coweeta Hydrologic Laboratory, North Carolina. Annual sediment losses were 283 kg/ha from the coppice hardwoods, 176 from old field, 76 from pine plantation, and 30 from mature hardwood watersheds. Sediment losses followed seasonal trends, with greater losses normally observed in winter. Sediment composition from old field, coppice hardwood forests, and pine plantation watersheds were similar, averaging 77.4% sand, 13.6% silt, 9.0% clay, and 7.6% organic matter. The same values for the mature hardwood forest were 49.9, 17.6, 32.5, and 21.9%. The order of concentration from high to low was nitrogen, calcium, magnesium, potassium, sodium, and phosphorus. Calcium, magnesium, potassium, and phosphorus showed no seasonal trends. Concentrations were generally lower in the coppice forest sediments. Nitrogen and sodium changed seasonally with highest concentrations in winter. Nitrogen concentrations were higher in forest sediments; calcium and magnesium losses were higher from the pine plantation and hardwood forest; and calcium and magnesium levels were high in old field watershed sediments. Total annual nutrient losses were less than 1% of the total loss. (See also W76-10266) (Buchanan-Davidson--Wisconsin).
W76-10330

THE EFFECT OF URBAN LAND USE ON NUTRIENT AND SUSPENDED-SOLIDS EXPORT FROM NORTH FLORIDA WATERSHEDS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 4C.
W76-10331

LIBRARY U. S. DEPARTMENT OF ...

CHANGES IN SOME HEMATOLOGICAL CHARACTERISTICS OF COHO SALMON (ONCORHYNCHUS KISUTCH) IN RESPONSE TO ACUTE EXPOSURE TO DEHYDROABIETIC ACID (DHAA) AT DIFFERENT EXERCISE LEVELS,
British Columbia Univ., Vancouver. Dept. of Zoology.
G. K. Iwama, G. L. Greer, and P. A. Larkin.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 285-289, 1976. 2 tab., 20 ref.

Descriptors: *Pulp wastes, *Industrial wastes, Laboratory tests, *Toxicity, *Cytological studies, Fish physiology, *Salmon, Biochemistry, Stress, Environmental effects, Water pollution effects, Salmonids, Methodology, Fish behavior, Mortality, Toxicants.
Identifiers: *Hematology, *Dehydroabietic acid(DHAA), Exercise levels(Fish), Oncorynchus kisutch, Sublethal effects.

To determine if changes in some hematological parameters accompanied acute exposure of juvenile coho salmon (Oncorhynchus kisutch) to dehydroabietic acid (DHAA) at three different exercise levels, clotting times, hematocrits, erythrocyte sedimentation rates, red blood cell counts, and white blood cell counts were monitored over 6-, 12-, 24-, and 48-h exposure periods to 0.75 mg/liter DHAA. White cell counts decreased significantly after 24 h exposure and there was a significant increase in clotting times after 48 h exposure to DHAA. In both cases, differences between experimentals and controls were significant only at low and intermediate exercise levels, and not at the high exercise level. Hematocrits, erythrocyte sedimentation rates, and red blood cell counts were not significantly different between experimentals and controls for any of the exposure periods or exercise levels. (Katz)
W76-10333

A COMPARISON OF TRACE-METAL AND METALLOENZYME PROFILES IN DIFFERENT MOLLUSCS AND DURING DEVELOPMENT OF THE OYSTER,
Institute of Marine Biochemistry, Aberdeen(Scotland).
P. G. George, and T. L. Coombs.
In: Proceedings 9th European Marine Biology Symposium, p. 433-450, 1975. 11 fig., 3 tab., 24 ref.

Descriptors: *Enzymes, *Molluscs, *Immature growth stage, Manganese, Animal physiology, Biochemistry, *Trace elements, *Oysters, Zinc, Mussels, *Absorption, Copper, Iron, Larval growth stage, Crustaceans, Invertebrates, Metals, Metabolism, Water pollution effects, Methodology, Analytical techniques, Environmental effects.
Identifiers: Mytilus sp., Haliotis sp., Cardium sp.

The possibility of correlations between the trace-metal distribution and biochemical function in four species of molluscs from different habitats was investigated. Neither oyster larvae nor young spat were able to concentrate zinc; this ability developed between 50 and 100 days after settlement, and although it coincided with a general increase in zinc-metalloenzyme activity it could not be correlated with the ability to survive anaerobiosis because adult Mytilus does not contain high tissue zinc concentrations. The zinc-dependent digestive hydrolase enzymic activities are correlated with the dietary components. Malate dehydrogenase enzymic activity is very much greater than that of lactate dehydrogenase for the four species investigated. Lactate dehydrogenase activity is correlated with different muscular activity between species and during development of the oyster. Malate dehydrogenase activity is increased in oyster larvae when stored fat is metabolized. (Katz)
W76-10334

ACUTE TOXICITY OF SODIUM CHLORIDE, PENTACHLOROPHENOL, GUTHION(R), AND HEXAVALENT CHROMIUM TO FATHEAD MINNOWS (PIMEPHALES PROMELAS) AND GOLDFISH (CARASSIUS AURATUS),
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
I. R. Adelman, L. L. Smith, Jr., and G. D. Siesennop.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 203-208, 1976. 2 fig., 12 ref.

Descriptors: Resistance, *Pesticides, *Minnows, *Bioassay, *Chromium, *Toxicity, *Lethal limit, *Phenols, *Sodium chloride, *Industrial wastes, *Mortality, Toxicants, Laboratory tests, Water pollution sources, Methodology, Chlorinated hydrocarbon pesticides, Fish physiology.
Identifiers: Pimephales promelas, Carassius auratus, *Guthion(R), Pentachlorophenol, *Goldfish.

The 96-h LC50's for sodium chloride were 7650 and 7341 mg/liter, for pentachlorophenol 0.21 and 0.22 mg/liter, for Guthion(R) 1.9 and 2.4 mg/liter, and for hexavalent chromium 48 and 120 mg/liter, for fathead minnows (Pimephales promelas) and goldfish (Carassius auratus), respectively. Threshold LC50's were reached in 6 days for sodium chloride (7650 and 7322 mg/liter for fathead minnows and goldfish, respectively), and pentachlorophenol (0.21 and 0.21 mg/liter), but were not attained in 11 days (termination of testing) with Guthion(R) (0.76 and 0.80 mg/liter)and hexavalent chromium (18 and 33 mg/liter). With pentachlorophenol and Guthion(R) goldfish were initially more resistant, but by termination there was no significant difference in LC50's between the two specis. With hexavalent chromium the goldfish were more resistant throughout the 11-day test, and with sodium chloride goldfish were initially more resistant but at attainment of a threshold LC50 were less resistant. Use of toxicity curves for assessment of acute mortality permits interpretation not possible in 96-h tests where LC50's are computed at 24-h intervals. (Katz)
W76-10335

FATHEAD MINNOWS (PIMEPHALES PROMELAS) AND GOLDFISH (CARASSIUS AURATUS) AS STANDARD FISH IN BIOASSAYS AND THEIR REACTION TO POTENTIAL REFERENCE TOXICANTS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
For primary bibliographic entry see Field 5A.
W76-10336

THE EFFECT OF IN VIVO CHROMIUM EXPOSURE ON NA/K- AND MG-ATPASE ACTIVITY IN SEVERAL TISSUES OF THE RAINBOW TROUT (SALMO GAIRDNERI),
Cleveland Metropolitan General Hospital, Ohio. Dept. of Obstetrics and Gynecology.
R. M. Kuhnert, B. R. Kuhnert, and R. M. Stokes.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 4, p. 383-390, 1976. 2 tab., 1 fig., 19 ref.

Descriptors: *Enzymes, Biochemistry, Inhibitors, *Rainbow trout, Laboratory tests, *Chromium, *Bioassay, *Fish physiology, Metals, Water pollution effects, Environmental effects, Absorption, Analytical techniques, Methodology, Spectrophotometry.
Identifiers: *ATPase, Tissue analysis, Sublethal effects, Bioaccumulation.

The effect of in vivo chromium exposure on Na/K- and Mg-ATPase activity was studied in several tissues of the rainbow trout, Salmo gairdneri. Those tissues studied were: intestine, gill, liver, and kidney. Tissue chromium levels were determined for control rainbow trout and trout exposed to 2.5 mg Cr/l (as chromate) for 48 hours. After exposure to chromium, inhibition of Na/K-ATPase activity, but not Mg ATPase activity, was observed. These results may partially explain the detrimental effects of hexavalent chromium on fish. (Katz)
W76-10337

DELTA-AMINO LEVULINIC ACID DEHYDRATASE ACTIVITY IN FISH BLOOD AS AN INDICATOR OF A HARMFUL EXPOSURE TO LEAD,
Canada Centre for Inland Waters, Burlington (Ontario).
P. V. Hodson.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 268-271, 1976. 1 fig., 10 ref.

Descriptors: *Lead, *Enzymes, Biochemistry, Methodology, *Rainbow trout, *Inhibitors, Water quality control, *Bioindicators, Public health, Laboratory tests, *Pollutant identification, Water pollution effects, Heavy metals, Fish physiology, Analytical techniques.
Identifiers: *Sublethal effects.

The activity of red cell D-amino levulinic acid dehydratase of rainbow trout (Salmo gairdneri) was depressed after exposure of the fish to lead. Concentrations of lead in water as low as 13 micrograms/liter caused a significant inhibition of activity after only 4-wk exposure. Assays of this enzyme's activity may provide a short-term indication of long-term harmful effects of lead. (Katz)
W76-10338

EFFECTS OF POWER-PLANT COOLING SYSTEMS ON MARINE PHYTOPLANKTON,
California Univ., Irvine. Dept. of Environmental Biology.
F. J. P. Briand.
Marine Biology, Vol. 33, No. 2, p 135-146, 1975. 4 tab., 10 fig., 53 ref.

Descriptors: *Temperature, *Mortality, Powerplants, *Cooling water, *Diatoms, *Phytoplankton, *Dinoflagellates, *Heated water, Plant populations, Aquatic populations, *Primary productivity, Cooling, Marine microorganisms, Algae, Biological communities, Dominant organisms, Seasonal, Chlorination, *Thermal pollution, Water pollution effects.
Identifiers: *Species diversity.

The large quantities of marine phytoplankton passing through the cooling systems of two Southern California coastal power plants were found to be greatly reduced in numbers (41.7%) and in volume (33.7%). Phytoplankton mortalities were most pronounced from October to December when intake waters of 17 to 20 C were subjected to temperature elevations of 9 to 11 C, and were lowest from January to March when cooler ambient temperatures prevailed. There was no apparent reduction in phytoplankton stocks when the intake water was cooler than 15 C. Surviving cells in 25 and 26.5 C effluent waters grew three times faster than influent populations, which suggests the short-term effects of power-plants on phytoplankton. Entrainment effects are very disruptive to the structure of phytoplankton communities and in reducing species diversity. Passage through the condenser tubes affected algal species differentially, killing diatoms in greater numbers than dinoflagellates. On this basis, use of deep-sea water by coastal power plants for cooling is advocated. (Katz)
W76-10339

AROCLOR 1016: TOXICITY TO AND UPTAKE BY ESTUARINE ANIMALS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
D. J. Hansen, P. R. Parrish, and J. Forester.
Environmental Research, Vol. 1, p. 363-373, 1974. 5 tab., 4 fig., 8 ref.

Descriptors: *Cytological studies, Pathology, *Mortality, Retention, *Aroclor, *Polychlorinated biphenyls, Oysters, Shrimp, *Bioassay, *Toxicity, *Lethal limit, *Absorption, *Brackish water fish, Pesticides, Benthic fauna, Invertebrates, Shellfish, Fish diseases, Laboratory tests, Water pollution effects, Path of pollutants, Pesticide residues, Microscopy, Chromatography.
Identifiers: Bioaccumulation, Lagodon sp., Sublethal effects, Penaeus sp., Palaemonetes sp., *Pinfish, *Tissue analysis, Brown shrimp.

Bioassays were conducted to determine the acute toxicities of the polychlorinated biphenyl (PCB) Aroclor 1016 in flowing sea water to American oysters (Crassostrea virginica), brown shrimp (Penaeus aztecus), grass shrimp (Palaemonetes pugio), and pinfish (Lagodon rhomboides), and to determine its toxicity to, and uptake and retention by pinfish. Acute 96-hr LC50's were: oysters, 10.2 micrograms/1; brown shrimp, 10.5 micrograms/1; grass shrimp, 12.5 micrograms/1. The PCB was not toxic to pinfish at 100 micrograms/1 for 96-hr, but significant mortality occurred when pinfish were exposed to 32 microgram/1 of Aroclor 1016 for 42 days. Pinfish exposed to 1 microgram/1 for 56 days accumulated the chemical to 17,000 x the nominal concentration in test water. Pathologic tissue alterations occurred in pinfish exposed to 32 microgram/1 of Aroclor 1016 for 42 days. (Katz)
W76-10340

ACUTE CADMIUM TOXICITY STUDIES UPON NINE SPECIES OF AQUATIC INSECTS,
Utah Univ., Salt Lake City. Dept. of Biology.
R. W. Clubb, A. R. Gaufin, and J. L. Lords.
Environmental Research, Vol. 9, p. 332-341, 1975. 4 fig., 9 tab., 11 ref.

Descriptors: *Stoneflies, *Mayflies, *Bioassay, *Aquatic insects, *Cadmium, *Absorption, *Lethal limit, *Mortality, *Toxicity, Insects, Laboratory tests, Invertebrates, Path of pollutants, Water quality control, Water pollution effects, Metals, Industrial wastes.
Identifiers: Bioaccumulation, Ephemerella sp., Pteronarcella sp.

Continuous-flow bioassays were employed to determine 96-hr median tolerance limits (TLm) for the stonefly, which had a TLm value of 18.0 mg Cd/1, and the mayfly, which had a TLm value of 28.0 mg Cd/1. Ninety-six hour TLM values for other species of aquatic insects tested were not determined since these species were relatively insensitive to cadmium. Insects exposed for four days to cadmium-containing water, then placed in clean water, show a linear rate of cadmium loss. This loss may lower or prevent mortality under ideal conditions. (Katz)
W76-10342

PIKES (ESOX LUCIUS L.) SHOWN TO BE AFFECTED BY LOW PH VALUES DURING FIRST WEEKS AFTER HATCHING,
Uppsala Univ., (Sweden). Inst. of Zoology.
N. Johansson, and J. E. Kihlstrom.
Environmental Research, Vol. 9, p. 12-17, 1975. 4 fig., 4 tab., 9 ref.

Descriptors: *Hydrogen ion concentration, *Mortality, *Juvenile growth stage, Fry, *Pikes, Movement, *Fish behavior, Fish physiology, Reproduction, Water quality, Environmental effects, Freshwater fish, Hatching, Fish reproduction.
Identifiers: Esox sp.

New hatched pike (Esox lucius) sac fry from artificially fertilized eggs were reared for eight days in water solutions with pH values ranging from 4.0 to 7.2. The mortality was 17% t pH 6.8, 26% at pH 5.0, and 97% at pH 4.2. Sac fry reared at pH 4.2 showed a less rapid development than those raised at pH 5.2 and 6.8, and showed a lesser degree of mobility. (Katz)
W76-10343

THE IDENTIFICATION OF PHTHALIC ACID ESTERS IN THE TISSUES OF CYPRINODONT FISH AND THEIR ACTIVITY AS HEARTRATE DEPRESSORS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W76-10344

SYNERGISM BETWEEN DISSOLVED OXYGEN AND CADMIUM TOXICITY IN FIVE SPECIES OF AQUATIC INSECTS,
Utah Univ., Salt Lake City. Dept. of Biology.
R. W. Clubb, A. R. Gaufin, and J. L. Lords.
Environmental Research, Vol. 9, p. 285-289, 1975. 1 fig., 3 tab., 18 ref.

Descriptors: *Bioassay, *Aquatic insects, *Cadmium, *Metabolism, *Absorption, *Dissolved oxygen, Insects, *Toxicity, *Mortality, Environmental effects, Diptera, Mayflies, Stoneflies, Caddisflies, Laboratory tests, Analytical techniques, Invertebrates, Toxicants, Metals, Oxygen.
Identifiers: *Synergistic effect(Insects).

Continuous-flow bioassays were employed to determine the relationship between dissolved oxygen and cadmium in five species of aquatic insects, as measured by survival and the amount of cadmium found within the insect. Results indicate the toxicity of cadmium increases as the dissolved oxygen concentration increases. This may be explained by an observed increase in the amount of cadmium found in the insect as the dissolved oxygen concentration increases. Oxygen consumption has been reported to increase as the dissolved oxygen concentration increases. In this study, using a fixed cadmium concentration, the amount of cadmium found in the insect also increaded with an increase in the dissolved oxygen. Therefore, cadmium absorption may be coupled to metabolism. (Katz)
W76-10345

THE INFLUENCE OF HARDNESS COMPONENTS (CA2+ AND MG2+) IN WATER ON THE UPTAKE AND CONCENTRATION OF CADMIUM IN A SIMULATED FRESHWATER ECOSYSTEM,
Northeast Louisiana Univ., Monroe. Dept. of Biology.
M. L. Kinkade, and H. E. Erdman.
Environmental Research, Vol. 10, p. 308-313, 1975. 2 fig., 1 tab., 5 ref.

Descriptors: *Hardness(Water), *Cadmium, *Calcium, *Magnesium, Ecosystems, *Cadmium radioisotipes, *Tracers, *Algae, *Catfish, Aquatic plants, *Snails, *Absorption, Environment effects, Laboratory tests, Water quality, Chemical properties, Analytical techniques, Freshwater fish, Pollutant identification.
Identifiers: Bioaccumulation, *Elodea.

Members of a simulated freshwater ecosystem, an alga, a rooted plant, infusoria snails, catfish and guppies were cultured together for 1 to 12 hours and from 1 to 21 days in hard water (total Ca2+ and Mg2+ approximately 150 ppm) or soft water (total Ca2+ and Mg2+ 0 ppm) containing one initial concentration of 0.1 ppm Cd-115. At the end of each of the 10 different exposure periods, specimens of each species were evaluated for cadmium content. The amount of radioactivity indicated that the initial rate of Cd uptake by the organisms was faster in hard water than in soft water. However, the total concentration of Cd was greater in those organisms cultured in soft water than those in hard water. (Katz)
W76-10346

INCORPORATION OF 203HG INTO METHYLMERCURY IN FISH LIVER: STUDIES IN BIOCHEMICAL MECHANISMS IN VITRO,
Wisconsin Univ., Madison. Dept. of Entomology.
F. Matsumura, Y. Gotoh Doherty, K. Furukawa, and G. M. Boush.
Environmental Research, Vol. 10, p. 224-235, 1975. 2 fig., 7 tab., 12 ref.

Descriptors: *Mercury, Biochemistry, *Fish physiology, *Inhibitors, *Tracers, Laboratory tests, Heat, *Irradiation, Metals, Path of pollutants, Metabolism, Salmon, Methodology, Analytical techniques.
Identifiers: *Methylmercury, *Tune, Methylation, Livers.

Livers of all fish species studied, particularly pelagic species, were capabe of transforming mercuric ion into methylmercury in vitro. The factors involved in the process of methylmercury formation from Hg2+ ion in the fish liver were studied. The methylation activities wer not destroyed by either heat or ultraviolet and visible light irradiation treatments. It was thus concluded that the reaction(s) studied here was not mediated by methylcobalmine. Mersalyl, an SH inhibitor, could, however, abolish most of the methylation reaction. (Katz)
W76-10347

TOXICITY OF POLYDIMETHYLSILOXANES IN CERTAIN ENVIRONMENTAL SYSTEMS,
Dow Corning Corp., Midland, Mich.
E. J. Hobbs, M. L. Keplinger, and J. C. Calandra.
Environmental Research, No. 10, p. 397-405, 1975. 3 tab., 14 ref.

Descriptors: *Reproduction, *Degradation(Decomposition), *Biodegradation, *Adsorption, *Industrial wastes, *Toxicity, *Absorption, *Carbon radioisotopes, Tracers, *Bioassay, *Lethal limit, *Rainbow trout, *Sunfishes, Water pollution sources, Water pollution effects, Methodology, Analytical techniques, Laboratory tests, Daphnia, Freshwater fish, Marine fish, Mortality, Mallard duck, Poultry.
Identifiers: *Polydimethylsiloxanes, *Silicones.

Selected polydimethylsiloxane (PDMS) fluids and formulations were studied in certain biological systems to evaluate the possible environmental impact of these materials. These siloxanes are not detectably degraded by sewage microorganisms as shown in a study with marked PDMS. The very low toxicity of these materials to daphnia, freshwater fish, marine species, mallard ducks, bobwhite quail and domestic chicken, and their non-accumulation in the flesh and eggs of chickens and in the flesh of fish minimizes concern regarding their potential to cause environmental damage. (Katz)
W76-10348

STANDARDIZATION OF THE CONTENT OF BENZO(A)-PYRENE IN WATER BODIES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
N. Ya. Yanysheva, Ya. I. Kostovetskii, and Z. P. Fedorenko.
Gig Sanit. 7, p 71-75, 1974.

Descriptors: *Organic compounds, Standards, Water pollution effects, Diseases.
Identifiers: *Carcinogens, Tumors, *Benzopyrene.

For standardizing the content of benzo(a)pyrene in water bodies, data on the blastomatogenic activity of various doses of this carcinogen following its oral introduction into the gastrointestinal tract of mice were obtained. A graph of the dependence of the frequency of stomach tumors on dose of the carcinogen was plotted. The maximum allowable concentration of benzo(a)pyrene in water bodies was determined by an equation taking into account the ratio of animal and human body weight, safety factor, and volume of water consumed by a person during his life. The maximum allowable concentra-

LIBRARY OF THE UNIVERSITY OF

tion of benzo(a)pyrene in water bodies should not exceed 0.0004 micro-g/1.--Copyright 1975, Biological Abstracts, Inc.
W76-10351

A DISCUSSION OF THE EFFECTS OF CERTAIN POTENTIAL TOXICANTS ON FISH AND SHELLFISH IN THE UPPER DELAWARE ESTUARY,
Delaware Univ., Newark.
A. Scheier, and P. Kiry.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-231 423, $4.50 in paper copy, $2.25 in microfiche. Academy of Natural Sciences of Philadelphia, Penn., December, 1973, 50 p, 7 tab., 1 fig.

Descriptors: Delaware, *Delaware river, *Estuaries, *Estuarine environment, *Toxicity, *Metals, Shellfish, Estuarine fisheries, Brackish water fish, Aquatic habitat, Water pollution effects, Marine fish, Freshwater fish, Environmental effects, Zinc, Iron, Nickel, Magnesium, Cadmium, Copper, Chromium, Manganese, Lead, Aluminum, Mercury.
Identifiers: *Delaware River Estuary System, Upper Delaware Estuary.

The purpose is to set forth the potential toxicants in the Upper Delaware Estuary and to determine whether their concentrations are sufficient to contribute to the reduction of fish and shellfish species in the Upper Estuary. A list of species historically found in the Upper Delaware Estuary serves as a baseline for comparison with species lists recently compiled during surveys of the Upper Estuary. A summary of the maximum concentrations of metals found in the Upper Estuary is presented, along with recommended safe concentrations. Of the ten potentially toxic substances listed, at least nine occur in sufficient quantity to contribute to lethal effects. Many of these ions occur fairly equally throughout the Upper Estuary, but the highest concentrations are, in general, found in the most industrialized and urbanized areas of the Upper Estuary. Investigation of available data concerning the effects of potential toxic ions upon fish and shellfish in the Upper Estuary leads to the conclusion: much more information must be generated before intelligent and rational policies for the future use of the Upper Estuary can be formulated. (Katz)
W76-10352

PROCEEDINGS OF THE CONFERENCE ON MARINE BIOLOGY IN ENVIRONMENTAL PROTECTION HELD AT SAN CLEMENTE ISLAND, CALIFORNIA ON 13-15 NOVEMBER, 1973.
Naval Undersea Center, San Diego, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-004 606, $7.50 in paper copy, $2.25 in microfiche. Report NUC TP 443, Published December, 1974, 187 p.

Descriptors: *Marine biology, *Environmental control, *Environmental engineering, *Enzymes, Bioassay, Toxicity, Marine algae, Annelids, Mollusks, Fish physiology, Water analysis, Fish diseases, Statistical methods, Fouling, Aquatic algae, California, *Sea water, Pollutant identification, Water pollution effects, Path of pollutants.
Identifiers: Southern California.

Short presentations were made on the following topics: the fouling community as a field monitoring technique; problems and techniques of marine biology in the field; systematic analysis of field survey techniques; the systems concept and pollution control; and the need for more intercomparable field data and widely applicable, short-term survey techniques. Papers were presented on the following topics: biological consideration of a bioassay system; a reliable algal assay procedure based on pH measurements; the sublethal effects of pollutants on polychaetous annelids; byssal thread production as a toxicity test; the activities of enzymes as pollution indicators; chemical problems encountered in toxicity studies; antifouling coatings and their influence on the marine environment; disease responses in southern California coastal fishes; and comparison of marine toxicity tests. (See W76-10354 thru W76-10367) (Katz)
W76-10353

THE FOULING COMMUNITY AS A FIELD MONITORING TECHNIQUE,
Naval Ship Research and Development Center, Annapolis, Md.
E. C. Fischer.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, on 13-15 November, 1973. December, 1974. p 7-17.

Descriptors: *Fouling, *Aquatic algae, *Aquatic plants, *Periphyton, Water pollution effects, Marine biology, Monitoring, Data collections, On-the-site investigations, Water quality, *Pollutant identification.
Identifiers: *Fouling racks, *Fouling plates.

Environmental biologists need an accurate, sensitive and economical technique for evaluating water quality over a period of time. The fouling community may contain valuable information which reflects ambient water quality. The use of fouling accretion panels placed in areas of heavy Navy activity is proposed as a standard field technique for environmental quality measurement by Navy laboratories. (See also W76-10353) (Katz)
W76-10354

PROBLEMS AND TECHNIQUES OF MARINE BIOLOGY IN THE FIELD: MODELING THE MARINE ECOSYSTEM,
California Univ., Davis. Dept. of Civil Engineering.
G. T. Orlob.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California on 13-15 November, 1973, December, 1974, p. 19-30, 1 tab, 1 fig, 15 ref.

Descriptors: *Marine biology, *Estuarine environment, Methodology, *Model studies, *Simulation analysis, *Mathematical models, Ecosystems, Bays, *Monitoring, Marine sediments, Water quality, California.
Identifiers: *Sediment modeling, San Diego outfall(Calif).

The art of mathematical modeling of aquatic systems has advanced rapidly during the past several years to the point where it is now being usefully applied in comprehensive studies of the marine environment. Investigations of circulation, sediment transport, heat exchange, water quality, and even marine ecosystems, are now facilitated through the use of models. Examples of current interest include studies of San Francisco Bay, Monterey Bay, the ocean outfall near San Diego, Puget Sound, and the New York Bight. In each of these studies, except that of the San Diego outfall, mathematical models have figured prominently as tools for environmental impact assessment and decision making. The San Diego case is of special interest because of the elaborate program set up by the San Diego Water Quality Control Board to monitor the impact of waste discharge on the marine environment, including marine benthic organisms in the region of the outfall. (See also W76-10353) (Katz)
W76-10355

SYSTEMATIC ANALYSIS OF FIELD SURVEY TECHNIQUES AND OPERATIONAL UTILITY OF ENVIRONMENTAL RESEARCH TO THE NAVY,
David W. Taylor Naval Ship Research and Development Center, Bethesda, Md.
For primary bibliographic entry see Field 5G.
W76-10356

THE SYSTEMS CONCEPT AND POLLUTION CONTROL,
San Diego State Univ., Calif.
For primary bibliographic entry see Field 5G.
W76-10357

THE NEED FOR MORE INTERCOMPARABLE FIELD DATA AND WIDELY APPLICABLE SHORT-TERM SURVEY,
Naval Undersea Center, Kailua, Hawaii. Hawaii Lab.
For primary bibliographic entry see Field 5G.
W76-10358

BIOLOGICAL CONSIDERATION OF A BIOASSAY SYSTEM,
Naval Ship Research and Development Center, Annapolis, Md.
G. L. Liberatore.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973, December, 1974, p 59-70, 6 tab, 7 ref.

Descriptors: *Bioassay, *Toxicity, Fish, Molluscs, Algae, Bacteria, Crustaceans, *Laboratory animals, Cadmium, *Marine animals, Methodology, Metals, Water analysis, Chesapeake Bay, Pollutant identification.
Identifiers: *Descaling agents, *Antifouling agents.

Seven different organisms, mostly indigenous to Chesapeake Bay, have been chosen to determine the LC50 (lethal concentration, 50 percent) with various chemicals. The bioassay system is a closed, one chemical dump or spill situation. Descaling, antifouling agents, and some metals have been used. The procedures have been constantly reviewed and revised with the aim that they should; (a) yield more statistical data, (b) reduce the time and workload, (c) approach the loading capacity of the system and (d) reflect the nature and life style of the organisms. None of the descaling agents were toxic, while the proposed antifouling agents ranged in toxicity from 1 ppm for fish to 50+ ppm for the oyster. The barnacle was the most sensitive to cadmium, while the fish was the least. The text of this presentation is divided into two phases: (a) brief description of the bioassay system in our laboratory at Annapolis and (b) some biological considerations of this system. (See also W76-10353) (Katz)
W76-10359

A RELIABLE ALGAL ASSAY PROCEDURE BASED ON PH MEASUREMENTS,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 5A.
W76-10360

BYSSAL THREAD PRODUCTION AS A TOXICITY TEST,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5A.
W76-10362

THE ACTIVITIES OF ENZYMES AS POLLUTION INDICATORS,
San Diego State Univ., Calif.
For primary bibliographic entry see Field 5A.
W76-10363

CHEMICAL PROBLEMS ENCOUNTERED IN TOXICITY STUDIES,
Naval Ship Research and Development Center, Annapolis, Md.
For primary bibliographic entry see Field 5B.
W76-10364

ANTIFOULING COATINGS AND THEIR INFLUENCE ON THE MARINE ENVIRONMENT,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5G.
W76-10365

DISEASE RESPONSES IN SOUTHERN CALIFORNIA COASTAL FISHES,
Southern California Coastal Water Research Project, El Segundo.
M. J. Sherwood, and A. J. Mearns.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973, December, 1974, p. 147-162, 3 tab, 8 fig., 4 ref.

Descriptors: *Marine fish, *Water pollution effts, Pathology, *Toxicity, *Marine fisheries, *California, *Fish diseases, Waste water disposal, Parasitism, Effluents, Sewage effluents, Sea water, Bays.
Identifiers: *Fin erosion, Dover sole, Microstomus pacificus, Tuna, Santa Monica Bay(Calif), San Pedro Bay(Calif), Los Angeles(Calif).

The nearshore demersal fish communities of southern California have been extensively monitored by public and private agencies since 1969. The Southern California Coastal Water Research Project has assembled and analyzed much of the data in order to evaluate the health of local populations. One approach has been to investigate the frequency of diseased or anomalous specimens. Diseases with external symptoms may be easily observed and quantified in the field, and the presence of diseased individuals in a given habitat may be indicative not only of the health of the population but also of an imbalance in the community. A number of disease conditions were recorded during the trawl surveys. Of these, only fin erosion in the Dover sole (Microstomus pacificus) appeared to be directly related to wastewater discharge sites. At present, there are no direct links between the identifiable field effect and the suspected causes. A laboratory program has been designed to determine the role of microorganisms and physical/chemical factors in the disease response. (See also W76-10353) (Katz)
W76-10366

COMPARISON OF TOXICITY TESTS,
Naval Undersea Center, San Diego, Calif.
P. R. Kenis.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973, December, 1974, p. 163-180, 3 tab., 52 ref.

Descriptors: *Toxicity, *Bioassay, *Water pollution effects, Water quality standards, *Monitoring, Standards, Laboratory animals, Data collections, Measurement, Variability, Domestic wastes, Industrial wastes, *Bioindicators, Statistical analysis, Marine organism, Pollutant identification.
Identifiers: Acceptable concentration limits, Acute response, Chronic response, Maximum Acceptable Toxic Concentration(MATC), Application factor, TLm, Comparison of toxicity data.

The assessment of water quality using living organisms is an integral part of most water quality monitoring programs. Toxicity test data provide a basis from which to control discharged waste in receiving waters and to predi pct the impact evoked by the discharge. Toxicity tests are performed on chemicals or particulate matter known to be in waste effluents. This information can be used to establish acceptable concentration limits for the various pollutants and develop water quality standards. (See also W76-10353) (Katz)
W76-10367

CHANGES IN THE LEVELS OF ENVIRONMENTAL POLLUTANTS (HG, DDT, DIELDRIN, PCB) IN SOME SWEDISH FOODS,
National Swedish Food Administration, Stockholm. Food Lab.
G. Westoo.
Ambio, Vol. 3, No. 2, p. 79-83, 1974. 2 tab., 8 fig., 16 ref.

Descriptors: *Pesticide residues, *Public health, *Dieldrin, *Industrial wastes, *Mercury, *Foods, *DDT, *Polychlorinated biphenyls, Fish, Legislation, Pulp wastes, Chlorinated hydrocarbon pesticides, Path of pollutants, Pollutants, Toxicants, Food webs, Food chains, DDE, Distribution, Water pollution effects.
Identifiers: *Sweden.

Regulations have been issued by Swedish authorities in order to diminish the use of certain pesticides and other toxic compounds found as pollutants in the environment. The effects of the measures can be observed as decreasing levels of pollutants in certain foods. Mercury levels in Swedish foods of animal origin such as meats, eggs and liver decreased to roughly 1/3-1/6 early levels. Mercury levels in fish have also decreased in areas downstream from several wood pulp and paper pulp industries, but no decrease has been observed in the vicinity of chlorine-alkali industries. DDT in human milk has also decreased, but levels of PCB seem to have increased in the past few years. (Katz)
W76-10368

LOW THERMAL RESPONSIVENESS IN THE BLUEGILL, LEPOMIS MACROCHIRUS,
Wisconsin Univ., Madison. Lab. of Limnology.
T. L. Beitinger, and J. J. Magnuson.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 293-295, 1976. 7 ref.

Descriptors: *Sunfishes, Temperature, *Fish behavior, *Mortality, *Heated water, *Water temperature, Freshwater fish, Laboratory tests, Thermal water, Seasonal, Lethal limit, Aquatic environment, Environmental effects, Diurnal, *Thermal pollution, Water pollution effects.
Identifiers: Lepomis machrochirus, Thermal responsiveness, Acclimation.

Fifteen young bluegill, Lepomis macrochirus, acclimated to 5C for at least 1 mo, died during temperature preference testing owing to apparent voluntary exposure to high temperatures. The mortality rate of 100% for these fish greatly exceeded the 3.8% rate found for 262 bluegill acclimated to temperatures ranging from 20 to 34C, and tested in the same apparatus. Modifications in the experimental design whereby fish acclimated to 5C were held at about 19C for 24 h during testing, enabled all fish to survive. These bluegill selected temperatures only 2C lower than those acclimated to summer conditions. (Katz)
W76-10369

MARINE POLLUTION MONITORING (PETROLEUM). PROCEEDINGS OF A SYMPOSIUM AND WORKSHOP,
National Oceanographic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 5B.
W76-10370

HYDROCARBONS IN BLUE MUSSELS FROM THE KIEL BIGHT,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5B.
W76-10408

DISTRIBUTION OF TAR BALLS AND NEUSTON SAMPLING IN THE GULF STREAM SYSTEM,
National Marine Fisheries Service, Narragansett, R. I. Narragansett Lab.
For primary bibliographic entry see Field 5B.
W76-10410

EFFECTS OF OILS ON BALTIC LITTORAL COMMUNITY, AS STUDIED IN AN OUTDOOR MODEL TEST SYSTEM,
Swedish Water and Air Pollution Research Lab., Studsvik (Sweden). Baltic Lab.
M. Notini, and A. Hagstrom.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974, p. 251-254, 5 fig, 1 tab, 9 ref.

Descriptors: *Oil pollution, *Laboratory tests, Methodology, *Marine algae, *Toxicity, *Model studies, Beaches, Intertidal areas, Gammarus, Oil spill, Bioassay, Crustaceans, Water pollution effects.
Identifiers: Littoral zone, Baltic, Fucus, Gammarus, Baltic zone, Littoral community, Sweden, Attenuity indices, Sweden.

An outdoor model system, simulating realistic littoral conditions was constructed to study oil pollution. A method was developed of using changes in the structures of Fucus communities which was both rapid and sensitive in measuring the effects of oil pollution. (See also W76-10370) (Katz)
W76-10411

EFFECT OF AN OIL SPILL ON BENTHIC ANIMALS IN THE LOWER YORK RIVER, VIRGINIA,
Virginia Inst. of Marine Sciences, Gloucester Point. Div. of Environmental Science and Engineering.
M. E. Bender, J. L. Hyland, and T. K. Duncan.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974. p. 257-259, 1 tab., 4 fig., 9 ref.

Descriptors: *Oil pollution, *Oil spills, *Toxicity, *Bioassay, Laboratory studies, On-the-site investigations, On-site tests, Benthic organisms, Intertidal areas, Estuaries, Invertebrates, Benthic communities, Water pollution effects, Methodology, *Statistical analysis, *Virginia.
Identifiers: *York River(Va), Cracking residue, No. 2 fuel oil, Species, Richness, Faunal similarities, Diversity indices, Acute toxicity.

The study documents both from field survey data and laboratory bioassay studies the effect of an accidental oil spill on the intertidal benthic communities of the Lower York River, Virginia. Species richness and faunal similarity appeared to give a better indication of the effects of the oil than did the informational diversity calculations. (See also W76-10370) (Katz)
W76-10412

MARINE POLLUTION BY CARCINOGENIC HYDROCARBONS,
Center for Science in the Public Interest, Washington, D. C.
J. B. Sullivan.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum), Proceedings of a Symposium and Workshop, December, 1974. p. 261-263, 18 ref.

Descriptors: *Oil pollution, *Toxicity, Pathology, *Organic compounds, *Marine animals, *Sea water, *Public health, *Safety, Chemical analyses, Marine fish, Mollusus, Crustaceans, Water pollution effects, Monitoring.
Identifiers: Polycyclic aromatic hydrocarbons, Tissue analysis, Carcinogenesis, Contaminated seafood.

LIBRARY U. S. ENVIRONMENTAL PROTECTION AGENCY

Polycyclic aromatic hydrocarbons (PAH) contamination of seafood due to ocean oil pollution has received very little attention. It is clear, however, that relying on oily taste in seafood as a danger warning is not warranted by the studies indicated in this issue. (See also W76-10370) (Katz)
W76-10413

OHIO RIVER COOLING WATER STUDY,
Argonne National Lab., Ill.
B. P. Butz, A. Policastro, J. J. Reisa, Jr., D. R. Schregardus, and B. A. Lewis.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-235 227, $10.75 in paper copy, $2.25 in microfiche. Report EPA-905/9-74-004, June, 1974, 385 p., 36 tab., 102 fig.

Descriptors: *Aquatic biology, *Cooling water, *Ohio River, *Heated water, *Water pollution effects, *Thermal pollution, *Analytical techniques, Water pollution sources, Hydrothermal studies, Thermal power, Water temperature, Thermal stress, Biological effects, Hydrologic modeling, Freshwater fish.
Identifiers: Thermal regime, Thermal plume analysis, Thermal models, COLHEAT, STREAM, Edinger-Geyer, Temperature prediction, Model evaluation, Plume physics, Boundary effects.

This study presents a review and critique of existing technical information relevant to the environmental effects of the use of the Ohio River main stem for cooling. In order to evaluate the effect of heat discharges on the indigenous aquatic life of the Ohio River, an extensive review and critique of past and existing studies dealing with the biological aspects of cooling water was undertaken. In order to judge the effect of heat discharges on the thermal regime of the river, three one-dimensional river temperature prediction models - COLHEAT, STREAM and Edinger-Geyer were evaluated, and the most appropriate model was selected to analyze changes in temperature distribution along the river. The effects of heat discharges on the thermal regime of the river near the points of discharge were evaluated by analyzing and critiquing available thermal plume study results. (Katz)
W76-10414

MACROZOOBENTHOS OF WATER BODIES OF THE KHAZARASP REGION OF THE KHOREZM OBLAST, (IN RUSSIAN),
For primary bibliographic entry see Field 2H.
W76-10476

EXCHANGE FLOW BETWEEN LAKE ONTARIO AND HAMILTON HARBOUR,
Canada Centre for Inland Waters,Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-10496

5D. Waste Treatment Processes

OPERATION AND IMPACT OF NPDES IN REGION II, PART I,
Environmental Protection Agency, New York. Caribbean Construction Grants Branch.
For primary bibliographic entry see Field 5G.
W76-10005

RETENTION OF METALS IN SEWAGE SLUDGE II: INCORPORATED RADIOISOTOPES,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5A.
W76-10006

FLOATING STRUCTURAL PLASTIC TRUSS SYSTEM PROTECTS WASTE LAGOON LINING,
FMC Corp., San Jose, Calif.
For primary bibliographic entry see Field 5G.
W76-10007

MUDS, SLIMES AND SLUDGES,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Mineral Chemistry.
R. Arnold.
Proceedings of the Royal Australian Chemical Institute, Vol. 43, No. 2, p 51-53, February, 1976. 1 fig, 11ref.

Descriptors: *Sludge analysis, *Sludge treatment, *Sewage sludge, Organic compounds, Suspended solids, Waste disposal, Filtration, Sedimentation, *Waste water treatment.

Waste discharges of finely divided solids suspended in water are usually treated by coagulation and settling, but not all suspensions settle out readily. Although inorganic slurries sometimes cause problems, orgaic sludges, such as those produced from sewage, textile processing, or the food industry, are always difficult to dewater. These pose a serious problem since they usually are produced in populous areas. However, quantities of these sludges are much smaller than those of inorganic sludges from mining. Due to the smaller quantities, sedimentation can be supplemented with filtration and other more costly processes. Organic sludges' main components are crosslinked natural hydrophilic polymers, such as proteins or carbohydrates. Probably stabilization is due largely to a sort of inbuilt 'stearic stabilization', and charge has a less important role. The only practical way of inducing this kind of colloid to settle is some type of flocculation. Most of the troublesome sluges are already flocculated, but the sediment is a more or less structured gel retaining a large amount of water. Mechanically breaking the structure enables more water to be removed from the sediment. The sediments are usually compressible, and higher solids contents will result under loading from deep beds. This loading effect also benefits filtration. (Snyder-FIRL)
W76-10008

A METHOD FOR ASSESSING FRICTION LOSSES FOR A NON-NEWTONIAN FLUID, SUCH AS SEWAGE SLUDGE, UNDER LAMINAR FLOW CONDITIONS,
Thames Water Authority, London (England) Metropolitan Public Health Div.
For primary bibliographic entry see Field 5B.
W76-10009

USE OF HIGH LEVEL RADIATION IN WASTE TREATMENT--STATUS AND PROSPECTS,
International Atomic Energy Agency, Vienna (Austria). Div. of Life Sciences.
S. Kobayashi.
Atomic Energy Review, Vol. 13, No. 3, p 615-621, September, 1975.

Descriptors: *Sewage treatment, *Waste water treatment, *Irradiation, Cost-benefit analysis, Pilot plants, Waste treatment, Cost analysis.
Identifiers: *Ionizing radiation.

A symposium was held in March, 1975, on the application of high level radiation to waste treatment. Discussion included treatment and reuse of waste water, radiosensitivity of microorganisms, disinfection and microbiological control, chemical and physical modification of aqueous pollutants, economic and technological considerations, pilot-plant design and operating experience, and radiation treatment of non-liquid wastes. Ionizing radiation, possibly combined with other treatment methods, is useful in solving problems of waste treatment and reuse of spent resources. Several methods of increasing the cost-effectiveness of microbiological control are discussed. While the use of ionizing radiation to decompose aqueous pollutants has advantages, its yield is generally too low to compete successfully with other methods. There is still disagreement about the choice of radiation source, and cost-benefit considerations are still unclear. Several pilot plants using radiation treatment are already operating, and it is expected that commercial plants will soon be built. Recommendations included study of the surface properties of suspended sewage particles and their reaction with radiolytic species, reporting of end products and pollutional effects when pollutants are treated by radiation, further study of the natural resistance of microorganisms to radiation, and an experimental protocol for study of radiation treatment of sludge and waste water. (Snyder-FIRL)
W76-10010

CHLORINE LOOKS SECURE AS WATER REAGENT.
Canadian Chemical Processing, Vol. 60, No. 3, p 28-29, March, 1976.

Descriptors: *Chlorine, *Disinfection, *Toxicity, Aeration, Lagoons, Pilot plants, Gamma rays, *Waste water treatment, Chlorination, Costs.
Identifiers: Dechlorination.

Unwanted contaminants may be introduced into the environment by water disinfection with chlorine. Water chemists suspect that some of the chloro-compounds that persist in nature are generated during water disinfection. Industry and agriculture do not account for all the chloro materials released to the environment. Primary effluent is usually toxic to fish; unchlorinated secondary effluent is nontoxic; and either stream containing 0.1 mg/liter residual chlorine is toxic for several hr, depending on water aeration. The chlorine residual is soon lowered to below the toxic threshold, 0.02 mg/liter, by lagooning/aeration. Use of a reducing agent, such as sulfur dioxide, to treat the chlorinated water also neutralizes the residual chlorine. When chlorine is added to effluent, it reacts to form several compounds including chloramines, which reduce coliform bacteria counts and are toxic to fish. Treatment with sulfur dioxide decomposes the chloramines and renders the water nontoxic. Chlorination costs about 7 cents/Imperial gal, and dechlorination would add another cent/1000 Imperial gal. A pilot unit disinfecting waste water with gamma rays was compared with a chlorination unit of similar size. The gamma irradiator performed well and had no 'gross interaction with the waste water' other than its biocidal action. Costs for gamma radiation to produce disinfection similar to that produced by chlorine have been estimated at 64 cents/1000 gal. Gamma radiation will probably not be used to treat waste water unless this cost is drastically reduced. (Snyder-FIRL)
W76-10011

BENEFICIAL EFFECTS OF BAKING SODA ADDED TO SEPTIC TANKS,
Septic Tank Systems, Berkeley, Calif.
J. H. T. Winneberger, and M. S. Weinberg.
Journal of Environmental Health, Vol. 38, No. 5, p 322-326, March-April, 1976. 2 fig, 2 tab, 12 ref.

Descriptors: *Septic tanks, *Chemical precipitation, *Suspended solids, *Domestic wastes, *Waste water treatment, *Flocculation, Sodium compounds.
Identifiers: *Baking soda additives.

Additives for septic tanks are discussed. Septic tanks are not generally designed for efficient operation, but dead zones could provide for gradual release of chemical additives. Experiments with fresh water in salt-water filled models showed that intermittent addition could be effec-

tive. Chemicals were also added to the water entering two actual septic tanks of different sizes; one had been cleaned recently. Their liquid volumes had considerablr hydraulically less active zones which could store suspended or dissolved additives and exchange them slowly with active zones. Cationic flocculants increase flocculation, but in excessive amounts, can increase suspended solids. Experiments adding varied amounts of flocculant to raw sewage showed that an optimum amount of flocculant exists at which maximum removals of suspended solids occur. Due to their rather narrow effectiveness range, cationic polymers could cause problems as septic tank additives, due to varying septic tank sizes and the tendency of some homeowners to add more than the recommended quantities. Baking soda is being added to septic tanks as a result of its use to deodorize drains. One study found that the addition of baking soda improved flocculation of suspended solids. Another study found that adding sodium bicarbonate, sodium chloride, sodium carbonate, sodium hydroxide, potassium bicarbonate, and potassium chloride to septic tank effluents decreased suspended solids and turbidity. (Snyder-FIRL)
W76-10012

DYNAMIC MODELLING AND CONTROL SIMULATION OF A BIOLOGICAL WASTE-WATER TREATMENT PROCESS,
Eidgenossische Technische Hochschule, Zurich (Switzerland). Laboratorium Technisch-Chemisches.
T. von Jeszenszky, and I. J. Dunn.
Water Research, Vol. 10, No. 5, p 461-467, 1976. 11 fig, 2 tab, 9 ref.

Descriptors: *Model studies, *Biological treatment, *Waste water treatment, Control systems, Recycling, Sludge treatment, *Simulation analysis.
Identifiers: Linear models, Monod models.

A dynamic control model of a two-stage reactor for biological treatment of waste water was developed. The rate of sludge recycle was manipulated according to exit substrate concentration deviations or entering substrate flow rate and concentration changes. The influence on process control of a Monod model and a linear model, with and without time delay functions, was investigated. The response of the system to sine variations of inlet concentration and flow was simulated by computer. Sludge recycle control provided substantial improvement for all models. On-off feedback control was best for linear models. Feedforward control was more effective for Monod kinetics. (Snyder-FIRL)
W76-10018

COMPUTER BASED CONTROL FOR WASTE-WATER SYSTEMS,
Greeley and Hansen, Chicago, Ill.
H. D. Gilman, E. F. Ballotti, and C. F. Guarino.
Consulting Engineer, Vol. 46, No. 4, p 46-48, April, 1976.

Descriptors: *Computers, *Waste water treatment, *Control systems, Automatic control, *Model studies, Monitoring.

The computer system is becoming an integral element in control of waste water treatment operations as well as monitoring. This has been noted in the upgrading of the water pollution control facilities in Philadelphia. Guidelines are provided for designing procedural models and documenting studies leading to the preparation of detailed specifications. The specifications should define what the supplier is to provide and delineate the information required by the supplier to form an operational data base. Specific computer performance is harder to specify then hardware, requiring significant written and diagrammed information. The information provided must include the types of information to be stored and displayed and the monitoring and control procedures required by the treatment system. The designs for plant monitoring and control are far more critical than data logging and reports, because integrating the computer into a control strategy is inherently a unique procedure. The computer control specification for a subprocess should include the names of all equipment, monitoring and control signals, descriptions of the monitoring and control requirements, control line diagrams, sample cathode ray tube displays, data and formats for printed logs and reports, alarm and status change log statements, storage of cumulative operation hours, process interface requirements, logic diagrams of the required computer operation procedures, and terminology. (Snyder-FIRL)
W76-10019

COMPUTER-AIDED ANALYSIS OF ENVIRONMENTAL DATA, PART I: LINEAR REGRESSION, PRECISION AND ACCURACY,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5A.
W76-10022

COMPUTER-AIDED ANALYSIS OF ENVIRONMENTAL DATA, PART II: BIOCHEMICAL OXYGEN DEMAND MODEL,
Rensselaer Polytechnic Inst., Troy, N. Y.
For primary bibliographic entry see Field 5A.
W76-10023

SELECTIVE RENOVATION OF EUTROPHIC WASTES PHOSPHATE REMOVAL,
Consiglio Nazionale delle Ricerche, Bari (Italy). Instituto di Ricercha sulle Acque.
G. Boari, L. Liberti, and R. Passino.
Water Research, Vol. 10, No. 5, p 421-428, 1976. 5 fig, 5 tab, 20 ref.

Descriptors: *Sewage effluents, *Eutrophication, *Nutrient removal, *Phosphates, *Waste water treatment, Equilibrium, Chlorides, Recycling.
Identifiers: *Phosphate removal, Chloride/phosphate equilibrium.

As part of the development of a selective process to remove eutrophic species from sewage effluents, the chloride/phosphate equilibrium was studied for various ion resins and the selectivity dependence on several external or internal parameters was evaluated. After being converted into chloride or phosphate form, the resins were tested in columns or by allowing equilibrium to be reached in a flask. Hydrostatic interactions appear to have a great importance in determining resin selectivities in the chloride/phosphate system, but not in the chloride/sulfate equilibrium. The experimental results for the chloride/phosphate equilibrium would lead to selection of a secondary and tertiary amino, porous, 8 to 10% crosslinked, polyacrylic resin having diethylentriamine (DETA) basic groups for selective removal of phosphate from secondary effluents, with .001 to .006 M total concentration, low phosphate concentration, and 6.5 to 7.5 pH. Equilibrium phosphate uptakes were as high as 0.7 kg phosphate/kg dry resin. Resins having more hydrophilic matrices would require adequate physico-chemical stabilization. A possible alternative is once-through utilization of less chemically resistant resins, re-using the resins directly in phosphate form in soil conditioners or fertilizer. (Snyder-FIRL)
W76-10026

POLLUTION MONITORING DOESN'T HAVE TO BE COSTLY,
Hewlett-Packard Co., Loveland, Colo.
For primary bibliographic entry see Field 5A.
W76-10029

COST-EFFECTIVE GOAL,
D. E. Wright.
The Consulting Engineer, Vol. 40, No. 2, p 37, 39, February, 1976.

Descriptors: *Cost analysis, *Model studies, *Computer models, Engineering, *Sewage treatment, Performance, Design criteria, *Waste water treatment, Construction, Treatment facilities.
Identifiers: Cash flow.

An optimization study on sewage treatment carried out by the Construction Industry Research and Information Association (CIRIA) was reported. The process stages are linked by the right kinds of connections and the model responds properly to external stimuli, but assumptions and limitations are inherent in prototype models. Purposes of the study included correcting errors in the computer program and analyzing the sensitivity of the total annual cash flow (TACF) to particular design parameters or cost relationships. The model includes performance relationships, but users must provide cost information. Its results depend totally on the model structure and input data. Influent and effluent quality and various engineering parameters are considered along with TACF. An increase in interest rate or reduction of operating costs shifted the optimal solution away from the use of stages with high capital costs and low operating costs. The lowest number of process units, the maximum volume of individual process units, the cost per unit volume, and the drying-bed area were affected by increasing the model flow incrementally between 0.1 and 0.9 cu m/sec. Several alternative sludge disposal methods, each involving several steps, were compared at various flows. Values considered reasonable for leading design variables were compared with values optimized by the model. It is felt that the model should be developed further, improving performance relationships and economic calculations and adding new processes. (Snyder-FIRL)
W76-10032

DESIGNING MICROSCREENS. HERE'S SOME HELP,
Envirex, Inc., Waukesha, Wis. Water Quality Control Div.
E. P. Saffran, and R. A. Kormanik.
Water and Wastes Engineering, Vol. 13, No. 4, p 41-42, 44-45, April, 1976. 4 fig, 1 tab.

Descriptors: *Hydraulic design, *Mathematical models, Model studies, Equations, *Sewage treatment, *Biochemical oxygen demand, *Suspended solids, *Screens, Turbidity, Filtration, *Waste water treatment.
Identifiers: *Microscreens.

In determining the hydraulic capacity of a microscreen for design purposes, several parameters must be taken into account. These include the rate of clogging of the fabric, the rotational speed of the drum, the area of the submerged screen, the backwash efficiency, and the total head. Mathematical formulae have been derived for calculating filterability, headloss, and the permeability coefficient. Equations and their derivations are presented. Microscreens are used in conventional sewage treatment plants to polish secondary effluent. They have been effective in removing up to 50 to 80% suspended solids, 30 to 50% BOD, and 20 to 50% turbidity. The microscreens are generally sized based on hydraulic loadings in terms of gallons per minute per square foot of submerged area. (Kramer-FIRL)
W76-10033

DESIGN OF A STORMWATER SEWER BY NONLINEAR PROGRAMMING–I,
Sherbrooke Univ. (Quebec). Dept. of Civil Engineering.
P. F. Lemieux, Y. Zech, and R. Delarue.
Canadian Journal of Civil Engineering, Vol. 3, No. 1, p 83-89, March, 1976. 3 fig, 10 ref.

Descriptors: *Mathematical models, *Design criteria, *Sewers, *Pipes, Model studies, Hydrology, Cost analysis, Sewage treatment, Storm water, Drainage, *Waste water treatment.
Identifiers: Nonlinear programming.

Methodology for the design of a stormwater sewer using nonlinear programming has been developed. Pipe flows are calculated at the critical time for the system, using the hydrologic characteristics of the drainage surface. Next, a set of constraints are established for every pipe according to the pipe layout. Thirdly, an optimal solution is found by minimizing the system total cost subject to the constraints defined. A value is then added to the value of every continuous pipe diameter, and the highest standard diameter below or equal to that value is chosen. Finally, a post-optimal analysis is made of the piezometric surface to evaluate the sewer system performance. While the standard diameter solution is not optimal in a mathematical sense, it does lead to efficiency of design. Factors which influence an optimal solution are the inlet time at a node, excavation in soil or rock, ground slope, and Manning's n. (Kramer-FIRL)
W76-10034

MATHEMATICAL MODEL SIMPLIFIES DESIGN OF SLUDGE DRYING BEDS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
T. M. Walski.
Water and Sewage Works, Vol. 123, No. 4, p 64-65, April, 1976. 2 fig, 1 tab, 5 ref.

Descriptors: *Mathematical models, *Dewatering, *Sludge treatment, Equations, *Waste water treatment, Treatment facilities, Sludge disposal, Evaporation.
Identifiers: *Sludge drying beds.

Sand drying beds for the dewatering of sludge from small waste water treatment plants have proven economical. A typical sand drying bed is made up of a top layer of sand with an effective grain size of 0.3 to 0.75 mm, underlain by 6 to 12 inches of graded gravel. Wet sludge is placed on the beds, where it drains and dries until it can be lifted and hauled away. Design methods for sizing the beds are detailed, using a rational method to tabulate total bed area required each month. While the rational method is preferred over the empirical formula, it is still awkward to use. A simpler mathematical formula has been derived to account for the major sludge drying mechanism. This model is based on the time for sludge to drain, time for moisture to evaporate from drained sludge, moisture in inches, percent solids, and monthly rainfall. It was demonstrated that the required drying bed area was relatively insensitive to the depth to which the sludge is applied but was quite sensitive to variations in solids concentrations and to the effective evaporation. (Kramer-FIRL)
W76-10035

THE ROLE OF HYDROXYL RADICAL REACTIONS IN OZONATION PROCESSES IN AQUEOUS SOLUTIONS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
J. Hoigne, and H. Bader.
Water Research, Vol. 10, No. 5, p 377-386, 1976. 4 fig, 10 tab, 45 ref.

Descriptors: *Ozone, *Waste water treatment, *Kinetics, Biodegradation, Hydrogen ion concentration, Analytical techniques, Equations, Water treatment.
Identifiers: *Hydroxyl radicals.

A reaction scheme involving hydroxyl radical reactions in ozonation processes in water and waste water was investigated. The hypothesis tested was that the ozone may either react directly in substrates or above a critical pH value may decompose prior to reaction with substrates. Beyond the critical pH value, decomposition products of ozone such as hydroxyl radicals (OH) become the important oxidant. The critical pH-value above which the second type of reaction predominates depends upon both the rate which ozone reacts directly with the substrates and on the solutes, including reaction products, that enhance or retard ozone decomposition. Results obtained on aqueous model solution showed that reaction conditions for ozonation can be selected to favor either of the two postulated oxidation mechanisms. While the distinction between the two different mechanisms initiated by ozonation and the use of data available on each will provide a basis for optimizing the ozonation process, the reaction sequences for real waste water systems are more complex and must be analyzed for the individual cases. (Kramer-FIRL)
W76-10036

BIOCHEMICAL AND PHYSICAL PROPERTIES OF AN ACTIVATED SLUDGE ON SETTLING CHARACTERISTICS,
Institute of Public Health, Tokyo (Japan). Dept. of Sanitary Engineering.
Y. Magara, S. Nambu, and K. Utosawa.
Water Research, Vol. 10, No. 1, p 71-77, 1976. 12 fig, 1 tab, 18 ref.

Descriptors: *Activated sludge, *Flocculation, *Settling velocity, *Sewage treatment, *Waste water treatment, Physical properties, Biological treatment, Biological properties, Suspension, Sanitary engineering, Chemical properties, Polymers.
Identifiers: Sludge volume index, Poly-b-hydroxybutyrate.

Relationships between the settling characteristics of activated sludge floc and its biochemical and physical properties were investigated in a laboratory aeration tank. The sludge volume index increased and the settling velocity decreased with an increase in the organic load. Floc density proved to be the most significant physical property affecting floc settling characteristics. Improved floc settling characteristics were associated with increases in floc density and floc strength and with a decrease in floc size. Settling characteristics were also improved by decreasing the electrophoretic mobility due to the disappearance of extracellular polymers and poly-b-hydroxybutyrate during the process of metabolism. The extracellular polymer parameter was the most significant factor affecting activated sludge floc settling characteristics. (Kreager-FIRL).
W76-10037

ASSESSMENT OF THE MAXIMUM CONCENTRATION OF HEAVY METALS IN CRUDE SEWAGE WHICH WILL NOT INHIBIT THE ANAEROBIC DIGESTION OF SLUDGE,
Water Pollution Research Lab., Stevenage (England).
F. E. Mosey.
Water Pollution Control, Vol. 75, No. 1, p 10-20, 1976. 2 fig, 7 tab, 24 ref.

Descriptors: *Heavy metals, *Anaerobic digestion, *Equations, Solids removal, Sludge disposal, *Waste water treatment, Sludge treatment.

A method was developed to predict the effect of mixtures of heavy metals on the anaerobic digestion process. Two equations of similar form were obtained, one indicating conditions under which inhibition is expected, and the other indicating conditions under which the probability that digestion will not be inhibited is at least 90%. Both equations include the content of zinc, nickel, lead, cadmium, copper, and solids arriving or in digesting sludge. Digestion is also safeguarded from heavy metal inhibition when the total weight of these heavy metals in grams arriving daily in the crude sewage does not exceed 4939 times the average daily dry weight in tons of solids fed to the digester. Inhibition of other stages of treatment occurs at heavy metal concentrations similar to those that inhibit anaerobic digestion. The effects on the receiving stream and land on which the sludge is spread must also be considered when formulating suitable conditions. (Snyder-FIRL)
W76-10040

BIODEGRADABILITY AND TOXICITY STUDIES OF PHOTOGRAPHIC PROCESSING WASTES AT OFFUTT AFB, NEBRASKA,
Environmental Health Lab., Kelly AFB, Tex.
For primary bibliographic entry see Field 5C.
W76-10053

HYDROGEOLOGIC AND OTHER CONSIDERATIONS RELATED TO THE SELECTION OF SANITARY-LANDFILL SITES IN OHIO,
Ohio Dept. of Natural Resources, Columbus. Regional Geology Section.
G. H. Groenewold.
Information Circular Number 41, 1974. 15 p, 6 fig, 2 tab, 18 ref, 1 plate.

Descriptors: *Solid wastes, *Landfills, *Sites, *Leaching, *Leachate, *Water pollution, Groundwater, Water purification, *Ohio, Topography, Hydrogeology, Permeability, Porosity, Surface water, Glacial drift, Glacial soils, Water sources, Clays, Till, Shales, Geologic investigations, On-site investigations, Waste treatment, Waste disposal.
Identifiers: Landfill site selection, Leachate treatment.

Solid waste disposal by landfilling is widely practiced in Ohio. Proper landfill site selection is of major importance so as to prevent escape of toxic leachate and noxious gases from the disposal site. If the site is properly chosen, natural processes of filtration and purification will minimize the threat to ground-water contamination by infiltrating leachate. Major considerations include the topography and hydrogeology of the proposed site as well as the availability of suitable cover materials. Utilization of existing geologic, soil, as well as ground-water and surface-water information in conjunction with on-site investigation is of utmost importance in the proper selection of disposal areas. Sites having natural safeguards and not requiring excessive alteration are abundant in most areas of Ohio. In some localities leachate collection and treatment may be necessary to assure safe disposal. (Heiss-NWWA)
W76-10084

PL92-500: MID-COURSE CORRECTION GRANTS OPTIONS; NEXT MOVE UP TO CONGRESS,
For primary bibliographic entry see Field 5G.
W76-10106

EFFECTS OF TREATED MUNICIPAL WASTEWATER ON OAT FORAGE AND GRAIN,
Arizona Agricultural Experiment Station, Tucson.
A. D. Day, and R. M. Kirkpatrick.
J Environ Qual. 2(2), p 282-284, 1973.

Descriptors: *Oats, *Water reuse, *Crop response, Nutrient requirements, *Recirculated water, *Surface irrigation, Return flow, Waste water(Pollution), Reclaimed water, *Fertilization.

Experiments were conducted at Tucson, Arizona (USA) to study some effects of treated municipal wastewater on growth, yield and quality of oats (Avena sativa L.) grown for pasture forage and grain. No differences were observed in plant height, tillers per plant, green forage yield and total protein between forage grown with well water plus suggested amounts of N, P and K and forage grown with wastewater alone. Oats produced more dry forage when grown with well

water plus suggested N, P and K than when irrigated with wastewater. Wastewater produced forage with higher moisture content than well water plus N, P and K. When grown for forage, cultivars differed in plant height, dry forage yield and total protein content. Oat grain data showed no differences between irrigation and fertilizer treatments for maturity, plant height, panicles per unit area, grain yield and total protein. Well water plus suggested N, P and K resulted in fewer seeds per panicle and heavier seeds than wastewater. Cultivars differed in maturity, plant height, panicles per unit area, seeds per panicle, seed weight, grain yield and total protein. Treated municipal wastewater can be utilized to produce oats with grain yields and forage and grain protein contents approximately equal to those obtained when oats are grown with well water and suggested levels of N, P and K.--Copyright 1973, Biological Abstracts, Inc.
W76-10119

SWINE WASTE DIGESTION ENHANCEMENT WITH NUTRIENT SEPARATION,
Kansas Water Resources Research Inst., Manhattan.
L. A. Schmid, and R. I. Lipper.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 021, $4.00 in paper copy, $2.25 in microfiche. Completion Report, KWRRI Contribution No. 173, June 1976. 29 p, 3 fig, 6 tab, 31 ref, append. OWRT A-063-KAN(1), 14-31-0001-5016.

Descriptors: *Anaerobic digestion, *Farm wastes, Hogs, *Waste water treatment, Nutrients, Separation techniques, Carbon dioxide, Ammonia, Methane, Nutrient removal, Anaerobic bacteria, Gases.
Identifiers: *Swine wastes, Methane production, Ammonia removal, Carbon dioxide removal.

A swine waste anaerobic digester receiving the waste from 80 boars was operated for a period of ten months. Digester mixing and nutrient removal were accomplished by the recirculation of digester gases through two stripping units. Phosphoric acid was used to strip ammonia from the recirculated gas stream. Caustic solutions, primarily lime, were used to strip carbon dioxide. The removal of carbon dioxide resulted in an elevation of digester pH to 8.0. At the elevated pH ammonia was more readily stripped. A system specific ammonia desorption coefficient was determined which may be used for selecting gas flow rates. The selection of the proper gas flow rate can provide the required degree of ammonia removal to reduce ammonia concentrations to levels non-toxic to anaerobic bacteria. (Powers-Kansas State)
W76-10128

NITROGEN REMOVAL DEPENDS ON FORM NUTRIENT TAKES,
Metcalf and Eddy, Inc., Boston, Mass.
B. W. Behrman.
Water and Wastes Engineering, p 27-29, 46, February, 1976. 1 fig.

Descriptors: *Nitrogen, *Nitrites, *Ammonia, *Waste water treatment, *Biocontrol, Nitrogen fixing bacteria, Land use, Algae, Chlorination, Ion exchange, Economic feasibility, Bacteria, Water quality control.
Identifiers: Ammonia stripping, Breakpoint chlorination.

Most nitrogen in raw municipal wastewaters is in ammonia form, but 30-50% is usually associated with organic matter which may be biologically broken down to ammonia if the waste receives secondary treatment. Nitrifying bacteria may be used under certain conditions to convert some ammonia to nitrites and nitrates, which rarely occur in raw wastewater. Biological control technology involves specialized microorganisms to oxidize and/or remove wastewater N. Such methods are described and their benefits analyzed. Biological control can be accomplished by land application of wastewaters, although removal rates are highly variable and depend on application rates as well as the soil's pH, temperature, dissolved oxygen and organic carbon content. Another method involving harvesting algae has economic disadvantages. Three physical-chemical removal processes are ammonia stripping, breakpoint chlorination and selective ammonium ion exchange, none of which can remove N in the organic, nitrite or nitrate forms. Advantages and disadvantages of these techniques are described. Economic factors in various types of N control are also analyzed. (Jahns-Arizona)
W76-10174

AQUICULTURE - NEW BROOM CLEANS UP WASTEWATER,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 5G.
W76-10180

THE INFLUENCE OF THE SURFACE RUNOFF OF HEAVY RAINS ON THE CALCULATION OF SEWERS (UBER DEN EINFLUSS DES FLACHENABFLUSSES DER STARKREGEN AUF DIE BERECHUNG VON KANALISATIONEN),
H. Schulz.
Wasserwirtschaft-Wassertechnik, Vol. 26, No. 3, p 99-101, 1976. 5 fig, 2 ref.

Descriptors: *Sewers, *Storm runoff, Analytical techniques, *Combined sewers, *Drainage systems, Dimensioning, Retention, Flood frequency, Mathematical studies.
Identifiers: Space-time coefficient method.

A space-time coefficient method is described for the calculation of the influence of heavy rains on sewer dimensions. According to this method, the sewer system is dimensioned as a function of a retention coefficient, which is dependent of the sewer length per unit area and ultimately of the sewer length to flow rate ratio, and of a dynamic storage capacity, which is dependent of the orographic conditions. The usual reserves and safety margins are eliminated, which implies that the envisaged frequency of flood may actually occur. This frequency should be reduced accordingly for certain overflow in mixed sewer systems, retention basins or drainage canals in important urban and industrial agglomerations. (Takacs-FIRL)
W76-10197

THE EFFECT OF VARIOUS DESIGNS OF RAIN CATCHING BASINS ON THE POLLUTION OF THE RECEIVING WATER AND THE ECONOMY OF THE SEWER SYSTEM (DIE AUSWIRKUNG DER VERSCHIEDENEN BAUARTEN VON REGENUBERLAUFBECKEN AUF DIE SCHMUTZBELASTUNG DES VORFLUTERS UND DIE WIRTSCHAFTLICHKEIT DES KANALNETZES),
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft.
K. Krauth.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 583-591, 1976. 6 fig, 1 tab, 4 ref.

Descriptors: *Basins, *Rain water, *Combined sewers, *Runoff, Bypasses, Watersheds(Basins), Rainfall, Design, Retention.

General considerations on the influence of rain catching basins on the pollution of recipients and on the economy of the mixed sewer system are presented. The efficiency of rainwater retention basins is apparent from the fact that the pollutant loads occurring during the initial phase of the rainwater runoff are multiples of the average load. Several basins should be linked in a by-pass system to prevent the discharge of runoff once retained in one basin into the recipient from the next one. Catchment basins are unable to retain the runoff during the later phase of many prolonged rain events. Basins of up to 500 cu m should be self-scavenging, and scavengers are necessary for larger units. For economic reasons, large areas should be subdivided into homogeneous zones of 20-40 ha each, with separate runoff retention basins in by-pass. (Takacs-FIRL)
W76-10198

SEWER PEST CONTROL CHECK VALVE,
For primary bibliographic entry see Field 8C.
W76-10199

APPARATUS AND METHOD FOR REMOVING POLLUTANTS FROM WASTEWATER,
Swift and Co., Chicago, Ill. (Assignee).
E. R. Ramirez, and D. L. Johnson.
United States Patent 3,959,131. Issued May 25, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 4, p 1738, May, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, Treatment facilities, *Flotation, *Aggregates, Treatment, Equipment, Wastes, Separation techniques, Bubbles.

A patent for a raw waste water treatment system is described. The system includes a tank into which the waste water is introduced and a bubble introduction means located below and in communication with the tank for supplying a dense zone of fine bubbles to the tank. The pollutants in the waste water combine with the bubbles to form aggregates which remain unseparated from the waste water flow. The aggregates and treated waste water flow are removed through a transfer conduit to a flotation basin for separation of the pollutants and bubbles from the clarified waste water. (Kreager-FIRL)
W76-10200

CONTINUOUS RESPIROMETER APPARATUS FOR MONITORING SEWAGE OXYGEN CONTENT.
Robertshaw Controls Co., Richmond (Australia). (Assignee).
For primary bibliographic entry see Field 5A.
W76-10201

WASTE WATER TREATMENT.
Westinghouse Electric Corp., Melbourne (Australia).
Australian Patent 470,038. Issued March 4, 1976. Official Journal of Patents, Trade Marks and Designs, Vol. 46, No. 7, p 663, March, 1976.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Patents, Separation techniques, Incineration, Disposal, Solid wastes, Liquid wastes, Filtration, Absorption, Colloids, Granules.

A waste water treatment system was patented. It includes an enclosure with an inlet adapted for receiving sewage influent for conditioning, separate liquid and solids outlets, and a liquid-solids separator in the enclosure receiving the influent to separate the solid and the liquid and to deliver the solids to the solids outlet. An incinerator which is associated with the outlet burns the solids delivered to it. A surge conditioning tank associated with the liquid outlet receives the liquid that has been separated. Chemical feed means connect with the tank to introduce chemical substances to condition the liquid. Filtration-absorption means connect with a tank outlet to remove colloidal material not removed by the separator. The filtration-absorption means include at least a stripper column with a mixture of various kinds of granules. One kind is chosen from materials having positive electrode potentials compared to hydrogen and another from materials having negative electrode potentials compared to hydrogen. (Snyder-FIRL)

LIBRARY OF THE UNIVERSITY OF

W76-10202

PROCESS FOR DECONTAMINATING SEWAGE CONTAINING CYANIDE,
Heinrich Koppers Gesellschaft mit Beschrankter Haftung, Essen (West Germany) (Assignee).
H. Kloster, G. Preusser, and P. Radusch.
United States Patent 3,959,130. Issued May 25, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 4, p 1738, May, 1976.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, Chemical wastes, *Fly ash, *Patents, Hydrogen ion concentration, Separation techniques, Particle size.
Identifiers: *Cyanide.

A process for decontaminating sewage containing cyanide was patented. The cyanide is removed from sewage by maintaining the sewage in contact with a fly ash product produced during the gasification or combustion of coal dust, lignite, or coal at pH 7 or greater for 10 minutes or more. The fly ash product particles are smaller than approximately 25 microns. The sewage and the fly ash product are then separated. (Snyder-FIRL)
W76-10203

TREATMENT AND DISPOSAL OF SEWAGE SLUDGE,
Sterling Drug Inc., New York. (Assignee).
G. H. Teletzke.
United States Patent 3,959,125. Issued May 25, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 4, p 1737, May, 1976.

Descriptors: *Biological treatment, *Heat treatment, *Sludge treatment, *Patents, *Landfills, *Sewage sludge, Sludge disposal, Microorganisms, Seeds.

A process was patented to condition sewage sludge for land disposal. The sludge is rendered free of viable plant seeds and disease-producing microorganisms by heating it to between approximately 65 C and 150 C for between about 30 seconds and 60 minutes. The time and the temperature vary inversely. Without separating liquid and solid phases, the resulting fluid sterilized sewage sludge is biologically digested at a temperature between about 32 C and 60 C. (Snyder-FIRL)
W76-10204

SEWAGE HANDLING AND DISPOSAL PROCESS FOR CHLORIDE (NACL) CONTAMINATED SLUDGES,
Dorr-Oliver Inc., Stamford, Conn. (Assignee).
R. S. Millward.
United States Patent 3,959,126. Issued May 25, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 4, p 1737, May, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Sewage sludge, Biological treatment, *Sodium chloride, Centrifugation, Chlorides, Saline water, Desalination.

A method was patented to treat sewage that contains sodium chloride from infiltration by salt water. It is suitable for sodium chloride concentrations that become corrosive at temperatures used to sterilize sludge. The sewage is treated to produce biologically treated sludge. This biologically treated sludge is centrifugally separated and concentrated in a nozzle type centrifuge. An underflow fraction with a controllable concentration and a overflow separated liquid fraction are delivered through the machine's nozzles. Wash water is fed into the separating chamber at a rate effectively blocking sodium chloride from discharging with the underflow fraction by displacing the sodium chloride by the wash water toward overflow, delivering underflow sludge substantially free of sodium chloride and an overflow that contains the displaced sodium chloride. This underflow sludge is heated by passing through heating apparatus which could otherwise be corroded by the sodium chloride at sterilizing temperatures. (Snyder-FIRL)
W76-10205

TRACTION-DRIVEN COMPOSITE SLUDGE RAKING MECHANISM FOR SEDIMENTATION TANKS,
Dorr-Oliver, Inc., Stamford, Conn. (Assignee).
J. A. Seifert, D. R. Hill, and M. Smith.
United States Patent 3,959,152. Issued May 25, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 4, p 1746, May, 1976. 1 fig.

Descriptors: *Patents, *Sludge treatment, *Sediment discharge, *Settling basins, *Sediment control, *Waste water treatment, Treatment facilities, Sedimentation, Treatment, Equipment, Sediments, Wastes.

A patent for a sludge raking mechanism for sedimentation tanks is described. A bladed rake arm extends from the lower end of a vertical cage structure surrounding a center pier near the discharge means of a settling tank and swings from a predetermined lowermost normal raking position to move the sludge toward the discharge means. The rake arm yields upwardly along the predetermined path when excessive sediment accumulation in the inner zone of the settling tank occurs. An outer complementary raking means functions to move light sedimentation sludge loads from an outer annular zone to the inner zone of sedimentation sludge accumulation. (Kreager-FIRL)
W76-10206

WASTE TREATMENT PROCESS,
Alar Engineering Corp., Chicago, Ill. (Assignee).
H. R. White, and A. J. Doncer.
United States Patent 3,959,129. Issued May 25, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 4, p 1737-1738, May, 1976. 1 fig, 1 tab.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical reactions, *Solubility, *Filtration, Treatment, Wastes, Adhesives.
Identifiers: Printing wastes, Paper board wastes.

A patent involving a process for treating waste waters derived from the clean-up of at least one water-based flexographic printing ink and from the clean-up of at least one starch based adhesive used in corrugated paper board manufacturing is described. The process involves the addition to the waste water of 500-5000 ppm of dissolved, water-soluble iron salt (selected from ferrous sulfate, ferric sulfate, or ferric chloride); agitation of the resulting mixture for a period of 20 min to 4 hr; mixing the agitated mixture with 500-5000 ppm of calcium hydroxide (composed of particles less than 250 micron); agitation of the resulting mixture for a period of 20 min to 4 hr; and the continuous passage of the resulting mixture over the surface of a rotating drum vacuum filter assembly which is coated with a layer of water-insoluble, inert particulate material having a particle size less than about 250 microns. The aqueous portion of the mixture is simultaneously withdrawn through the surface portion of the rotating drum, while the filter cake deposited on the outer surface portion of the drum is moved along a longitudinal path of the drum. The waste water treated should contain a 4000-60,000 ppm of suspended solids with an average diameter below about 200 milli-micron and 1-6 weight % non-aqueous matter. (Kreager-FIRL)
W76-10207

METHOD AND APPARATUS FOR THE ACTIVATED SLUDGE TREATMENT OF WASTEWATER,
Sweco, Inc., Los Angeles, Calif. (Assignee).
G. Tchobanoglous.
United States Patent 3,959,124. Issued May 25, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 4, p 1736-1737, May, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Activated sludge, *Aeration, *Screens, Treatment facilities, Equipment, Wastes, Treatment, *Sludge treatment.

A patent for an activated sludge waste water treatment method and apparatus is described. The apparatus includes an aeration basin and a secondary clarifier along with a screening means arranged for receiving at least a portion of the flow from the aeration basin for solids removal. The screening means includes at least one screen and a distribution means for directing the flow with a substantial relative movement itself and the screen so that the screen is maintained unclogged. The screening means divides the flow into a screened effluent and a concentrate. The former is directed to the secondary clarifier and the latter to the aeration basin for control of the mean cell residence time in the aeration basin. (Kreager-FIRL)
W76-10208

RECIRCULATING SEWERAGE SYSTEM,
Koehler-Dayton, Inc., New Britain, Conn. (Assignee).
F. J. Bogusz.
United States Patent 3,958,279. Issued May 25, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 4, p 1460, May, 1976. 1 fig.

Descriptors: *Sewage treatment, *Waste water treatment, *Sewerage, *Recycling, *Patents, *Treatment facilities, Equipment, Treatment, Sewage disposal, Waste disposal, Wastes, Sewage effluents.

A patent for a recirculating sewerage system is described. The sewage system consists of a toilet, a recirculating tank, a drain conduit which communicates with the bottom of the recirculating tank, a valve for controlling the gravitational flow of sewage from the recirculating tank through the drain conduit, and a means for directing the effluent from the toilet into the recirculating tank. When the system is operated in the flushing mode, a means for energizing a pump communicating with the recirculating tank is provided along with a means for recirculating the effluent discharged by the pump to the toilet for flushing purposes. Means are also provided for operating the system in a drain mode whenever the recirculating tank is to be drained. (Kreager-FIRL)
W76-10209

WHAT TO DO WITH SEWAGE SLUDGE.
Mosaic, Vol. 7, No. 3, p 20-28, May-June, 1976. 1 fig.

Descriptors: *Sewage sludge, *Sewage disposal, *Waste water treatment, *Land use, Odor, Heavy metals, Groundwater, Water pollution sources, Microorganisms, Irradiation.
Identifiers: Land application.

Higher degrees of purification of waste water are producing larger amounts of sludge, at the same time that it is becoming more difficult to dispose of. Application to land is considered more practical than burning or disposal at sea. Problems with application to land include the heavy metal content of the sludge, odor, and objections from local residents. Most existing sludge disposal options seem to have serious drawbacks. Research is underway on the economic and health problems of land disposal. One system being studied involves injection of sludge under the soil surface. Potential

problems with the method include nitrate pollution of groundwater, contamination of crops with heavy metals, and infection of soil and groundwater with microorganisms. The extent of these problems varies with sludge, soil, and moisture conditions. Microorganisms pose the most serious problem. Irradiation of sludge is being studied as a means of inactivating pathogenic agents. (Snyder-FIRL)
W76-10210

HYDROGEN PEROXIDE SOLVES SLUDGE ODOR PROBLEM,
Appleton Public Works, Wis.
R. G. Miller.
Water and Sewage Works, Vol. 123, No. 5, p 74-76, May, 1976. 1 fig.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Sludge treatment, *Dewatering, Odor, Hydrogen sulfide, Industrial wastes, Domestic wastes.
Identifiers: Hydrogen peroxide, *Odor control.

An extreme problem with hydrogen sulfide odor from sludge dewatering at a waste treatment plant was solved using hydrogen peroxide treatment. The activated sludge plant serves Appleton, Wisconsin, treating both residential and industrial waste. A classical pattern of primary and secondary treatment is used. The filter room odor problem had existed ever since the secondary treatment facility began operation. The dewatered sludge disposed of on land also emitted a sulfide odor. Hydrogen peroxide, which controls hydrogen sulfide odors by breaking down hydrogen sulfide into elemental sulfur and water, was tested for effectiveness. The hydrogen peroxide was injected into a main between the storage tanks and the vacuum filters, to remove the sulfide producing slimes that populated the mains. Injection at 50 ppm resulted in no sulfides or odor in the sludge and no hydrogen sulfide in the atmosphere. The sulfide odor in the filter room also disappeared, and the hydrogen peroxide was easy to store and inject. This method of odor control was instituted immediately after it was proved effective. (Snyder-FIRL)
W76-10211

TREATMENT OF WASTE WITH OXYGEN OR OZONE.
Commonwealth Industrial Gases, Ltd., Sydney (Australia).
Australian Patent 470,115. Issued March 4, 1976. Official Journal of Patents, Trade Marks and Designs, Vol. 46, No. 7, p 683, March, 1976.

Descriptors: *Liquid wastes, Waste treatment, *Patents, *Ozone, *Oxygen, *Waste water treatment, Recycling, Chemical oxygen demand.

A process for treating liquid wastes with oxygen or ozone has been patented. Such wastes have an oxygen demand sufficient that when the liquor is contacted with a treatment gas having an oxygen content in the range 70 to 95% by volume, at least a part of the effluent gas produced is subjected to an enrichment step. This will restore its oxygen content to the treatment level. The oxygen is then recycled. (Kramer-FIRL)
W76-10212

FOUR-MODE TREATMENT PLANT WILL GENERATE SODIUM HYPOCHLORITE ONSITE.
The American City and County, Vol. 91, No. 5, p 22, May, 1976.

Descriptors: *Waste water treatment, *Activated sludge, *Biochemical oxygen demand, *Treatment facilities, *Sodium compounds, Sea water, Disinfection, Aeration, Suspended solids, Sludge disposal, Dewatering, Incineration, Connecticut.
Identifiers: *Sodium hypochlorite.

Seawater will be used for generating sodium hypochlorite for use as a disinfectant in a waste water treatment plant being constructed in New Haven, Connecticut. Volume and strength of the waste water and Connecticut State requirements dictated design of a flexible aeration system. The aeration process includes four modes: conventional activated sludge to treat low-strength domestic wastes, a complete-mix process to protect against shock loads, step aeration for better oxygen utilization which periodically may be required, and contact stabilization because land for later staged expansion is unavailable. Adjustable outlet weirs, either automatically or manually operated, will control the water levels of the aeration basins to provide the required extent of oxygen transfer. Warm, screened seawater, previously used for condenser cooling, will be obtained from an electric generating station outfall near the treatment plant. After degritting, gravity thickeners and centrifuges will thicken the primary sludge, and primary and thickened waste activated sludge will be mixed. A reactor will oxidize volatile sludge solids; insoluble volatile matter in the sludge is reduced by 30%, and the oxidized sludge is then thickened. The dewatered sludge will be disposed of in a multiple hearth incinerator. The facility, which is scheduled for completion in 1979, will be able to handle 100 mgd peak flow and will reduce biochemical oxygen demand (BOD) and suspended solids by 90%. (Snyder-FIRL)
W76-10213

WHAT'S NEW IN OZONATION, OXYGENATION, REVERSE OSMOSIS AND ULTRAFILTRATION.
Modern Power and Engineering, Vol. 70, No. 4, p 44, April, 1976.

Descriptors: *Ozone, *Reverse osmosis, *Waste water treatment, *Sewage treatment, *Recycling, Sewage treatment, Effluents, Industrial wastes, *Oxygenation, Filtration.
Identifiers: *Ultrafiltration, Ozonation.

Ozonation techniques for both industrial and municipal waste treatment have increased in recent years and wider applications of ozone to sewage treatment plant effluents have been developed. Since ozone treatment removes contaminants without producing known toxic materials and simultaneously increases the dissolved oxygen levels of the treated waters, emphasis on recycling and reuse of process waters has encouraged renewed interest in the study of ozonation processes. The performance of ozone equipment has improved significantly and costs of producing ozone have been greatly reduced. One United States ozone manufacturer even promises ozone disinfection of water at the same prices as chlorination. Other growing technologies for treating municipal and combined municipal-industrial waste waters are detailed. These include oxygenation, reverse osmosis, and ultrafiltration. (Kramer-FIRL)
W76-10214

EXPERIMENTS ON RAPID SAND FILTRATION OF BIOLOGICAL SEWAGE TREATMENT-PLANT EFFLUENTS (UNTERSUCHUNGEN UEBER DAS VERHALTEN VON SCHNELL-SANDFILTERN BEI DER FILTRATION EINES BIOLOGISCH GEREINIGTEN KLAERANLAGENABLAUFS),
B. Hanisch, V. Mayer, and B. Zacher.
Wasserwirtschaft, Vol. 66, No. 5, p 144-147, 1976. 5 fig, 4 tab, 3 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, *Filtration, Sands, *Biological treatment, Filters, Biochemical oxygen demand, Pilot plants, Activated sludge.
Identifiers: Upflow filters, *Sand filtration.

Part of the residual biochemical oxygen demand (BOD) in the effluent of biological sewage treatment plants is produced by small floc particles, which are not retained in the final sedimentation tanks. According to experiences in Great Britain, rapid filtration in sand filters can effectively remove these suspended solids. Downflow filters of the kind used for water treatment were used earlier; more recently, upflow filters have also been used. Some results of experiments with filters at The Institut fuer Siedlungwasserbau und Wassergutewirtschaft in Stuttgart-Busnau are reported. These experiments are directed toward correlating the most important parameters of the process. Activated sludge plant effluent, treated in pilot rapid sand filters of both types, is less highly nitrified than was reported for the plants in Britain. (Snyder-FIRL)
W76-10215

USE OF THE EARTH'S CRUST FOR TREATMENT OR STORAGE OF SEWAGE EFFLUENT AND OTHER WASTE FLUIDS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
H. Bouwer.
CRC Critical Reviews in Environmental Control, Vol. 6, No. 2, p 111-130, March, 1976. 1 fig, 2 tab, 97 ref.

Descriptors: *Waste water treatment, *Underground storage, *Waste storage, *Sewage effluents, *Liquid wastes, Land use, Irrigation, Organic wastes, Nitrogen.
Identifiers: Land application.

Land application or underground storage of liquid wastes may be most feasible in a number of situations. Surface application usually is restricted to wastes with mostly organic pollutants. Low-rate systems involve using secondary or equivalent treated effluent to irrigate crops. The amount of nitrogen applied to the soil by sewage sludge is not much more than the crop can remove, but the system must stimulate denitrification for animal waste slurries. Damaging effects of metals can be minimized by lime addition and by growing relatively insensitive crops. Boron is adsorbed by components in some soils. Due to the amount of land needed, low-rate systems are generally used only for small capacity. Overland flow systems, in which waste water flows over sloping fields, can significantly improve quality if the loading rates are relatively low. High rate systems require less land, but the renovated water is usually intercepted to prevent spreading into the aquifer. It can be intercepted by choosing a location where it drains naturally into surface water, or by drains or wells. The water table should not rise high enough below the infiltration area to restrict infiltration. Infiltration and drying periods are generally alternated. Because land treatment is so dependent on local conditions, use of a pilot system for at least one year is desirable. Land treatment costs depend on the cost of the land needed, its distance from the treatment plant, and the cost of wells or drains to collect the renovated water. (Snyder-FIRL)
W76-10216

OPTIMIZING CENTRIFUGE DECANTATION FOR SLUDGE THICKENING (OPTIMISATION DES DECANTEUSES CENTRIFUGES POUR LA CONCENTRATION DES BOUS),
Alfa-Laval A. B., Tumba (Sweden).
L. Kallstrom.
Techniques et Sciences Municipales – L'Eau, No. 3, p 141-143, March, 1976. 4 fig.

Descriptors: *Treatment facilities, *Centrifugation, *Sludge treatment, *Industrial wastes, Sludge, Flocculation, Effluents, Optimization, On-site tests, *Waste water treatment.
Identifiers: *Centrifuge decantation.

Optimizing a decantation centrifugation installation consists in establishing an equilibrium between yield and economy, and achieving max-

imum capacity, sludge dryness, and clarity of effluent with minimum energy and chemical expenditure. Adjustment of the installation involves a number of parameters such as rotor and conveyer speeds, and volume of liquid in the rotor. Rate and dosage of the flocculant are then adjusted together by one of two methods or a combination of both; with the first, a feeding rate is chosen significantly lower than the theoretical maximum, thereby increasing transit time and the quantity of fine particles on the rotor. With the second method, more flocculant is used to gather the fine particles into larger flocs which will be deposited more quickly in the force field of the centrifuge. A combination of both is frequently chosen in view of economic considerations. (Waltner-FIRL)
W76-10217

BUFFERING AIDS DIGESTION OF WASTE.
Chemical Week, Vol. 118, No. 23, p 51, June 9, 1976. 1 fig.

Descriptors: *Waste water treatment, *Biological treatment, *Biochemical oxygen demand, Treatment facilities, *Sodium compounds, Bicarbonates, Digestion, Hydrogen ion concentration, Trickling filters.
Identifiers: *Sodium bicarbonate, Buffering, Waste digestion.

Municipal waste treatment plants work better when buffered with sodium bicarbonate. Sodium bicarbonate use enabled the 37-yr old Hightstown plant, which was once slated for replacement because it could not meet Environmental Protection Agency standards, to operate well within EPA limits. Septic tank users have also reported that sodium bicarbonate additions increased tank life. Some municipal waste treatment plants use sodium bicarbonate on a spot basis to improve alkalinity. It was considered the 'best alkaline chemical' to adjust pH without danger of overdosage. Sodium bicarbonate also reduces biochemical oxygen demand (BOD), sulfide odors, corrosion, and sludge-handling costs; increases solids settling, toxic-pollutant removal, and methane production; and controls nitrification. Rejuvenating the one million-gal/day trickling-filter, biological waste treatment plant in Highstown was the first major project using sodium bicarbonate. Adding sodium bicarbonate to the waste influent and digester produced a return of bacterial activity to the trickling filter and reduced BOD from 36 to 7. Sodium bicarbonate can also significantly reduce sludge volume. Sodium bicarbonate costs more per ton than other waste treatment chemicals, but usually only half the volume of sodium bicarbonate is needed. Sodium bicarbonate is also easier and less hazardous to handle than many chemicals. Although some large plants use sodium bicarbonate for functions such as neutralization and methane production, most users are expected to be small plants where sophisticated equipment is unaffordable. (Snyder-FIRL)
W76-10218

WASTEWATER RENOVATION AND REUSE: VIRUS REMOVAL BY SOIL FILTRATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. G. Gilbert, R. C. Rice, H. Bouwer, C. P. Gerba, and C. Wallis.
Science, Vol. 192, No. 4243, p 1004-1005, June 4, 1976. 1 tab, 10 ref.

Descriptors: *Waste water treatment, *Sewage treatment, Treatment facilities, *Filtration, Sewage effluents, *Reclaimed water, Groundwater, Viruses, *Water reuse, Soils.
Identifiers: *Soil filtration, *Virus removal.

Renovated water and secondary sewage effluent from four wells at the Flushing Meadows Wastewater Renovation Project, a land disposal project near Phoenix, Arizona, operating since 1967, were sampled about every 2 months in 1974 during flooding periods. The samples were assayed for viruses by bottle culture and the overlay method, using primary kidney cells from immature baboons. The number of viruses detected in the sewage effluents averaged 2118 per 100 liters with a minimum of 158 per 100 liters and a maximum of 7475 per 100 liters. Seven types of viruses were identified, whose occurrence varied seasonally. No viruses were detected in renovated water samples. Apparently human viral pathogens do not move through soil into groundwater, but are absorbed and degraded by the soil, their numbers being reduced by a factor of at least 10,000. (Snyder-FIRL)
W76-10219

GENERAL CONSIDERATIONS IN WASTEWATER DISINFECTION,
Ontario Ministry of the Environment, Toronto. Wastewater Treatment Section.
F. A. Tonelli.
Water and Pollution Control, Vol. 114, No. 5, p 23-24, 28, 30, 46-47, May, 1976. 1 fig, 9 tab.

Descriptors: *Waste water treatment, *Disinfection, *Chlorination, *Gamma rays, *Pathogenic bacteria, Coliforms, Aquatic microorganisms, Resistance.
Identifiers: *Gamma irradiation.

The objective of waste water disinfection is to destroy pathogens before discharging the waste water. Because of the varied resistance of microorganisms to any disinfectant, more than one organism should be used to assess efficiency. Total coliforms or fecal coliforms are usually used. Chemical conditions in the waste water determine the chemical reactions undergone by added chlorine; the effectiveness as a disinfectant varies for different chlorine compounds. Efficiency of disinfection can be seriously impaired at lowered temperatures. Contact time and residual are equally important in determining coliform kill. Thorough initial mixing of concentrated chlorine solution and bulk waste water is necessary for optimum disinfection. A contact chamber with highly developed plug flow characteristics is desirable, so that detention time can be known with some certainty and back mixing can be avoided as much as possible. Process control for chlorination involves maintaining a specified residual at the end of the chlorine contact chamber detention period; methods include manually setting the chlorine addition rate, flow-paced chlorine application, and compound loop control, in order of increasing complexity. Reaction with sulfur dioxide is currently the best developed dechlorination process, but excess sulfur dioxide can increase the oxygen demand of the effluent and depress the pH of the waste water. (Snyder-FIRL)
W76-10220

APPLICATION OF ACTIVATED SLUDGE DESIGN AND OPERATION,
Oklahoma State Univ., Stillwater.
T. L. Bentley, and D. F. Kincannon.
Water and Sewage Works, Reference number, p R10-R-13, April 30, 1976. 9 fig, 1 tab, 14 ref.

Descriptors: *Trickling filters, *Biological treatment, *Aerobic treatment, *Activated sludge, *Biodegradation, Treatment, Equipment, Chemical oxygen demand, Microorganisms, Evaluation, Performance, *Waste water treatment.

Parameters affecting the operation and performance of laboratory-scale biological towers (trickling filters) were investigated and compared with those commonly used to describe activated sludge processes. Sucrose was used as the carbon source and growth-limiting nutrient for a prepared synthetic waste used in the investigation. The parameter food to microorganism ratio and mean cell residence time which are used for designing activated sludge systems were also found suitable for describing the operation of trickling filters. A comparison of both treatment processes with the same loading parameters resulted in similar treatment efficiencies being obtained. Treatment efficiencies of 95% were obtained in each case for food to microorganism ratios of 0.5. Variation in the percent of chemical oxygen demand removal as a function of mean cell residence time for the experimental trickling towers was also similar to curves obtained for activated sludge systems. (Kreager-FIRL)
W76-10221

BIOLOGICAL TREATMENT PROCESS IN COLD CLIMATES,
CH2M/Hill, Corvallis, Oreg. Wastewater Reclamation.
J. D. Boyle.
Water and Sewage Works, Reference number, p R-28, R-30, R-32-R-34, R-37-R-38, R-43-R-44, R-46, R-48, R-50, April 30, 1976. 16 fig, 2 tab, 9 ref.

Descriptors: *Biological treatment, *Aeration, *Activated sludge, *Trickling filters, *Temperature, *Kinetics, *Waste water treatment, Equipment, Treatment facilities, Performance, Biochemical oxygen demand, Heat transfer, Cold regions, Climates.

The effects of cold climates on three aerobic biological treatment processes are examined. The treatment processes considered are: extended aeration and conventional activated sludge systems utilizing air as an oxygen source, oxygen-activated sludge systems (covered and uncovered), and activated biological filtration systems (activated sludge and trickling filter combination). Temperature-sensitive parameters discussed include: effluent biochemical oxygen demand, solids production, aeration requirements, horsepower requirements, and heat loss. Housing the biota within a process that is able to resist the adverse effects of low temperature on the processes' kinetics can significantly improve the cold weather performance of biological treatment systems. (Kreager-FIRL)
W76-10222

VERTICAL STATIC TUBE AERATORS: EVALUATING THEIR PERFORMANCE,
Associated Engineering Services, Ltd., Vancouver (British Columbia).
M. J. Stewart, and T. R. Lidkea.
Water and Sewage Works, Reference number, p R80-R84, April 30, 1976. 5 fig, 2 tab, 10 ref.

Descriptors: *Aeration, *Oxygen, *Transfer, *Rates, *Waste water treatment, Equipment, Evaluation, Performance, Testing procedures.
Identifiers: *Aeration, Vertical static tube.

A procedure for finding the oxygen transfer rate of vertical static tube aerators based on the oxygen concentration versus lapsed time of aeration values obtained during a given test run is described. The procedure consists of the following steps: an evaluation of the oxygen saturation concentration which has been corrected for site barometric pressure, mid-depth, water pressure, and water vapor pressure; calculation of the oxygen transfer coefficient by plotting the difference between the oxygen saturation concentration and the oxygen concentration in a water sample collected at a given time versus the time on semilog paper; correction of the oxygen transfer coefficient to 20 C; calculation of the true (mid-depth) oxygen transfer rate under standard conditions using the oxygen transfer coefficient at 20C; and calculation of the transfer rate at the waste water treatment plant site under operating conditions. (Kreager-FIRL)
W76-10223

THE DISPOSAL OF SEWAGE FROM COASTAL TOWNS: THE CASE FOR TREATMENT,
E. C. Whitaker.

Water Pollution Control, Vol. 75, No. 2, p 146-152, 1976. 3 fig.

Descriptors: *Oceans, *Sewage treatment, *Sewage effluents, *Sewage disposal, *Sewage, Beaches, Decision making, Treatment facilities, Public health, *Outfall sewers, *Waste water treatment.

Factors leading to the decision to install an inland sewage treatment plant at a British coastal town are reviewed. Prior to the treatment plant installation, direct outfall discharge to the sea was observed up to 600 m offshore, and sewage was often observed on high water marks. More than 10,000 kg of litter was removed daily over a 3-kilometer stretch of the coastal beach area. Factors other than pollution of the beaches which contributed to a decision to install an inland treatment plant included: the potential health hazard associated with direct sewage discharge, a rapid increase in housing development with no drainage except cesspools, and flooding as a result of overloaded sewers. (Kreager-FIRL)
W76-10225

DIFFUSED AIR IN DEEP TANK AERATION,
Water Pollution Control Corp., Milwaukee, Wis.
F. L. Schmit, P. M. Thayer, and D. T. Redmon.
Water and Sewage Works, Reference number, p R-86-88, R-90, R-92-R-93, April 30, 1976. 9 fig, 3 tab, 16 ref.

Descriptors: *Aeration, *Efficiencies, Oxygen, *Oxygenation, Waste treatment, Equipment, Evaluation, Performance, *Waste water treatment, Tanks.
Identifiers: *Oxygen transfer, Tank geometry, *Aeration tanks.

Factors affecting oxygen transfer efficiencies and power requirements of deep tank aeration systems were investigated using a steel tank 34 ft in. wide by 6 ft long by 24 ft deep. Temporary baffles were used to permit the evaluation of two tank widths. For a given oxygen transfer capability, a tank width of 34 ft 4 in was more efficient than a tank width of 19 ft 3 in with the same water depths and submergences. Increased air rates showed an increase in percent oxygen absorption and transfer capability of the diffusers for all tank geometries, depths, and air rates tested at a fixed water depth and submergence. Adiabatic power requirements of transferring a given amount of oxygen were reduced as tank depths increased, regardless of the tank width. An extrapolation of the data obtained over tank depths of 13-23 ft revealed that advantages of deep tank construction apply to depths significantly greater than 23 ft. The extrapolation also indicated that at some depth beyond 23 ft narrower tanks may require less power for a given oxygen transfer. (Kreager-FIRL)
W76-10226

IMPORTANT CONSIDERATIONS IN DESIGNING ACTIVATED SLUDGE PROCESSES,
Peabody Welles Inc., Roscoe, Ill. Research and Development Div.
J. D. Walker.
Water and Sewage Works, Reference number, p R-54, R-55-R-58, R-60-R-62, April 30, 1976. 5 fig, 1 tab, 1 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Reaeration, Biological treatment, Equipment, Performance, Biochemical oxygen demand, Chemical oxygen demand, Mixing, Design criteria.

Design considerations for air-operated activated sludge processes are discussed. Topics covered include: reaeration, rapid blending of the activated seed sludge with the substrate, air diffuser spacing and placement, clumping tendencies in activated sludge floc, rotary positive blowers, and centrifugal blowers (single stage and multistage). A modification to plug flow activated sludge systems known as complete mixing offers the advantage of blending out high strength, highly soluble biochemical oxygen demand-chemical oxygen demand within the reactor; however, the return seed sludge often requires substantial reaeration to avoid a sludge bulking problem and consequent solids loss to the effluent. The extent of the reaeration should be substantial, for example, at least one-fourth to one-fifth of the detention period, even in plants with high space loadings. Contact stabilization and step feed (both with substantial return activated sludge reaeration) are examples of the application of meaningful reaeration. (Kreager-FIRL)
W76-10227

SMALL SEWAGE WORKS THAT FUNCTION SATISFACTORILY,
Southern Water Authority, East Sussex, (England). East Sussex Water and Drainage Div.
D. H. Banks.
Water Pollution Control, Vol. 75, No. 75, No. 2, p 162-175, 1976. 14 ref.

Descriptors: *Sewage treatment, *Rural areas, *Treatment facilities, *Administration, *Project planning, *Scheduling, Decision making, Economics, *Waste water treatment.
Identifiers: Great Britain, England, Wales.

The status of small rural sewage works throughout England and Wales is reviewed along with options for future design. Over 80% of the more than 5000 sewage treatment plants in England and Wales are administered by rural district councils, indicating the number of smaller sewage treatment plants that have been inherited by 10 newly established water authorities. No radical policy of treatment centralization is expected in view of potential problems associated with constraints in the shape of costly outfall sewers, the possible need for pumping, and the questionable desirability of concentrating effluent discharges into one receiving watercourse. Options available for future sewage works design and construction include: sewage works designed for construction in stages, the design and construction of works with capacities for an ultimate population, and the design of works capable of further expansion. The construction of sewage works which have a life of 30 years or more is considered to be undesirable due to the rate of technological development and change in the sewage treatment field. (Kreager-FIRL)
W76-10228

THAMES WATER OPENS STANFORD RIVERS SEWAGE TREATMENT WORKS,
Water Services, Vol. 80, No. 962, p 248, April, 1976.

Descriptors: *Treatment facilities, *Sewage treatment, *Municipal wastes, *Waste water treatment, Treatment, Equipment, Sludge treatment, Sedimentation, Sewage lagoons, Lagoons.
Identifiers: Great Britain, England.

The opening of the Stanford Rivers Sewage Treatment Works by the Thames Water Authority is described. The new works serve a population of about 12,000 and have a daily inflow of 2500 cu m/day. The sewage treatment works were built in two stages. The first stage involved the provision of a central collection point for sludge treatment and pressing from outlying works and included the construction of sludge holding tanks, mixing tanks, a pumping station, and press house. The second stage called for the rebuilding of treatment facilities to increase capacity and improve the effluent standard and involved the installation of new inlet works, sedimentation tanks, effluent lagoons, a screw pumping house, and ancillary facilities. (Kreager-FIRL)
W76-10229

VIRUS REMOVAL IN AN ACTIVATED SLUDGE PLANT,
Hamilton County Community Development, Tenn.
J. D. Naparstek, K. Kawata, V. P. Olivieri, and V. R. Sherman.
Water and Sewage Works, Reference number, p R-16, R-20, April 30, 1976. 1 fig, 2 tab, 3 ref.

Descriptors: *Activated sludge, *Viruses, *Municipal wastes, *Domestic wastes, *Waste water treatment, Treatment facilities, Evaluation, Performance, Microorganisms, Efficiencies, Wastes, Treatment, Sludge, Chlorination, Chlorine.
Identifiers: f2 virus, *Virus removal.

Virus removal studies at a step aeration activated sludge plant in Maryland City, Maryland were conducted. The plant has a design capacity of 750,000 gallons/day and treats primarily domestic waste from residences along with some commercial waste. An f2 model virus was used to seed the influent of the plant, with the resulting seed virus concentration being 1 million plaque forming units/ml as compared with a background virus concentration of between 100 and 10,000 plaque forming units. The average cumulative virus removal throughout the plant was 80.5%. The most significant virus removals occurred in the plant's chlorine contact basin and averaged 72.0%. Virus reductions in the preliminary units, the primary basin, the aeration tank and secondary basin, and sand filters used throughout the process averaged 7.5, 46.8, 11.1, and 22.2%, respectively. (Kreager-FIRL)
W76-10230

BIOLOGICAL TREATMENT OF WASTE WITH HIGH ASH CONTENT USING A HYDROLYTICALLY ASSISTED EXTENDED AERATION PROCESS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
A. E. Gaudy, Jr., T. S. Manickam, H. Saidi, and M. P. Reddy.
Biotechnology and Bioengineering, Vol. 18, No. 5, p 701-721, May, 1976. 7 fig, 3 tab, 10 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Biochemical oxygen demand, *Chemical oxygen demand, *Suspended solids, Aeration, Digestion.
Identifiers: Ash content, Extended aeration.

A modified extended aeration process for biological treatment of wastes, in which autodigestion was aided and controlled by periodic partial hydrolysis of small portions of the recycle sludge, was previously demonstrated to be feasible using an artificial waste containing little suspended organic solids. To test the process for wastes with high organic feed content and ash content, a 1.5 year pilot study was made using hydrolyzed trickling filter sludge. Analyses were performed for chemical oxygen demand (COD), biochemical oxygen demand (BOD), TOC, suspended solids, ammonia nitrogen, organic-nitrogen, and nitrite-nitrogen. Ash contents in the activated sludge were higher, but did not continually increase or adversely affect the efficiency of organic matter removal. They may have enhanced separation in the final clarifier, since there was little trouble in separating mixed liquor at concentrations over 20,000 mg/liter. COD and suspended solids removal and BOD samples indicated that the system provided waste water purification comparable to other activated sludge processes operating on wastes of much lower ash content. The high dissolved inorganic solids concentration in the effluent is apparently amenable to further physical-chemical treatment. Several further treatment processes were investigated. Ion exchange appears to favorably reduce solids, and, while activated carbon adsorption was relatively ineffective in solids removal, it was extremely effective in removing color. (Snyder-FIRL)
W76-10231

DESIGN CRITERIA FOR MICROSCREENING BIOLOGICAL WASTEWATER PLANT EFFLUENTS,
Ewing Engineering Co., Milwaukee, Wis.
L. Ewing.
Water and Sewage Works, Reference number, p R-94-R-96, R-98-R-101, April 30, 1976. 3 fig, 3 tab, 6 ref.

Descriptors: *Screens, *Biological treatment, *Waste water treatment, *Activated sludge, *Tertiary treatment, Physical properties, On-site investigations, Treatment facilities, Equipment, Performance, Evaluation, Solid wastes, Waste treatment, Treatment, Biochemical oxygen demand, *Design criteria.
Identifiers: Microscreens.

Factors affecting the performance of horizontal rotary drum type microscreens used in biological waste water plants are reviewed along with operating and performance data obtained at two activated sludge plants using microscreens. Major variables affecting the removal efficiency of microscreens and/or effluent quality include: biological loading of the upstream process, final clarifier hydraulic loading, flocculation procedures, hydraulic head across screen media, upstream hydraulics, effectiveness of the solids collection system, media aperture, screen peripheral speed, and raw waste water characteristics. Variables affecting screen capacity expressed as gallons/min/ft of width include: type of biological process and loading, screen influent suspended solids concentration, media effective open area, peripheral speed, effectiveness of cleaning system and solids removal system, head across screen media, media aperture, temperature, and diameter or length of submerged arc. Data obtained from an activated sludge facility using a microscreen for tertiary treatment revealed effluent suspended solids and biochemical oxygen demand concentrations of less than 5 mg/liter under normal operating conditions. The screen successfully handled plant effluents with suspended solid concentrations up to 80 mg/liter. (Kreager-FIRL)
W76-10232

SODIUM BICARBONATE DOSES UPGRADE PLANT TO '77 STANDARDS.
Water and Sewage Works, Reference number, p R-64-R65, April 30, 1976.

Descriptors: *Sewage treatment, *Sodium compounds, *Neutralization, *Alkalinity, *Bicarbonates, Evaluation, On-site investigations, Trickling filters, Performance, *Treatment facilities, Biochemical oxygen demand, Chemical properties, Efficiencies, Sludge, Sludge digestion, Methane, Water quality standards.
Identifiers: *Sodium bicarbonate.

Field tests at a gravity flow trickling filter sewage treatment plant were conducted to assess the effect of sodium bicarbonate addition to the process on the level of biochemical oxygen demand. The addition of 4 lb/hr of sodium bicarbonate to the waste stream as it passed through the bar screen reduced the biochemical oxygen demand from 15-25 mg/liter to less than 10 mg/liter, the latter figure being in compliance with the 1977 Environmental Protection Agency standards. This reduction was the result of the buffering capacity of sodium bicarbonate to neutralize the fatty acids in the waste. Tests involving the addition of 100 lb of sodium bicarbonate to the plant's sludge digester each day were also conducted. This addition resulted in the alkalinity being increased from about 1400-1500 mg/liter to as high as 2500 mg/liter, with the pH being maintained between 6.6 and 6.7. This in turn resulted in better solids/liquid separation, a finer particle cake, less odor, and an increase in methane production from 800-900 cu ft/day to 4000 cu ft/day. (Kreager-FIRL)
W76-10233

ANIONIC AND NON-IONIC SURFACTANT BIODEGRADATION IN A PURIFYING PLANT USING ACTIVATING MUDS (BIODEGRADAZIONE DE TENSIOATTIVI ANIONICI E NON-IONICI IN UN IMPIANTO DI TRATTAMENTO A FANGHI ATTIVATI),
Stazione Sperimentale Oli e dei Grassi, Milano (Italy).
For primary bibliographic entry see Field 5A.
W76-10238

EFFECT OF WASTEWATER COMPOSITION AND CELL RESIDENCE TIME ON PHOSPHORUS REMOVAL IN ACTIVATED SLUDGE,
Phillips Petroleum Co., Bartlesville, Okla.
T. R. Stall, and J. H. Sherrard.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 307-322, February, 1976. 8 fig, 4 tab, 23 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Chemical oxygen demand, *Phosphorus, Phosphates, Hydrogen ion concentration, Suspended solids, Microorganisms, Temperature, Analytical techniques.
Identifiers: Cell residence time.

A bench-scale activated sludge unit was operated under closely controlled conditions to study the influence of mean cell residence time and stoichiometric relationships on phosphorus removal. It was operated on a batch basis until the solids concentration reached approximately 1,500 mg/liter, then switched to continuous flow operating conditions. The initial seed of microorganisms was taken from a well-operating experimental activated sludge system. The raw feed solution was tested for chemical oxygen demand, total phosphate phosphorus and pH; the unfiltered effluent for total phosphate-phosphorus, pH, and suspended solids; filtered effluent for COD and soluble phosphate-phosphorus; and the biological reactor for aeration basin ss, total system microorganisms concentration, temperature, and pH. Phosphorus removal efficiencies were higher when mean cell residence time was lower. At any given mean cell residence time, larger COD: phosphorus ratios produced higher phosphorus removal efficiencies. The phosphorus content of the sludge varied between 2.21% and 3.63% on a dry weight basis. Phosphorus removal efficiency and sludge production are directly related. The effective phosphorus removal efficiency is significantly reduced by solids carry-over in the effluent. Biological phosphorus removal may be predicted closely if the cellular phosphorus content and the sludge production are estimated reasonably. Phosphorus may become a limiting nutrient at high COD: phosphorus ratios and low sludge ages, whereas COD is limiting at a high sludge age. (Snyder-FIRL)
W76-10239

FLUCTUATIONS OF THE RUNOFF OF TWO ACTIVATED SLUDGE PLANTS AND ITS CONSEQUENCES FOR THE OBSERVANCE OF LIMIT VALUES (SCHWANKUNGEN DER ABLAEUFE ZWEIER SCHLAMMBELEBUNSANLAGEN UND INRE KONSEQUENZEN FUER DIE EINHALTBARKEIT VON GRENZWERTEN),
H-J. Frenzel, and F. Sarfert.
Gas-und Wasserfach-Wasser/Abwasser, Vol. 117, No. 3, p 123-128, 1976. 10 fig, 6 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Biochemical oxygen demand, *Treatment facilities, Potassium compounds, Nitrogen, Phosphates, Runoff.
Identifiers: Dry matter content.

The BOD5 value, the KMnO4 consumption, the total nitrogen content and the phosphate content were measured in the purified effluent from a low-loaded biological waste water treatment plant and from a normally loaded pilot plant in a study on the possibility of observing the limiting values according to Poepel's concept. The BOD5 level, the KMnO4 consumption and the dry matter content were lower in the effluent from the low-leaded treatment plant, while the phosphate content was higher due to the limited mineralization of the activated sludge at the low sludge BOD5 level of about 0.1 kg/kg x day. It was impossible to adopt a limit value which is never exceeded. The compliance with the limit value can be determined by a limited random sampling rather than daily checks. (Takacs-FIRL)
W76-10242

EVALUATION OF THE CIRIA PROTOTYPE MODEL FOR THE DESIGN OF SEWAGE-TREATMENT WORKS,
K. Bowden, R. S. Gale, and D. E. Wright.
Water Pollution Control, Vol. 75, No. 2, p 192-205, 1976. 3 fig, 3 tab, 17 ref.

Descriptors: *Sewage treatment, *Optimization, *Computer programs, *Model studies, *Cost analysis, Waste water treatment, Evaluation, Design criteria, *Treatment facilities.

A prototype computer model for the cost optimization of sewage treatment plant design is presented. Performance relationships for each of the unit processes involved are built into the model; cost data are not incorporated into the model since these vary considerably from site to site and with the degree of inflation. Parameters used for characterizing the process are those used in conventional sewage treatment practice (biochemical oxygen demand, suspended solids, ammonia for liquors, and total solids content and volatile content for sludge). Application of the model is illustrated by an example involving a series of sewage works having different flows but the same series of processes and the same influent and effluent concentrations. (Kreager-FIRL)
W76-10245

CONTRIBUTION TO OPTIMIZING CHEMICAL PRECIPITATION IN UNTREATED WASTE WATER THROUGH CONTROL OF THE ADDED FLOCCULANT QUANTITY (BEITRAG ZUR OPTIMIERUNG CHEMISCHER FAELLUNG IM ROHABWASSER DURCH DIE STEUERUNG DER FAELLMITTELZUGABEMENGE),
H. Overath, and G. Marr.
Gas-und Wasserfach-Wasser/Abwasser, Vol. 117, No. 3, p 109-122, 1976. 15 fig, 5 tab, 42 ref.

Descriptors: *Waste water treatment, *Chemical precipitation, *Flocculation, *Optimization, *Phosphorus, Hydrogen ion concentration, Alkalinity, Electrical conductance, Turbidity.

The influence of different chemical and physical characteristics of untreated municipal waste water on the optimal dosage of flocculant (a by-product from bleaching earth production, a highly acid liquid with A1, Fe, Ca, Mg and C1 ions) was studied in model experiments. The optimal quantity of the flocculant was determined primarily by the phosphorus concentration in the raw waste water. A correlation factor of 0.963 was found for the relationship between phosphorus concentration and the optimal flocculant dose. The correlation factor expressing the relationship between the optimal flocculant dose and the pH value before the flocculant addition is -0.455. A correlation factor of 0.670 was found for the alkalinity. A correlation with the electric conductivity was found to be 0.818. The findings indicate that the electrical conductivity, the standardized alkalinity and turbidity can be used as parameters for the control of the flocculant dosage. (Takacs-FIRL)
W76-10246

VERIFICATION STUDIES OF THE BIOFILM MODEL FOR BACTERIAL SUBSTRATE UTILIZATION,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
K. Williamson, and P. L. McCarty.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 281-296, February, 1976. 19 fig, 5 tab, 8 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Model studies, *Kinetics, *Aerobic bacteria, Membranes, Diffusion, *Films.
Identifiers: *Biofilm models.

A verification study was performed for a model describing the kinetics of substrate utilization by biofilms. Aerobic, autotrophic, nitrifying bacteria were used as test organisms. Biofilms were made before each experiment by filtering dispersed bacteria onto membrane filters. The biofilm thickness was determined by examining a side view of the biofilm and the support filter with a microscope and a calibrated ocular micrometer. The diffusion reactor consisted of an enclosed Plexiglas cylinder immersed in an outer vessel. The biofilm model accurately predicted the biofilm substrate utilization rate for deep biofilms that are flux and substrate limited by either an electron donor or an electron acceptor. It was also modified to predict accurately the substrate utilization rate for thin biofilms that were flux and substrate limited by the electron donor and for which the substrate concentrations throughout the biofilm were greater than the half-velocity coefficient. A mathematical relationship was determined indicating whether the biofilm will be flux limited by the electron acceptor or the electron donor. Diffusion coefficients for ammonia, nitrate, nitrite, and oxygen through biofilms of nitrifying bacteria of about 80 to 100% of their corresponding values in water were obtained. (Snyder-FIRL)
W76-10247

PERCOLATION TESTS FOR SEPTIC TANK SUITABILITY IN SOUTHERN ARIZONA SOILS,
Arizona Univ., Tuscon. Dept of Soils, Water, and Engineering.
K. A. Barbarick, A. W. Warrick, and D. F. Post.
Journal of Soil and Water Conservation, Vol. 31, No. 3, p 110-112, May-June, 1976. 2 fig, 4 tab, 20 ref.

Descriptors: *Percolation, *Soil tests, *Septic tanks, Testing procedures, *On-site tests, Soil properties, Subsoil, Sands, Clays, Silts, Gravels, Soil types, Soil chemistry, Hydrogen ion concentration, Electrical conductance, *Arizona, Path of pollutants.

Percolation tests for septic tank suitability were conducted in nine southern Arizona soils to determine relationships between the percolation rate and test-hole diameter and to correlate the rates with selected soil parameters. Both a mathematical relationship and a regression analysis were used to relate percolation rate to test-hole geometry. Percent carbonates varied from 1.6% to 7.4%, pH from 7.7 to 8.1, electrical conductivity from 0.1 to 0.4, and EDTA required for the saturation extract from 0.2 ml to 0.7 ml. The theoretically predicted percolation rate of a 10 cm diameter test-hole was 2.5 times that of a 30 cm hole, an estimate which approximated the experimental results. Variability coefficients for percolation rates at each site ranged between 7% and 48%. Percent sand, clay, and silt in the subsoil correlated significantly with percolation rate. Multiple regression analysis showed that percentages of clay, silt, sand, gravel, and carbonates in subsoil; subsoil pH and electrical conductivity; and amount of EDTA required accounted for 62% of the variation in percolation rates. A variance analysis of soil parameters indicated significant differences among the sites for every parameter. (Snyder-FIRL)
W76-10248

RECLAMATION OF A BURNED ANTHRACITE REFUSE BANK WITH MUNICIPAL SLUDGE,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5E.
W76-10249

GREAT LAKES POLLUTION CLEANUP STAGNATES AS PROBLEMS MOUNT,
For primary bibliographic entry see Field 5G.
W76-10250

TECHNIQUES FOR POWER MEASUREMENT FOR SURFACE AERATOR,
National Environmental Engineering Research Inst., Nagpur (India).
S. N. Kaul, and V. Raman.
Indian Journal of Environmental Health, Vol. 17, No. 3, p 232-237, 1975. 3 fig, 14 ref.

Descriptors: *Aeration, *Electrical properties, *Efficiencies, *Electrical design, Evaluation, Performance, *Waste water treatment, Equipment, Measurement.
Identifiers: *Surface aerator.

A review of techniques used for measuring the power output from surface aerators is presented along with a comparison of two laboratory methods used for power measurements on full scale aerators. Configurations using an induction motor connected to an alternating current source versus those using a direct current generator as the power source were compared, and the latter type was found more suitable for power input/output and efficiency calculations since it was not affected by frequency changes and skin effects associated with the alternating current configuration. The net power consumed by full-scale aerators was calculated by multiplying the output power by the gear efficiency. (Kreager-FIRL)
W76-10251

TREATMENT OF SYNTHETIC URINOUS WASTEWATER USING COMBINED REVERSE OSMOSIS, IMMOBILIZED UREASE, AND ION EXCHANGE SYSTEMS,
Rutgers - The State Univ., New Brunswick, N. J. Coll. of Engineering.
B. Davidson, W. Vieth, S. Wang, and R. Gilmore, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A008 947, $6.75 in paper copy, $2.25 in microfiche. 1974, 134 p, 29 fig, 6 tab, 126 ref, 5 append. Prepared for Army Mobility Equipment Research and Development Center, Fort Belvoir, Virginia.

Descriptors: *Waste water treatment, *Sewage treatment, Treatment facilities, *Urine, *Sewage, *Reverse osmosis, *Ion exchange, Membranes, Enzymes, Model studies.
Identifiers: *Urease, Biocatalytic reactors.

A collagen-urease membrane complex of relatively stable enzymatic activity was successfully produced and evaluated for the treatment of urinous waste water. It was evaluated in a spiral wound biocatalytic reactor module integrated into a prototype system containing reverse osmosis and ion exchange processes. A synthetic urinous feed solution containing sodium chloride and urea was used for the evaluation. A transport model based on the assumptions of steady-state, plug-flow, and Michaelis-Menten kinetics and accounting for simultaneous mass transfer and biochemical reaction simulated the performance of the biocatalytic reactor module. The system produced overall urea removals of 75 to 80%. These results are better than can be achieved with a single component system of practical size. Sixty to 80% of the tryptophan was still intact within the matrix in the biocatalytic reactor after intermittent storage and use. An irreversible denaturation of the enzyme must also be occurring in order to account for the decline in enzymatic activity of the collagen-urease membrane complex. The effects of mass transfer were of the same order of magnitude throughout the flow regimes investigated. (Snyder-FIRL)
W76-10254

A PRESENT VALUE-UNIT COST METHODOLOGY FOR EVALUATING WASTEWATER RECLAMATION AND DIRECT REUSE AT A MILITARY BASE OF OPERATIONS,
Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Sanitary Sciences Div.
V. J. Ciccone.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A012 175, $3.50 in paper copy, $2.25 in microfiche. December, 1974, 24 p, Report No. 2123, 1 fig, 16 ref.

Descriptors: *Waste water treatment, Analytical techniques, *Water reuse, *Reclamation, *Unit costs, *Cost comparisons, Mathematical models, Computer models, Costs.
Identifiers: Present value-unit cost.

A present value-unit cost (PVUC) methodology was applied to a water supply problem typical for a military base, considering reclamation and direct reuse of treated waste waters. A hierarchy of water use was established, with the highest quality for potable purposes and a lesser quality for non-potable uses. The difference in the calculated unit costs for the alternatives was examined over selected planning horizons, indicating the practicality of a particular quality scheme in the comparison of alternatives. This difference was included in a FORTRAN mathematical model for use on a digital computer. The model selects an optimal water supply system for a military base. The ideas of a dual supply system are incorporated by the reclamation of treated waste waters and the direct reuse of these waters after specified advance treatment. The focus of the model is on the demand for water and alternative methods to satisfy it. The major emphasis is on the role of cost as a determinant. The model essentially consists of a difference equation between the calculated PVUC for each alternative taken over selected planning horizons. A dual water supply system was concluded to be a practical alternative for consideration. The PVUC was a usable measure for evaluating alternatives, and the calculated difference between the PVUC's of two alternatives yielded a worthwhile decision variable, easily calculated with a computer program. The methodology may be applied to existing systems in conjunction with expansion plans or to formulating plans for new military bases. (Snyder-FIRL)
W76-10255

THE DEVELOPMENT OF A SIMPLE WASTE TREATMENT SYSTEM FOR U.S. NAVAL VESSELS,
Denver Research Inst., Denver, Colo.
B. D. Church, L. Griffin, D. Mack, and R. Espinosa.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A010 233 $4.00 in paper copy, $2.25 in microfiche. Final Report, Office of Naval Research, 1975, 43 p, 11 fig, 6 tab, 14 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Treatment facilities, *Chemical oxygen demand, *Sewage, Fermentation, Sludge, Sludge digestion, Organic wastes.

An apparatus was developed in which shipboard wastes containing garbage, sanitary waste, and small amounts of crankcase oil was successfully digested by continuous fermentation. An initial chemical oxygen demand (COD) over 1000 mg/liter decreased to under 100 mg/liter in 6 hr.

LIBRARY U. OF L. ENGINEERING & SCIENCE

The process has potential advantages for scale-up for shipboard waste treatment. A limiting nitrogen level in the raw waste seriously restricted sludge development and waste material oxidation. Adding 0.05% heavy corn steep liquor overcame this problem. The best microbial sludge mass with regard to waste digestion treatment time and floc settling time, a natural enriched mass, developed from the wastes themselves. (Snyder-FIRL)
W76-10256

SYSTEM FOR TOTAL DIRECT RECYCLE OF SECONDARY MUNICIPAL WASTEWATER, VOL I -- DESIGN CONCEPTS,
Houston Research, Inc., Tex.
C. E. Mauk, S. L. Gandhi, and R. W. Legan.
Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-011 938, $6.75 in paper copy, $2.25 in microfiche. Report AFWL-TR-7 4-235, Vol. I June 1975, 157 p, 17 tab, 28 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Effluents, *Recycling, *Water reuse, Design, Potable water, Tertiary treatment, Reclaimed water, Recirculated water.

The conversion of secondary municipal effluent from an existing conventional waste water treatment facility to a quality suitable for potable use was studied. Over 800 papers and reports on all advanced waste water treatment processes were acquired in a comprehensive literature survey. The important processes were summarized and evaluated. A set of potable water quality criteria parameters was defined for closed loop water reuse. Mathematical performance and cost models were compiled for the individual processes. Both microscreening and multimedia filtration were included for suspended solids removal. Air stripping of ammonia ion exchange by clinoptilolite, and nitrification/denitrification were included for nitrogen removal. Although many municipal plants may already have a lime treatment step or no phosphate problem, phosphate removal by lime treatment was included. Regeneration and nonregeneration of carbon were both considered for the removal of dissolved organic material with activated carbon. Reverse osmosis and ion exchange were included, but not electrodialysis, due to operational problems and the lack of large scale, long term data. While ozone is expected to be more effective and economical for disinfection than chlorine, adding ozone to drinking water is not currently practiced in the United States, and authorities favor chlorine because of its long term residual. Evaporation was used for brine disposal because nonevaporative processes are not generally applicable and may not be allowed in the future. Incineration and nonincineration options were included for sludge disposal. The 14 processes were included in a FORTRAN computer program for performing design calculations of optimal combinations of the processes. (Snyder-FIRL)
W76-10257

LSW-500 DISPOSAL OF AIR FORCE LIQUID WASTES,
Combustion Power Co., Inc., Menlo Park, Calif.
For primary bibliographic entry see Field 5E.
W76-10258

WATER REUSE IN THE UNITED STATES,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
B. H. Pringle.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A011-856, $3.50 in paper copy, $2.25 in microfiche. EPA Report, December 1974, 89 p 7 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Water reuse, *Sewerage, *Treatment facilities, *Recycling, Pathology, Toxicity, Public health, Water pollution effects, Waste water disposal, United States.
Identifiers: Environmental toxicology.

The demand for water and the level of indirect water reuse in the United States have been increasing. There is also increased interest in direct reuse of treated water for domestic supply. Direct reuse is accomplished by recycling waste treatment plant effluents directly to the water treatment plant; indirect reuse involves the discharge of effluents to bodies or watersheds where it becomes available for use again. Neither the Environmental Protection Agency nor the American Water Works Association approved direct reuse in the early 1970's. Current drinking water standards do not consider the possible toxic elements and compounds likely to be found in waste water. Some of the key health factors to be considered include viruses, bacteria, other microorganisms, chemicals, and the reliability of plant operation. The kind of supply many advocate for reuse with no additional treatment could produce a 30% viral infection rate, and the infected individuals could then infect others. Bacteria, protozoa, and helminthes could also be spread by direct reuse. Most sewage treatment processes remove little of the chemicals disposed of in sewers. Waste water and water treatment plants are not sufficiently reliable. Failsafe treatment operations with monitoring and control should be provided. (Snyder-FIRL)
W76-10260

THIURAM POLYSULFIDE HEAVY METAL REMOVER,
Sagami Chemical Research Center, Tokyo (Japan). (Assignee).
T. Fujisawa, M. Ambe, N. Kobayashi, A. Osawa, and K. Shimizu.
U.S. Patent No. 3,951,790, 7 p, 13 tab, 13 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1342, April 20, 1976.

Descriptors: *Patents, *Water pollution, *Mercury, *Heavy metals, *Waste water treatment, Water pollution treatment, Water quality control, Water pollution sources, Separation techniques, Chemical reactions, Selectivity.

A polymeric compound having thiuram mono- or poly-sulfide linkage shows noteworthy property for removing and collecting heavy metals, especially mercury in any form, from the environment. The compound shows ability to selectively recover some kinds of heavy metals by the selection of appropriate conditions. The heavy metal removers can be used effectively to remove heavy metals in wide pH conditions. The affinities of heavy metals with the compound can vary with the change of conditions and selective removal of specified heavy metals can be achieved by selection of appropriate conditions. However, the removers cannot react with an alkali metal contained in the solution. The reaction products of the heavy metal removers and the heavy metals are, in general, insoluble or sparingly soluble in an aqueous solution, and therefore, the removers can easily be separated and recovered from the treated solution by a conventional procedure, such as filtration, settling, centrifuge and the like. The adoption of a closed system known in the art, such as column system, fixed bed system or fluidized bed system, is preferred. (Sinha - OEIS)
W76-10466

METHOD FOR TREATING FOULED WATER,
Mitsubishi Gas Chemical Co., Ltd., Tokyo (Japan). (Assignee).
C. Y. Huang, N. Takashina, and T. Nishimura.
U.S. Patent No. 3,951,791, 5 p, 5 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1342, April 20, 1976.

Descriptors: *Patents, *Water treatment, *Water pollution treatment, *Waste water treatment, Chemical wastes, Flocculation, Chemical reactions.
Identifiers: Anionic latexes, Anionic resin emulsions.

A method is described for flocculating solid particles suspended in fouled water containing anionic latexes or anionic resin emulsions which comprises adding to the fouled water 0.1 to 15 parts by weight, based on 100 parts of the suspended solid in the fouled water, of a cationic aqueous dispersion of a copolymer having a quaternary ammonium salt form or an inorganic or organic acid salt form, which is obtained by the emulsion polymerization in the presence of a cationic surfactant. (Sinha - OEIS)
W76-10467

FLOCCULATION OF SUSPENDED SOLIDS,
GAF Corp., New York. (Assignee).
J. L. Azorlosa, and E. P. Williams.
U.S. Patent No. 3,951,792, 4 p, 1 fig, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1343, April 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Industrial wastes, *Chemical wastes, Water pollution treatment, Water pollution control, Water quality control, Flocculation, Suspended solids, Separation techniques, Mineral industry.
Identifiers: Synergistic effect.

The flocculation of solids suspended in an aqueous phase is enhanced by the addition of a flocculation amount of a novel flocculating composition consisting essentially of a blend of from about 2 to about 3 parts by weight of polyvinyl pyrrolidone having a K-value of from about 80 to about 140 and about 1 part by weight of polyethylene imine having a viscosity in 5% aqueous solution at 25 deg C of from about 20 to about 5,000 centipoises. The blend can be added to the aqueous phase either in dry form or as an aqueous solution. The flocculating agents prepared in accordance with this invention may be employed in the flocculation or anionic colloidal dispersions in aqueous systems. They are excellent for precipitating anionic dispersed latices natural and synthetic, sewage for separating sewer sludges, for separating sludges from industrial operations, and in its precipitation of colloidal dispersions of all types having an anionic charge. They are of particular interest in many areas of mineral ore recovery. (Sinha - OEIS)
W76-10468

PROCESS AND APPARATUS FOR TREATING FATTY WASTE WATER,
Alar Engineering Corp., Chicago, Ill. (Assignee).
A. J. Doncer, and H. R. White.
U.S. Patent No. 3,951,795, 12 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1343, April 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Water pollution control, Water quality control, *Lipids, Food-processing industry, Filtration, Sludge disposal, Settling basins, Calcium hydroxide, Chemical reactions.
Identifiers: Grease pits.

The invention relates to a system for treatment of fat containing waste waters produced during normal industrial and commercial scale food-processing operations, including equipment cleanup of processing operations. The system requires no modifications to present plant operations and procedures. The waste water cleanup system may be housed in an integral building structure and placed on top of a grease pit and settling basin, minimizing space requirements and installation costs. The chemical addition system, controls and other components may also be housed in this structure. After filtration, the dry

sludge is conveniently conveyed outside the structure into commercial dry waste disposal containers. Waste water is first mixed with a ferric salt aqueous solution until a pH in the range from about 3 to 5 is achieved. The resulting mixture is then mixed with calcium hydroxide until a pH in the range from about 7 to 8 is achieved. After calcium hydroxide treatment, the resulting so-chemically treated waste waters are maintained in a hold zone which serves multiple functions. Finally the so-chemically treated system is subjected to filtration using a rotary vacuum filter. The product filtered water is characteristically at least sufficiently high in its quality to meet all known governmental standards for water-sewering purposes. (Sinha-OEIS)
W76-10471

PHOTOOXIDATIVE DESTRUCTION OF ORGANIC WASTES,
Charles F. Kettering Foundation, Dayton, Ohio. (Assignee).
G. R. Seely.
U.S. Patent No. 3,951,797, 7 p, 3 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1344, April 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, *Water pollution treatment, Water pollution control, Water quality control, *Oxidation, Dyes, Organic compounds, Phenols, Catalysts.
Identifiers: *Photooxidation, Alginates.

A feasible method of promoting photooxidation of organic waste materials, including phenolic compounds is provided. The method involves the use of gelled metal alginate particles. The particles are stained with an appropriate sensitizing dye which will photocatalytically generate singlet oxygen in the presence of sunlight or artificial light for effective destruction of the oxidizable pollutants contained in the organic wastes. Most organic waste molecules are not destroyed by direct absorption of visible light, but when oxygen is excited to a singlet state, it becomes a strong oxidizing agent capable of oxidizing many ordinarily refractory organic compounds. This invention utilizes those known principles in providing a means to effectively oxidize polluting organic compounds. In addition to providing the known sensitizing function of homogeneous dye systems, the dyestained alginate particles present a heterogeneous phase in which there is no need to separate the dye from the water treated as occurs when a homogeneous dye systems is used. In addition, the particles do not introduce a new toxic material into the environment since alginate is known to be both non-toxic and biodegradable. Likewise, the dyes used are not notably toxic, and are slowly degraded under conditions of use. (Sinha-OEIS)
W76-10472

FILTRATION PROCESS,
Commonwealth Scientific and Industrial Research Organization, Campbell (Australia); and Imperial Chemical Industries of Australia, Campbell; and New Zealand Ltd., Campbell (Australia). (Assignees).
D. E. Weiss, and H. A. J. Battaerd.
U.S. Patent No. 3,951,799, 12 p, 1 fig, 7 tab, 10 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1345, April 20, 1976.

Descriptors: *Patents, *Separation techniques, Oil spills, *Oil pollution, *Wettability, Absorption, *Waste water treatment, Polymers, Magnetic studies, Cooling water, Filtration.
Identifiers: *Phase separation, *Ferromagnetic polymers, Oil slicks.

A process of phase separation comprises the treatment of a mixture of phases with ferromagnetic material in particulate or granular form whereby at least part of one phase of the mixture is absorbed or collected into or onto the particulate or granular material and the separation by magnetic means of the particulate material together with the absorbed or collected portion of the mixture, from the remainder of the mixture. It is preferred to use a synthetic polymer comprising ferromagnetic material. One class of suitable polymers for use in a given multi-phase mixture in which at least one of the phases is a liquid are those which are preferentially wetted by a liquid phase of the mixture. The chemical constitution of the polymers is not critical except insofar as the polymer should have adequate insolubility as well as mechanical and chemical stability in the mixture; the main criterion for selection is wettability. A second class of suitable polymers are those which will preferentially absorb one of the phases of the mixture. Suitable polymers are those which will swell in good solvents for the polymer and will not do so in non-solvents. The efficiency of the process also depends on the size, size distribution and shape of the polymer particles. Relatively coarse particles are best for certain applications such as removing oil slicks from the surface of the sea especially in windy weather. For use as filter aids smaller particles are preferred. The invention is also of use in a liquid/gas phase separation problem encountered in cooling towers. (Sinha-OEIS)
W76-10473

METHOD OF STORING SLUDGE RECOVERED FROM THE HOT WATER EXTRACTION OF BITUMEN FROM TAR SANDS,
Great Canadian Oil Sands Limited, Toronto (Ontario). (Assignee).
J. E. Ashton, and J. Davitt.
U.S. Patent No. 3,951,800, 5 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1345, April 20, 1976.

Descriptors: *Patents, *Sludge treatment, *Sludge disposal, *Waste storage, Water pollution control, Water quality control, Bituminous materials, Flocculation, Storage, Settling basins, *Waste water treatment.
Identifiers: Tar sands.

A method for storing bitumen-containing sludge formed in a retention pond used to store effluent discharge recovered from the hot water extraction of bitumen from tar sands also provides for outdoor open storage of sludge in a manner which does not negatively affect the local environment. Sludge which has formed in a quiescent retention pond used for storing effluent discharge is transferred to a storage area comprised of a receiving zone and a storage zone. The receiving zone can be described as a receiving well or tank in which the sludge is first deposited. This receiving zone communicates with the generally larger open storage zone via subsurface openings in a barrier which separates the closed receiving zone from the general storage zone. The open storage zone contains a surface layer of substantially unpolluted water. When entering the storage zone from the receiving well, the sludge displaces the freshwater layer in the storage zone upwardly because of the higher density of the sludge. Thus the sludge storage zone is composed of two layers, an upper surface layer of uncontaminated water and a lower subsurface layer of sludge. By treating the unpolluted surface water layer with a flocculating agent, the intrusion of sludge contamination can be substantially suppressed or diminished. The flocculating agents can be added to the surface water before, during, or after the sludge layer has been introduced into the storage zone. (Sinha-OEIS)
W76-10474

CLARIFIER APPARATUS,
Ecodyne Corp., Lincolnshire, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W76-10479

FILTER PRESS,
Gebrueder Bellmer K.G. Maschinenfabrik, Niefern (West Germany). (Assignee).
U. Kollmar.
U. S. Patent No. 3,951,809, 5 p, 2 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1348, April 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Water pollution control, Water quality control, Sludge, Sludge treatment, Filtration, Filters.
Identifiers: Filter presses.

A web filter press is described in which the endless filter webs, after leaving the tapered filtering space, are guided around a so-called dandy roll or pulp roller, whereupon the two webs are guided through several S-shaped runs in which the webs may be deflected over an angle of 90 deg or more. One or both of the endless filter webs include run portions in which they pass over suction boxes so that the suspension is subjected to the suction effect of a negative pressure. Continuously operating web filter presses for the removal of the liquid component from suspensions, such as fiber-containing slurries or sludge are also particularly suitable for the removal of the water from the settling sludge obtained in sewage treatment facilities. (Sinha - OEIS)
W76-10481

MODULAR CONTAINER,
Almag Pollution Control Corp., Baltimore, Md. (Assignee).
A. J. Casolo, and H. Handler.
U. S. Patent No. 3,951,811, 5 p, 4 fig, 17 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1349, April 20, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Water pollution treatment, Water pollution control, Water quality control, Filtration, Ion exchange, Resins, *Waste water treatment.
Identifiers: Modular containers, Particulate material.

A modular container includes a housing frame containing particulate material through which contaminated liquid is passed for purposes of purification. The container provides a mechanism whereby contaminated liquid may be introduced, passed through the particulate material and transported out of the container in a somewhat more purified state. The modular container can be utilized to hold particulate material in filtration process systems. In such cases particulate material may be sand, anthracite, or an adsorbing material such as activated carbon. Also the container can be used to maintain particulate material in ion exchange reactions where a number of containers may be arranged in some continuous flow path to provide purification of liquids as a function of ion exchange resinous materials through which the contaminated liquid passes. The invention permits insertion and removal of particulate material without requiring removal of the container from its location in an operating system, or it can be removed from a system and easily replaced to provide decreased ion-exchange system non-operating time. (Sinha - OEIS)
W76-10483

COMPOSITE SEMIPERMEABLE MEMBRANES MADE FROM POLYETHYLENIMINE,
Universal Oil Products Company, Des Plaines, Ill. (Assignee).
For primary bibliographic entry see Field 3A.
W76-10485

CLARIFICATION TANK,
Burmah Oil and Gas Co., Houston, Tex. (Assignee).
A. H. Bascope, and E. H. Grizzard.
U.S. Patent No. 3,951,816, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1350-1351, April 20, 1976.

LIBRARY U. OF I. URBANA-CHAMP.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Oil industry, *Oil pollution, *Water purification, Flotation, Water pollution treatment, Water pollution control, Water quality contrl, Weirs.

In oilfield water flooding operations, which are commonly used as secondary recovery method for crude oil production, oil is produced by injection of water into an oil bearing sand formation to displace the oil and water in the sand formation towards adjacent wells where it is brought to the surface. The oil thus produced is an oil-water mixture containing about 60 to 70% water, and the oil in such production mixtures is normally separated from the water by physical separation means such as settling tanks. The water separated from this mixture still contains on the order of 50 to 500 ppm oil. Consequently, this waste water is subjected to further clan-up operations to remove the residual oil prior to final disposal of the waste water or reusing it in an industrial application. According to the present clarification tank design, water is removed from the cell or tank adjacent the bottom, through a series of pick-up tubes which are connected to a central collection column or plenum chamber which is connected to an external vertical riser through which the clarified water is removed from the central collection tubes. The upper end of the vertical riser is provided with a weir assembly which is vertically adjustable so that the liquid level in the clarification tank can be accurately controlled by adjustment of a single weir. The weir device at the upper end of the riser is a four-sided enclosure positioned over the top of the riser tube to discharge water on all four sides into a weir box which is connected to an outlet tube. Sand and other solid particles settle to the bottom and are withdrawn. (Sinha - OEIS)
W76-10486

CHEVRON CLARIFIER,
M. Bosnjak.
U.S. Patent No. 3,951,818, 7 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1351, April 20, 1976.

Descriptors: *Patents, *Water purification, *Waste water treatment, *Separation techniques, Industrial wastes, Food processing industry, Water pollution treatment, Water pollution control, Water quality control, Equipment.
Identifiers: Gravity separation, Sugar beet refineries.

The clarifier provides a vessel having a separation portion within which a number of separation elements are retained in at least one pair of vertical columns. Each separation element has a uniform cross section in the direction of fluid flow which is achieved by the construction of the separation element. Each element generally has a vertically downward extending portion or wing and a downward and outward wing joined at an apex at a predetermined angle. Both wings are generally rectangular in shape. A predetermined number of separation apertures are provided near the apex. Each pair of vertical columns of separation elements is arranged such that the downward wings provide a vertically extending collecting channel through which the clarified liquid will flow. As the substance of heavier density settles toward the bottom of the vessel, a gradient of specific gravity is established between the top and bottom of the vessel, with the top having a lesser specific gravity. As the substance of heavier density settles the specific gravity gradient causes a buoyant or generally upward flow of the liquid as its specific gravity decreases. The upward-flowing liquid encounters the downward and outward wings of the separation filter elements and the buoyancy forces the liquid toward the separation apertures to the collecting channel. The separation apertures restrict the flow into the collecting channel to a slow laminar flow to insure that the particles of heavier density will settle downward against the similar outward and downward jutting wings of the separation element. (Sinha-OEIS)
W76-10488

PHOSPHORUS REMOVAL DEMONSTRATION STUDIES AT C.F.B. TRENTON, PHASE II,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
W. E. Stepko.
Technology Development Report EPS 4-WP-76-4, Environmental Protection Service April, 1976, 33 p, 9 fig, 8 tab, 11 ref, append.

Descriptors: *Sludge treatment, *Treatment facilities, Sludge, *Waste water treatment, Sewers, Sewage treatment, Sediments, Phosphorus, *Canada.
Identifiers: *Phosphorus removal, Soluble phosphorus, Alum addition.

Full scale phosphorus removal studies, employing alum addition to an activated sludge treatment plant, were conducted at C.F.B. Trenton. Treatment plant performance with respect to total phosphorus removals was closely monitored under a number of alum addition levels and several different alum addition schemes. The optimum alum dosage for phosphorus removal was 1.3 mg/l as Al and the most effective addition scheme was a continuous 24 hour addition to the exit end of the aeration basins. This procedure resulted in a 57% reduction in the alum requirement for phosphorus removal (effluent phosphorus level less than 1 mg/l) and lowered the annual chemical costs from $5,800 to $2,500. Removal of soluble phosphorus above stoichiometric amounts of aluminum was observed during periods of reduced alum dosages. This additional removal is thought to be caused by the strong phosphate binding properties of the recycled alum sludge. The comparison of jar test predictions with plant scale results revealed that the jar test overestimated the optimum alum dosage for phosphorus removal by 500 percent. The choice of a prime precipitant and the determination of the optimum precipitant dosage should be based on plant scale studies rather than jar test predictions. (See also W75-09416) (Environment Canada)
W76-10490

EFFLUENT POLISHING BY FILTRATION THROUGH ACTIVATED ALUMINA, VOLUME I.
Pollutech Pollution Advisory Services Ltd., Oakville, (Ontario).
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 39, Training and Technology Transfer Division (Water), Environmental Protection Service, Environment Canada, Ottawa, Canada, April, 1976, 60 p, 13 fig, 14 tab, 10 ref, append. 73-5-4.

Descriptors: *Filtration, *Waste water treatment, Effluents, Phosphorus, *Efficiencies, Water pollution, Great Lakes, Water quality, Sewage, Nutrients, Economics, *Treatment facilities, Canada.
Identifiers: *Effluent polishing, *Activated alumina columns, Oakville Water Pollution Control Plant(Ontario), Alum treatment, *Phosphorus removal.

The effluent from the Oakville Water Pollution Control Plant was treated with alum to reduce the phosphorus concentration to 1 or 2 mg/l. This pretreated effluent was further polished in activated alumina columns. The phosphorus concentration in the polished effluent depended on the flowrate and the feed phosphorus concentration. Levels of 0.1 mg P/l or less were obtained by this process for appreciable periods. The performance of activated alumina was restored by regeneration with sodium hydroxide after the alumina had been exhausted. This process was estimated to be more economical than alum treatment alone if the desired concentration of phosphorus in the polished effluent was less than 0.5 mg/l. (Environment Canada)
W76-10491

ASSESSMENT OF POLYELECTROLYTES FOR PHOSPHORUS REMOVAL,
McMaster University, Hamilton (Ontario). Dept. of Chemical Engineering.
A. Benedek, A. E. Hameilec, J. J. Bancsi, and T. Ishige.
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 37, Training. Technology Transfer Division (Water), Environmental Protection Service, March, 1976, 227 p, 196 fig, 12 tab, 50 ref, 3 append. 72-5-6.

Descriptors: *Polyelectrolytes, Water quality, Great Lakes, *Waste water treatment, Domestic wastes, Surface waters, Effluents, Flocculation, Sediments, Phosphorus, *Chemical precipitation, *Coagulation.
Identifiers: *Phosphorus removal.

A simple batch settling test has been developed to examine the process effectiveness of polyelectrolytes. The conditions for polyelectrolyte testing have been optimized and a theoretical data interpretation technique has been developed to permit the extrapolation of batch data to continuous clarifiers. The shear and chemical degradation of solid polyelectrolyte during dissolution in water has been studied. Serious degradation and loss of effectiveness were noted under high shear, in the presence of ferrous ion, and with long term storage. Polyelectrolyte application in phosphorus removal is expected to occur in conjunction with 'coagulant precipitants' such as alum, ferric chloride and lime. Thus, before assessing the effect of polyelectrolytes, the residual settled phosphorus concentration and the settling rate resulting from the addition of these three coagulant precipitants were studied by themselves in model phosphate solutions as a function of phosphate type, pH and coagulant precipitant dosage. The addition of polyelectrolytes slightly increased the removal of residual phosphorus and dramatically increased settling rates in the model solution systems. With polyelectrolytes, satisfactory performance is anticipated over a much wider pH range. The results of a full scale study indicated agreement within 40% between laboratory predictions and full scale removals in the alum domestic wastewater polyelectrolyte system. (Environment Canada)
W76-10492

HARVEST OF BIOLOGICAL PRODUCTION AS A MEANS OF IMPROVING EFFLUENTS FORM SEWAGE LAGOONS,
For primary bibliographic entry see Field 5G.
W76-10500

5E. Ultimate Disposal Of Wastes

USE OF HIGH LEVEL RADIATION IN WASTE TREATMENT--STATUS AND PROSPECTS,
International Atomic Energy Agency, Vienna (Austria). Div. of Life Sciences.
For primary bibliographic entry see Field 5D.
W76-10010

PREDICTING THE WATER POLLUTION POTENTIAL OF PROPOSED SANITARY LANDFILLS PART I: SANITARY LANDFILL LEACHATE...WHAT IT IS,
Indiana Univ., Indianapolis. School of Medicine.
For primary bibliographic entry see Field 5B.
W76-10013

PREDICTING THE WATER POLLUTION POTENTIAL OF PROPOSED SANITARY LANDFILLS PART II: AN INDEX OF THE WATER POLLUTION POTENTIAL OF SANITARY LANDFILLS,
Indiana Univ., Indianapolis. School of Medicine.
For primary bibliographic entry see Field 5B.
W76-10014

POLLUTION OF GROUNDWATER BY LANDFILLS (POLLUTION DE L'EAU SOUTERRAINE PAR LES DECHARGES),
For primary bibliographic entry see Field 5B.
W76-10016

SHORT-TERM REGULATION OF BOD UPSETS IN AN ESTUARY,
Delaware Univ., Newark, Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W76-10020

MATHEMATICAL MODEL SIMPLIFIES DESIGN OF SLUDGE DRYING BEDS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5D.
W76-10035

ASSESSMENT OF THE MAXIMUM CONCENTRATION OF HEAVY METALS IN CRUDE SEWAGE WHICH WILL NOT INHIBIT THE ANAEROBIC DIGESTION OF SLUDGE,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5D.
W76-10040

GROUND-WATER POLLUTION PROBLEMS IN THE NORTHWESTERN UNITED STATES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-10083

HYDROGEOLOGIC AND OTHER CONSIDERATIONS RELATED TO THE SELECTION OF SANITARY-LANDFILL SITES IN OHIO,
Ohio Dept. of Natural Resources, Columbus. Regional Geology Section.
For primary bibliographic entry see Field 5D.
W76-10084

EFFECTS OF A LANDFILL ON GROUNDWATER QUALITY,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-10137

WASTE WATER TREATMENT.
Westinghouse Electric Corp., Melbourne (Australia).
For primary bibliographic entry see Field 5D.
W76-10202

TREATMENT AND DISPOSAL OF SEWAGE SLUDGE,
Sterling Drug Inc., New York. (Assignee).
For primary bibliographic entry see Field 5D.
W76-10204

WHAT TO DO WITH SEWAGE SLUDGE.
For primary bibliographic entry see Field 5D.
W76-10210

FOUR-MODE TREATMENT PLANT WILL GENERATE SODIUM HYPOCHLORITE ONSITE.
For primary bibliographic entry see Field 5D.
W76-10213

USE OF THE EARTH'S CRUST FOR TREATMENT OR STORAGE OF SEWAGE EFFLUENT AND OTHER WASTE FLUIDS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W76-10216

DISPOSAL OF SEWAGE FROM COASTAL TOWNS: THE CASE FOR SEA OUTFALLS,
Taylor (John) and Sons, London (England).
J. T. Calvert.
Water Pollution Control, Vol. 75, No. 2, p 153-161, 1976. 6 ref.

Descriptors: *Sewage effluents, *Sewage disposal, *Sewage, *Outlets, *Oceans, Biological properties, Biochemical oxygen demand, Chemical properties, *Outfall sewers.

A case is made for the disposal of sewage from coastal towns via sea outfalls. The case for direct sewage discharge is based on observations of natural purification. When sewage is diluted 100 times with clean seawater, it is indistinguishable from fully treated secondary effluent in terms of bacteriological properties and is superior in quality in terms of suspended solids and biochemical oxygen demand. Subsequent to the dilution, the natural chemical and biological processes of purification occur such that no change in the character and composition of the sea can be detected. Other reasons for favoring direct discharge involve land use requirements for treatment facilities and the costs involved. Direct sewage discharge to the sea also eliminates sludge treatment problems. Exceptions to the above approach which might favor some form of treatment include cases where toxic materials are being discharged, problems involving visible solids, and coastal areas where currents are unfavorable. (Kreager-FIRL)
W76-10224

THE DISPOSAL OF SEWAGE FROM COASTAL TOWNS: THE CASE FOR TREATMENT,
For primary bibliographic entry see Field 5D.
W76-10225

IMPROVING THE FUEL VALUE OF SEWAGE SLUDGE,
Municipal Environmental Research Lab., Cincinnati, Ohio.
S. W. Hathaway, and R. A. Olexsey.
News of Environmental Research in Cincinnati, October 31, 1975. 4 p, 3 fig, 2 tab, 8 ref.

Descriptors: *Sewage sludge, *Fuels, *Costs, *Incineration, *Sludge disposal, Ultimate disposal, Dewatering, Sludge treatment.

The cost of auxiliary fuel is an increasingly crucial component of the cost of incinerating municipal sewage sludge. Auxiliary fuel is needed because, even after dewatering, more heat is required to evaporate the entrained water than the sludge solids can provide. Sludge volatility also affects the combustibility of the sludge cake. Less expensive alternative auxiliary fuels are being considered, including coal, municipal refuse, wood chips, and paper products. The use of incinerator ash for sludge conditioning does not remove the need for auxiliary fuels, because the ash must be heated and has no beneficial heat value. Sewage sludge is very compressible, and the compressed floc particles hinder dewatering by making the filter medium less porous. Sludge treatment with an incompressible substance is beneficial because it reduces this effect. Granulated coal with a maximum particle size of 9.5 mm, was added to liquid sludge in dosages ranging from 0.2 to 1.0 kg coal/kg dry sludge solids. When coal dosage was above 0.3 kg coal/kg sludge solids, the combustion of the sludge cake provided sufficient energy to supply the heat needed for incineration. The addition of coal in this particle size range did not produce a startling increase in filter yield. Results from a pilot plant show that without polymer, coal addition does not affect the net yield of sludge solids, but that the addition of polymer significantly increases yield. The cost for coal addition is estimated at $10/metric ton dry sludge solids. The cost of oil as a supplementary fuel is estimated at $17.50/metric ton of dry solids. Coal cannot, in itself, serve as a complete conditioning agent. (Snyder-FIRL)
W76-10234

RECLAMATION OF A BURNED ANTHRACITE REFUSE BANK WITH MUNICIPAL SLUDGE,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sopper, L. T. Kardos, and B. R. Edgerton.
Compost Science, Vol. 17, No. 2, p 12-19, March-April, 1976. 7 tab.

Descriptors: *Sludge disposal, *Land reclamation, *Fertilization, *Application methods, *Sewage effluents, Irrigation, Vegetation establishment, Trees, Grasses, Legumes, Crops, *Municipal wastes.
Identifiers: Land application.

The use of municipal effluent and sludge to fertilize a burned anthracite refuse bank was studied. A burned anthracite refuse bank was divided into three plots, one of which was not irrigated, one irrigated with effluent, and one irrigated with fresh water. Different sludge application rates were used on different parts of each plot. Ten species of trees, five species of grasses, and five species of legumes were planted in the plots. It was shown that heat-dried sludge, municipal sewage effluent, or a combination may successfully revegetate burned anthracite refuse banks. Irrigation with only fresh water was helpful in establishing seeded legumes, but grasses responded more strongly when sludge was also applied. More tree seedlings survived at the lower rates of sludge application. However, the seedlings that survived showed greater height growth at higher application rates. The hardwood trees, especially hybrid poplar and black locust, had greater potential to revegetate burned refuse banks than the conifers. All of the hardwoods had better survival rates than the best conifers. The species with the highest survival rate was black locust. After one season, black locust and hybrid poplar had the greatest height growth. Hardwoods also grow best with a herbaceous cover. The fast growing legumes and grasses quickly overtop and suppress the slowly growing conifers. The best overall sludge application rate was 34 tons/acre in terms of growth of herbaceous vegetation. Eighteen tons/acre was second best for establishing herbaceous vegetation. Grasses were better suited for revegetation than legumes, which responded poorly under competition. (Snyder-FIRL)
W76-10249

SOFTENING AND COAGULATION SLUDGE-DISPOSAL FOR A SURFACE WATER SUPPLY,
Stilson (Alden E.) and Associates, Columbus, Ohio.
For primary bibliographic entry see Field 5F.
W76-10252

THE FATE OF POLLUTANTS IN SUBSURFACE ENVIRONMENTS,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5B.
W76-10253

LSW-500 DISPOSAL OF AIR FORCE LIQUID WASTES,
Combustion Power Co., Inc., Menlo Park, Calif.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A010 429, $6.00 in paper copy, $2.25 in microfiche. Report AFWL-TR-74-70, April 1975, 137 p, 19 fig, 14 tab, 3 ref, 3 append.

Descriptors: *Treatment facilities, *Sewage sludge, Civil engineering, *Incineration, *Environmental engineering, Sludge disposal, Solid wastes, Smoke, Ultimate disposal, Liquid wastes, Oil wastes, Herbicides.

LIBRARY U. OF L. ENGINEERING

lentifiers: *Fluidized bed incineration, Orange erbicide.

hermal degradation of liquid wastes in a fluidized ed incineration system was investigated. The astes studied included aircraft washrack waste; aint stripping waste; herbicide orange; petrole-n, oil, and lubricant waste (POL); municipal gar-ge; and sewage sludge. Of these, POL wastes, erbicide orange, a portion of the paint stripping aste, and municipal garbage were identified as els, with enough heat energy to maintain the uidized bed at operating temperature. Use of the uidized bed incinerator to dispose of selected astes was successful. POL and municipal wastes an be used without additional fuel to dispose of rcraft washrack waste, paint stripping wastes, id sewage sludge. Liquid waste fuels were in-cted in the lower 6 inches of the fluidized bed sing the existing oil guns. Other liquid wastes ere injected using the existing feed locations just ove and below the secondary bed. Non-fuel quid wastes could be disposed of at a rate of 148 l/hr in the test system. Existing exhaust emis-on standards were met in all areas except par-culate matter loading. A dry scrubber is recom-ended for use with such systems. Herbicide range can be satisfactorily disposed of providing nission control can be maintained. (Snyder-IRL)
/76-10258

/ATER REUSE IN THE UNITED STATES,
erospace Medical Research Lab., Wright-Patter-on AFB, Ohio.
or primary bibliographic entry see Field 5D.
/76-10260

OLLUTION-FREE WELL CUTTINGS ISPOSAL APPARATUS,
'L Industries, Inc., New York. (Assignee).
or primary bibliographic entry see Field 5G.
/76-10464

IETHOD OF STORING SLUDGE RECOVERED ROM THE HOT WATER EXTRACTION OF ITUMEN FROM TAR SANDS,
reat Canadian Oil Sands Limited, Toronto Ontario). (Assignee).
or primary bibliographic entry see Field 5D.
/76-10474

F. Water Treatment and Quality Alteration

HE ROLE OF HYDROXYL RADICAL REAC-IONS IN OZONATION PROCESSES IN AQUE-US SOLUTIONS,
idgenoessische Technische Hochschule, Zurich Switzerland).
or primary bibliographic entry see Field 5D.
/76-10036

/ATER, ITS EFFECTS ON LIFE QUALITY.
/ater Quality Research Council, Lombard, Ill.
roceedings, Seventh International Water Quality ymposium, April 23-24, 1974, Washington, D. C., 92 p, Edited by D. X. Manners.

escriptors: *Water quality, Public health, Water rification, Potable water, Water resources, /ater resources development, Planning, Water pply, Domestic water, Industrial water, En-ronmental engineering, Pesticide toxicity, Ener-budget, Water softening.
entifiers: Potable water standards, Chemical-sease relationships, Backward utilities, Foreign ews on water quality, Industrial recycled water, nergy crisis.

he International Water Quality Symposium is an ducational forum, held on alternate years, which brings together the world's foremost scientists, researches, conservationists, industrialists, government leaders, and others concerned with water quality. The Symposium is designed to translate the technical language of experts into layman's terms and bring to the public the lastest findings on the importance of water quality in such areas as health, environmental protection, sanitation, food processing, as well as various commercial and industrial applications. (Heiss-NWWA)
W76-10087

ANALYZING FOR ASBESTOS IN DRINKING WATER,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W76-10240

SOFTENING AND COAGULATION SLUDGE-DISPOSAL FOR A SURFACE WATER SUPPLY,
Stilson (Alden E.) and Associates, Columbus, Ohio.
M. A. Burris, K. W. Cosens, and D. M. Mair.
American Water Works Association Journal, Vol. 68, No. 5, p 247-257, May 1976. 13 fig, 8 tab.

Descriptors: *Water quality control, *Sludge treatment, *Water softening, Surface waters, *Sludge disposal, *Byproducts, Treatment facilities, Calcium carbonate, Lagoons, Magnesium, Recycling, *Water supply, *Water treatment.

Results from pilot plant studies at two surface water treatment plants in Columbus, Ohio, dealing with the feasibility of recovering quicklime from the calcium carbonate in softening sludge as well as methods of sludge disposal are presented. The studies indicate that quicklime which is suitable for reuse can be recovered with an 86% calcium oxide content. Waste streams from centrifugation and sludge concentration processes which contain large quantities of dissolved magnesium require stabilization in lagoons, with the supernatant being returned to the surface stream below the intake dam. Recarbonation, concentration, and centrifuging of softening sludge are required to reduce impurities in the product quicklime in order to ensure continuous high quality for recycling. These steps, together with an efficient first stage clarification process, are essential when a turbid surface water supply is the source. Coagulation sludges must be removed ahead of the softening operation and kept separate. Alum sludges can be concentrated and dewatered by centrifuges or filter presses; the latter produce a more satisfactory cake and a better filtrate for return to the process. (Kreager-FIRL)
W76-10252

METHOD FOR TREATING FOULED WATER,
Mitsubishi Gas Chemical Co., Ltd., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W76-10467

METHOD FOR CONTROLLING SCALE,
Texaco Inc., New York. (Assignee).
For primary bibliographic entry see Field 5G.
W76-10469

WATER SOFTENER,
R. Derouineau.
U.S. Patent No. 3,951,802, 4 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1346, April 20, 1976.

Descriptors: *Patents, *Water treatment, *Water softening, *Demineralization, *Hardness(Water), Ion exchange, Water purification, Water quality, Water quality control, Resins.

A water softener comprises at least two containers each one of which has an ion-exchange resin element as well as an inlet duct and an outlet duct, a supply duct connected to a source of water to be softened, a discharge duct for the softened water, a control valve for alternately connecting the containers to the supply duct and the discharge duct, a salt container, and a valve unit for passing a water stream through the salt container and alternately through that container which is not connected to the supply duct and the discharge duct. (Sinha-OEIS)
W76-10475

CLARIFIER APPARATUS,
Ecodyne Corp., Lincolnshire, Ill. (Assignee).
D. A. Young.
U.S. Patent No. 3,951,806, 4 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1347-1348, April 20, 1976.

Descriptors: *Patents, Effluents, *Water purification, *Water treatment, *Water pollution treatment, Water pollution control, Water quality control, Sludge, Coagulation, Suspended solids, Chemicals, Equipment, Chemical precipitation.
Identifiers: Center post clarifier, Chemial treatment.

In water treating and clarification suspended solid particles act as 'seed' or nuclei to which newly formed precipitates adhere, creating a smaller number of larger, more dense and easily settled particles. Previously formed precipitates act as the 'seed' to speed the reactions between the incoming raw water and treatment chemicals. A primary object of the invention is to provide a center post clarifier which hydraulically recirculates solid precipitates or sludge upward into contact with the incoming raw water and added chemical agents. The clarifier has an uptake zone defined around the center support post forming an eductor tube having an upper and lower end which connect with an upper and lower portion of the mixing and recirculation chamber. A first set of openings is provided intermediate the center post for directing the flow of raw water upward into an intermediate portion of the uptake zone. A second set of openings positioned above the first set is provided for directing the remaining flow of raw water from the center post into the upper portion of the uptake zone. The relative flow rates of raw water causes sludge which has accumulated adjacent the lower end of the uptake zone to be lifted and recirculated with the raw water. (Sinh - OEIS)
W76-10479

WATER CONDITIONING APPARATUS,
C. H. Sanderson.
U.S. Patent No. 3,951,807, 5 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1348, April 20, 1976.

Descriptors: *Patents, *Water treatment, *Water softening, *Demineralization, Scaling, Water quality, Water quality control, Magnetic studies, Equipment, Desalination.
Identifiers: Magnetic materials, Magnetic field.

An apparatus is described for treating water to reduce the buildup of scale in water systems. The device includes a cylindrical, multipoled magnetic core and an outer casing of magnetic material placed in radially spaced-apart relationship and includes ports for causing the water to pass through the magnetic field between the magnet and the magnetic casing. The passage of water through the apparatus causes materials that ordinarily form scale to form, instead, a loose slurry or mud-like substance which can be easily removed from the system by a simple blowdown or flushing. (Sinha - OEIS)
W76-10480

MODULAR CONTAINER,
Almag Pollution Control Corp., Baltimore, Md. (Assignee).
For primary bibliographic entry see Field 5D.
W76-10483

5G. Water Quality Control

COMPILATION AND ANALYSIS OF WATER QUALITY RIGHTS AND RESPONSIBILITIES IN HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
H. Yamauchi, and G. M. Hudes.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 835, $4.00 in paper copy, $2.25 in microfiche. Technical Memorandum No. 46, February 1976. 33 p., 298 ref. OWRT A-052-HI(1) 14-31-0001-5011.

Descriptors: *Water rights, *Water quality, *Regulation, *Institutions, *Hawaii, Legal aspects, Management, Administration, State jurisdiction, Evaluation, Bibliographies.
Identifiers: *Property rights, *Ahupua'a.

The ahupua'a of ancient Hawaii was a watershed-based institutional community. Water was of cardinal importance as a basis for, and object of the organization and administration of these largely self-sufficient communities. The concepts and doctrines of ahupua'a management, have recently been given reinvigorated legal standing by the 1973 Hanapepe decision of the Hawaii Supreme Court. This initial phase of the project consists of a general description of objectives and a bibliography compiled from library research in the concepts, rights, and responsibilities of the ahupua'a. The Hawaiian Collection of the University of Hawaii, the Bishop Museum, and the State Supreme Court libraries will provide the major information sources. Also maps and boundaries which may indicate additional geopolitical aspects of the ahupua'a will be reviewed.
W76-10001

OPERATION AND IMPACT OF NPDES IN REGION II, PART I,
Environmental Protection Agency, New York. Caribbean Construction Grants Branch.
W. J. Muszynski, and T. J. Olenik.
Water and Sewage Works, Vol. 123, No. 5, p 62-65, May, 1976. 2 tab, 7 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Permits, *Legislation, *Federal Water Pollution Control Act, Standards, Grants, Effluents, New Jersey, New York, Puerto Rico, Virgin Islands, *Water quality standards.
Identifiers: *National Pollutant Discharge Elimination System, Discharge permits.

The Federal Water Pollution Control Act Amendments provide Federal grants for construction of public waste water treatment works and establish interim effluent standards and the National Pollutant Discharge Elimination System (NPDES) permit program. Requirements are provided which systems must meet in order to receive permits. Region II includes Puerto Rico, the United States Virgin Islands, and the states of New York and New Jersey. The initial problems regarding permits for publicly owned discharges involved funding, pre-treatment of industrial wastes, combined flow, and the lack of discharge information. The last is the most serious problem, and it is complicated by the lack of understanding of the permit program by the municipalities. Several reviews of an application are necessary before a permit is issued. The steps in processing a permit include developing a preliminary draft of conditions for the treatment plant, certification by the state, public notice, and issuance of the permit. Attempts are made to verify the information provided on application forms. Where secondary treatment facilities do not currently exist, interim effluent requirements are aligned with the construction schedule for the secondary facilities. Secondary plants capable of achieving the required treatment level would be required to study what could be done to raise their treatment levels. In some instances existing secondary treatment plants would receive two compliance schedules, one related to the permit and the other related to construction grants for plant improvement. (Snyder-FIRL)
W76-10005

FLOATING STRUCTURAL PLASTIC TRUSS SYSTEM PROTECTS WASTE LAGOON LINING,
FMC Corp., San Jose, Calif.
R. K. Andrews.
Water and Sewage Works, Vol. 123, No. 1, p 55, January, 1976.

Descriptors: *Waste treatment, *Corrosion control, *Plastics, Construction Materials, Pipes, Joints(Connections), West Virginia.

A lagoon lining at a facility for waste treatment for a plant in Nitro, West Virginia, had to be designed to protect it from damage. The lagoon was planned to contain acidic wastes in variable depths. Supports and piping were to be designed for corrosion resistance and minimum outdoor maintenance. Structural plastic was designated for outlet and inlet piping supports for this reason. A pivoted truss system and floating platforms were designed and fabricated. A minimum lagoon water level prevents platform floats from resting on the lining. Fiberglass reinforced plastic piping having flexible joints at its truss pivot points was installed. The floating platform gave rise to some stability problems, but these have been corrected. The structural components have not noticeably deteriorated after approximately 2 years' operation. A long useful life is predicted for the system. (nyder-FIRL)
W76-10007

OPTIMAL ALLOCATION OF MEASUREMENT AND CONTROL RESOURCES WITH APPLICATION TO RIVER DEPOLLUTION,
Columbia Univ., New York. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5A.
W76-10017

SHORT-TERM REGULATION OF BOD UPSETS IN AN ESTUARY,
Delaware Univ., Newark, Dept. of Chemical Engineering.
R. K. Jain, and M. M. Denn.
Transactions of the ASME: Journal of Dynamic Systems, Measurement, and Control, Vol. 98, No. 1, p 30-31, March, 1976. 1 fig, 5 ref.

Descriptors: *Water quality control, *Mathematical models, *Biochemical oxygen demand, Estuaries, Waste disposal, *Regulation, Water pollution control, Pollution abatement.

Local dynamic regulation at discharge points of effluent biochemical oxygen demand (BOD) upsets in an estuary was studied to determine its feasibility. The study was carried out with a mathematical model for an estuary of constant cross-sectional area, using parameters characteristic of the Delaware estuary. The solution requires the major response to be within the first tidal cycle, but it would be impossible for response to be so rapid in practice. Disturbances die out within approximately 3 days without controls, but averaging extends the period of disturbances to 6 days or more. Thus the spread of poor quality water is increased, although the peak disturbance is considerably reduced. This method of regulation does not appear to be a feasible means of maintaining water quality. (Snyder-FIRL)
W76-10020

COMPUTER-AIDED MODELLING OF STREAM PURIFICATION CAPACITY, PART I: NON-LINEAR DO MODEL,
Rensselaer Polytechnic Inst., Troy, N. Y.
For primary bibliographic entry see Field 5B.
W76-10024

COMPUTER-AIDED MODELLING OF STREAM PURIFICATION CAPACITY, PART II: MULTIPLE LINEAR CORRELATION METHOD,
Rensselaer Polytechnic Inst., Troy, N. Y.
For primary bibliographic entry see Field 5B.
W76-10025

INDUSTRIAL RESEARCH INSTITUTE STUDYING POLLUTION PROBLEMS OF SETO INLAND SEA,
Chugoku National Industrial Research Inst., Hiroshima (Japan).
For primary bibliographic entry see Field 5B.
W76-10031

ECOSYSTEMS ANALYSIS OF THE BIG CYPRESS SWAMP AND ESTUATIES,
Environmental Protection Agency, Athens, Ga. Surveillance and analysis Div.
For primary bibliographic entry see Field 6G.
W76-10046

CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM, A CONDENSED GUIDE TO CHEMICAL HAZARDS,
Coast Guard, Washington, D. C. Office of Marine Environment and Systems.
For primary bibliographic entry see Field 5A.
W76-10047

EVALUATION OF THE ARMY PESTICIDE MONITORING PROGRAM, EVALUATION OF DATA FROM ENVIRONMENTAL SAMPLES COLLECTED PRIOR TO 1 JANUARY 1974, PART I, SOIL, SEDIMENT, WATER,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
For primary bibliographic entry see Field 5A.
W76-10048

IRRADIANCE REDUCTION: EFFECTS ON STANDING CROPS OF THE EELGRASS, ZOSTERA MARINA IN A COASTAL LAGOON,
San Diego State Univ., Calif. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-10067

GROUND-WATER POLLUTION PROBLEMS IN THE NORTHWESTERN UNITED STATES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-10083

PITLESS UNIT AND ADAPTER UPDATE.
For primary bibliographic entry see Field 8G.
W76-10092

ALFALFA SAFEGUARDS GROUND WATER.
Ground Water Age, Vol. 10, No. 9, p 31, May, 1976. 4 fig.

Descriptors: *Water pollution sources, *Nitrogen, *Nitrates, Groundwater, *Decomposing organic matter, *Alfalfa, Corn(Field), Feedlots.
Identifiers: *Abandoned feedlots.

Planting unused feedlots to alfalfa after abandonment will prevent nitrate pollution of ground water that otherwise might occur. It was found that corn is less efficient than alfalfa in removing accumulated nitrogen in the soil. Nitrogen normally builds

p in the top five to six feet of soil in a relatively nmobile form. However, when feedlots are aban-oned, organic nitrogen may be converted to itrate which will infiltrate the soil with moisture nce the impermeable surface seal breaks down. lanting of alfalfa will preclude free nitrogen con-ersion to nitrate by fixing the nitrogen in the root ystem in high concentration. (Heiss-NWWA)
/76-10093

UARDIANS OF GROUND WATER QUALITY,
ational Water Well Association, Worthington, hio.
. E. Gass.
Vater Well Journal, Vol. 30, No. 7, p 28-29, July, 976.

escriptors: *Water quality, *Water wells, Groundwater, *Water pollution, Well regula-ons, Legislation.
lentifiers: *Water well construction, *Water well ontractors, *Well completion techniques, Well onstruction guidelines.

he water well contractor plays an integral part in rotecting the nations' ground water from con-mination. Poorly constructed water wells epresent ground-water quality's greatest hazard. ny well construction which provides a path for ontaminants to enter a potable aquifer is a threat public health as well as a detriment to the water ell industry. State laws regulating the construc-on standards of water wells vary in effective-ess, and definitive language. Ultimately the con-actor is responsible for the proper construction f water wells. In successfully completing this task e contractor not only preserves the nation's round-water quality, but maintains the good repu-tion of the water well industry. (Heiss-NWWA)
/76-10096

ELECTING PACKER FLUIDS: HERE'S WHAT O CONSIDER,
elta Mud and Chemical Co., Houma, La.
or primary bibliographic entry see Field 8G.
/76-10099

L92-500: MID-COURSE CORRECTION RANTS OPTIONS; NEXT MOVE UP TO CON-RESS,
. W. Heckroth.
Vater and Wastes Engineering, Vol. 13, No. 5, p 3-32, May, 1976.

escriptors: *Legislation, *Water pollution, Water pollution treatment, *Water pollution con-ol, Pollution abatement, Discharge(Water), Water quality standards, Water treatment, Waste ater treatment.
entifiers: *Public Law 92-500, *National Com-ission on Water Quality, Interim legislation, En-rcement of standards, Water treatment funding.

x essential and a number of secondary recom-endations embody the text of Mid-course cor-ction moves of the National Commission on ater Quality for Public Law 92-500. The six es-ntial recommendations are: (1) Maintain the ly, 1977 compliance date with uniform treatment quirements by both industry and publicly owned eatment works, but provide some flexibility to ant extensions and waivers, on a case-by-case sis, (2a) Maintain the 1983 interim goals, but stpone the 1983 requirements for application of iform technologies five to ten years, (2b) Meet e 1983 interim water quality goal by application the 1977 requirements to all discharges, (3) ecentralize regulatory and administrative func-ons of the national program by selective certifi-tion of states, (4) Stabilize the Federal construc-n grants program by assuring 75 percent federal ancing for priority treatment needs, (5) edefine the goal of elimination of discharge of llutants as one stressing conservation and reuse resources, (6) Authorize flexibility in control or treatment measures to irrigated agriculture and support salinity alleviation projects to reduce salt loads from sources other than man's activities. (Heiss-NWWA)
W76-10106

EFFECTS OF TREATED MUNICIPAL WASTE-WATER ON OAT FORAGE AND GRAIN,
Arizona Agricultural Experiment Station, Tucson.
For primary bibliographic entry see Field 5D.
W76-10119

AN ENVIRONMENTAL ASSESSMENT OF IM-PACTS OF COAL DEVELOPMENT ON THE WATER SOURCES OF THE YAMPA RIVER BASIN, COLORADO AND WYOMING--PHASE-1 WORK PLAN,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4C.
W76-10135

WATER QUALITY IMPLICATIONS OF CAT-TLE GRAZING ON A SEMIARID WATERSHED IN SOUTHEASTERN UTAH,
Oregon State Univ., Corvallis. Rangeland Resources Program.
J. C. Buckhouse, and G. F. Gifford.
Journal of Range Management, Vol. 29, No. 2, p 109-113, March, 1976. 1 fig, 1 tab, 28 ref.

Descriptors: *Public health, *Water quality, *Water pollution control, Watershed management, *Grazing, Coliforms, Cattle, *Range management, Rainfall-runoff relationships, Pine trees, Juniper trees, Land clearing, Human diseases, Recreation facilities, *Utah.
Identifiers: *Fecal pollution.

No adverse effects from fecal contamination were detected after cattle grazing was introduced in a semiarid watershed near Coyote Flat in Southeast-ern Utah. The area was seeded to crested wheat-grass in 1967 after pinyon-juniper chaining and windrowing of debris, and it was protected from grazing until 1974 when it was cattle stocked at 2 ha/AUM. There were no significant changes in fecal and total coliform production, indicating that potential health hazards from fecal pollution dur-ing such grazing are minimal. Most dry rangelands such as those covering the southwestern U.S. have few, if any, permanent streams. Cattle are main-tained by hauling water to troughs or by creating water catchment ponds at local springs. Thus, there is little or no effective stream bank area from which bacteria can be flushed into a water course. On most chainings, especially those with debris in place, runoff water cannot flow any distance over-land and very little rainfall runs off. (Jahns-Arizona)
W76-10171

NITROGEN REMOVAL DEPENDS ON FORM NUTRIENT TAKES,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W76-10174

AQUICULTURE - NEW BROOM CLEANS UP WASTEWATER,
Hazen and Sawyer, New York.
D. Walrath, and A. S. Natter.
Water and Wastes Engineering, p 38-41, February 1976.

Descriptors: *Aquiculture, *Waste water treat-ment, *Aquatic productivity, *Nutrient removal, Aquatic animals, Aquatic plants, Nitrogen, Phosphorus, Water quality control, Nutrients, Shellfish, Absorption.
Identifiers: Nutrient recovery.

Aquiculture is evaluated as a means of controlling nitrogen and phosphorus discharges in waste-water. Nutrient recovery provides potential food stuffs return as well as fuel sources and fertilizer compounds. Basic systems are described and cur-rent research outlined, especially with filter-feed-ing shellfish and macroscopic plant forms. Aquiculture system size depends on the area required for plant growth, which is determined by incident solar radiation, the plant species under culture and the efficiency of exposure to sunlight. In research on systems using unmixed basins, area requirements under favorable light conditions ranged from 6 to 60 acres/mgd (for summer opera-tion in the northern U.S. and all year at subtropical latitudes). Area requirements under northern winter conditions may be over 10 times greater. Such requirements may be reduced by culturing a species with higher growth and uptake rates, cul-turing at higher concentrations, and mixing or other methods for increasing light exposure. The use of filter-feeding shellfish requires a heated system; waste heat from power plants is one viable source. Wastewater N:P ratios must be between 10:1 and 15:1 for a species which will uptake both nutrients effectively. (Jahns-Arizona)
W76-10180

LARGE-SCALE ESTUARINE WATER QUALI-TY MATRIX MODEL,
Texas Univ. at Austin. Dept. of Electrical En-gineering.
For primary bibliographic entry see Field 5B.
W76-10191

A REVIEW ON DECISION MODELS IN ECONOMICS OF REGIONAL WATER QUALI-TY MANAGEMENT,
Technical Univ., of Denmark, Lyngby. Instituttet for Kemundustri.
M. Bundgaard-Nielsen, and C. L. Hwang.
Water Resources Bulletin, Vol. 12, No. 3, p 461-479, June 1976. 5 fig, 94 ref.

Descriptors: *Water quality control, *Management, Economics, *Optimization, *Mathematical models, *Reviews, River basins, Waste water treatment, Decision making, Systems analysis, Linear programming, *Bibliographies, *Regional analysis.
Identifiers: Taxation, Effluent charges, Multiob-jective model, Nonlinear programming, Cen-tralization models, Decentralization models, At-source treatment.

Literature specifically on decision models in economics of regional water quality management is reviewed critically and classified systematically. The concept of a basin-wide firm introduced by Kneese in 1964 is equivalent to the centralization system. Linear programming models for at-source treatment in water pollution control are presented in the earlier studies while nonlinear programming models are in recent ones. Since the economies of scale favor installation of a few large treatment plants, centralized waste treatment systems are studied by many using a number of programming techniques, including integer programming, dynamic programming, a nonconvex quadratic minimization algorithm, and an enumeration method. A general model for the basinwide firm may have the possibility of at-source treatment, centralized waste treatment plants, and by-pass piping to achieve regional water quality standards at a minimum cost. One of the major arguments in support of the taxation approaches is that they can achieve economic efficiency with minimum infor-mation requirements. Finally, it has been increas-ingly recognized that most decision problems in-volve multiple objectives. (Bell-Cornell)
W76-10195

GREAT LAKES POLLUTION CLEANUP STAG-NATES AS PROBLEMS MOUNT,
Engineering News-Record, Vol. 196, No. 22, p 26-27, May 27, 1976. 1 tab.

Descriptors: *Sewage treatment, *Municipal wastes, *Industrial wastes, *Great Lakes, Great Lakes region, Lake Erie, Waste water treatment, Treatment facilities, Water quality, Water pollution effects, Legal aspects, Financing.

Municipal and industrial water pollution problems being experienced by cities on the shores of the Great Lakes are reviewed along with legal, financial, and bureaucratic difficulties impeding their solution. Lake Erie is generally considered to be the most severely polluted of the lakes, with water quality in Cleveland harbor being poor with respect to biochemical oxygen demand, phosphorus, nitrogen, total dissolved solids, and coliforms. A year-long holdup in the building of the city's 50 million gallon/day physical-chemical sewage treatment plant is the result of protests of potential contractors who were beaten out in the bidding. Other delays associated with environmental impact statements required by the Environmental Protection Agency are also a problem. Similar delays are being experienced by other cities on the Great Lakes in terms of deadlines set for both industry and the municipalities. In contrast to the Lake Erie situation, water quality for Lakes Michigan, Superior, and Huron is generally good. (Kreager-FIRL)
W76-10250

SYSTEMS MODELS FOR PHOSPHORUS MANAGEMENT IN FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W76-10277

THE SANTEE SWAMP AS A NUTRIENT SINK,
South Carolina Univ., Columbia. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10288

PLANNING IMPLICATIONS OF DISSOLVED OXYGEN DEPLETION IN THE WILLAMETTE RIVER, OREGON,
Geological Survey, Portland, Oreg.
D. A. Rickert, W. G. Hines, and S. W. McKenzie.
In: Urbanization and Water Quality Control: American Water Resources Association Proceedings Series No 20, p 70-84, June 1975. 8 fig, 2 tab, 7 ref.

Descriptors: *Water quality control, *Low-flow augmentation, *Rivers, *Oregon, Water analysis, *Dissolved oxygen, Oxygen demand, Nitrification, Summer, Water temperature, Biochemical oxygen demand, Streamflow, Water management(Applied).
Identifiers: *Willamette River(Oreg), River-quality planning, Dissolved oxygen standards.

Basinwide secondary treatment of municipal and industrial wastewaters has resulted in a dramatic increase of summertime dissolved-oxygen (DO) concentrations in the Willamette River in Oregon. Rates of carbonaceous decay are very low (0.03 to 0.06/day), and point-source BOD loading now accounts for less than one-third of the satisfied oxygen demand. Nitrification is now the dominant DO sink. DO concentrations met the state standards in all reaches of the Willamette during the low-flow period of 1974. Mathematical modeling shows that low-flow augmentation from storage reservoirs was largely responsible for the standards being met. Future achievement of DO standards will require continued low-flow augmentation in addition to pollution control. Summertime flows above 6000 cfs will be needed even with increased treatment removals of oxygen-depleting materials. The greatest immediare incremental improvement in DO can be made through reduction in point-source ammonia loading. The pros and cons of upgrading treatment efficiencies for BOD removal would best be determined after ammonia loadings have been reduced to reasonable levels and the possibility of controlling a benthal-oxygen demand in Portland Harbor has been fully assessed. (Woodard-USGS)
W76-10332

SYSTEMATIC ANALYSIS OF FIELD SURVEY TECHNIQUES AND OPERATIONAL UTILITY OF ENVIRONMENTAL RESEARCH TO THE NAVY,
David W. Taylor Naval Ship Research and Development Center, Bethesda, Md.
S. C. Rainey.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973, December, 1974, p 31-38.

Descriptors: *Methodology, *Administration, *Planning, *Management, *Data collections, *Information retrieval, *Monitoring, On-site survey, Environmental research, Administration, Data storage and retrieval, Basic data collections, Environment.

The problems of the interaction between the Navy and the marine environment in any area are so involved that inventories are probably indicated. An adequate biological program is going to need some continuing integration and a highly responsive central information central storage location for information. (See also W76-10353) (Katz)
W76-10356

THE SYSTEMS CONCEPT AND POLLUTION CONTROL,
San Diego State Univ., Calif.
J. H. Mathewson.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973, December, 1974, p 39-44.

Descriptors: Ecosystems, *Monitoring, *Water quality control, *Systems analysis, Abatement, Water pollution, Forecasting, Dynamic programming, Hydrologic systems, Environment, Water pollution control, *Pollution abatement.

An aspect of pollution abatement that has not been adequately recognized is the integrated nature of the problems, the reactions of ecosystems to the problems; and the solutions required to solve the problems. Environments are dynamic systems consisting of complex interactions among many components, with a tendency to maintain themselves in response to outside perturbations. This self-regulating aspect requires the full natural complement of both living and non-living components -- water, light, minerals, plants, animals, microbes -- that interact to make up the whole system. Damage to a single component alters the integrity of the entire system because it reacts as a whole. (See also W76-10353) (Katz)
W76-10357

THE NEED FOR MORE INTERCOMPARABLE FIELD DATA AND WIDELY APPLICABLE SHORT-TERM SURVEY,
Naval Undersea Center, Kailua, Hawaii. Hawaii Lab.
E. C. Evans.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973, December, 1974, p 45-55.

Descriptors: *Bioassay, *Toxicity, *Methodology, Ecosystems, *Monitoring, *Data collection, *Bioindicators, *Water quality standards, Variability, Water pollution, Water quality, Marine animals, Surveys.

The range of biological responses of different marine organisms should be compared and integrated to encourage a practical degree of standardization among field biologists. The use of the Navy Environmental Protection Data Base (NEPBD) and the services of the Marine Environmental Management Office (MEMO) is advocated. (See also W76-10353) (Katz)
W76-10358

ANTIFOULING COATINGS AND THEIR INFLUENCE ON THE MARINE ENVIRONMENT,
Naval Postgraduate School, Monterey, Calif.
E. C. Haderlie.
In: Proceedings of the Conference on Marine Biology in Environmental Protection, held at San Clemente Island, California, on 13-15 November, 1973 December, 1974, p 139-145, 6 ref.

Descriptors: *Heavy metals, *Toxicity, *Periphyton, *Fouling, Ships, Aquatic algae, Nuisance algae, Ions, Crustaceans, Water pollution control.

Currently used antifouling coatings owe their effectiveness to the release of the ions of heavy metals into the sea water surrounding the surface protected by the coatings. These ions can contribute significantly to the concentration of heavy metals in the surrounding sea water and can pose a threat to the marine environment. New techniques that do not depend on toxic chemical formulations must be developed to prevent fouling on ships' hulls and other submerged structures. (See also W76-10353) (Katz)
W76-10365

CHANGES IN THE LEVELS OF ENVIRONMENTAL POLLUTANTS (HG, DDT, DIELDRIN, PCB) IN SOME SWEDISH FOODS,
National Swedish Food Administration, Stockholm. Food Lab.
For primary bibliographic entry see Field 5C.
W76-10368

PILOT PROJECT ON MARINE POLLUTION MONITORING UNDER THE FRAMEWORK OF IGOSS,
Intergovernmental Oceanographic Commission, Paris (France).
For primary bibliographic entry see Field 5B.
W76-10373

MARITIME CONSIDERATION OF OIL TRANSPORTATION,
Maritime Administration, Washington, D. C.
H. F. Casey.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop, December 1974. p. 33-39.

Descriptors: *Transportation, *Ships, *Safety, *Accidents, *Hazards, *Oil industry, Mechanical equipment, Safety factors, Storage, Structural design, Structural engineering, International waters.
Identifiers: Tankers, Anti-Oil Spill Program.

Outlines are presented of the programs of the United States Government to insure safe and economic transportation of petroleum products with emphasis on oil tanker equipment and systems that will effectively protect the marine environment at a reasonable cost. (See also W76-10370) (Katz)
W76-10375

MARITIME CONSIDERATIONS,
Maritime Administration Washington, D.C.
J. J. Nachtscheim.
In: NBS Special Publication 409, Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop, December, 1974. p. 49-56.

Descriptors: *Administrative agencies, *Transportation, *Ships, Marine pollution, Oily

aters, Water pollution, Administrative decisions, doption of practices, Conferences, Safety, Accidents, Structural design, Oil industry, International waters.
dentifiers: *Tankers, *Ballast handling operations, *Oily water separators, *Segregated ballast, .N. Conference on the Law of the Sea.

he U. S. Maritime Commission's role in pollution revention is outlined. In regard to petroleum roduct transfer attention is paid to oil content mering, oily water separators and ballasts. Emphas is placed on marine pollution abatement. (See so W76-10370) (Katz)
76-10377

IL SPILLAGE MONITORING, SAMPLING ND RECOVERY SYSTEMS,
urham Associates, Inc., Milford, N. H.
or primary bibliographic entry see Field 5B.
76-10382

OLLUTION-FREE WELL CUTTINGS ISPOSAL APPARATUS,
L Industries, Inc., New York. (Assignee).
. O. Stearns, and J. A. Gill.
.S. Patent No. 3,901,254, 4 p, 4 fig, 6 ref; Official azette of the United States Patent Office, Vol 7, No 4, p 1245, August 26, 1975.

escriptors: *Patents, *Offshore platforms, *Oil dustry, *Drilling, Exploration, Water pollution urces, Continental Shelf, Oil pollution, Water uality control, Environmental effects, Resources evelopment.
dentifiers: *Outer Continental Shelf, Offshore chnology, Oil slicks, Drilling cuttings.

his invention relates to the art of rotary well illing in offshore locations using oily drilling uids, and more particularly to an apparatus and rocess which permits the economical disposal of ttings without polluting the body of water where e drilling takes place. A partially submerged own pipe extends both above the surface and elow the surface of the water. A cuttings spraying evice receives cuttings which have been eparated from the drilling mud, sprays them with cleaning liquid and discharges them into a flume hich conveys them to the down pipe and scharges them interiorly of the down pipe and elow the surface of the water. The wash or cleang liquid is collected and pumped into a desilting eans such as a cyclone and returned to the ttings washer. A submersible pump within the own pipe at water level or adjacent the water vel serves to pump oil released from the cuttings d which has risen to the level of the top of the uid in the down pipe. An oil-water separator ceives the mixture of oil and water pumped out the down pipe. (Sinha - OEIS)
76-10464

HIURAM POLYSULFIDE HEAVY METAL EMOVER,
gami Chemical Research Center, Tokyo apan). (Assignee).
r primary bibliographic entry see Field 5D.
76-10466

ETHOD FOR CONTROLLING SCALE,
xaco Inc., New York. (Assignee).
F. Tate, and J. Maddox, Jr.
S. Patent No. 3,951,793, 4 p, 1 tab, 8 ref; Offial Gazette of the United States Patent Office, l 945, No 3, p 1343, April 20, 1976.

escriptors: *Patents, *Scaling, *Impaired water ality, *Water treatment, Calcium sulfate, Inhibirs, Chemical reactions.
entifiers: Barium sulfate.

method is described of controlling the build-up scale deposits selected from the group consisting of calcium sulfate scale and barium sulfate scale in an aqueous system which comprises incorporating in the system a scale treating composition consisting essentially of about one part by weight of a sulfated-sulfonated polyethoxy alkyl phenol containing from about 8 to about 14 carbon atoms in the alkyl group and from about 4 to about 10 ethoxy groups, in admixture with from about 1 to 3 parts by weight of a C8-C14 alkyl benzene sulfonate for a time period of from about 5 to about 90 minutes at a temperature in the range of from about 50 deg. to about 60 deg C. (Sinha - OEIS)
W76-10469

GEOTHERMAL POWER METHOD,
For primary bibliographic entry see Field 3C.
W76-10470

FILTRATION PROCESS,
Commonwealth Scientific and Industrial Research Organization, Campbell (Australia); and Imperial Chemical Industries of Australia, Campbell; and New Zealand Ltd., Campbell (Australia). (Assignees).
For primary bibliographic entry see Field 5D.
W76-10473

WATER SOFTENER,
For primary bibliographic entry see Field 5F.
W76-10475

ALGAE HARVESTER,
J. C. Dodd.
U.S. Patent No. 3,951,805, 5 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1347, April 20, 1976.

Descriptors: *Patents, *Algae, *Aquatic algae, Harvesting, Water harvesting, *Harvesting of algae, Water pollution, Water pollution sources, Water pollution control, Water pollution effects, Equipment.
Identifiers: Animal feed.

While the algae harvester can be used in a number of different ways, it has been successfully used in the way described. A main belt is provided of foraminous material preferably fine mesh for retaining or supporting a fibrous precoat but for permitting water or liquids to pass through. The main belt screen is trained over a number of rotary drums and guides. As the belt screen travels clockwise around the rotating forming drum and passes through the aqueous bath, fibrous material is deposited on the outer surface of the belt screen and forms in effect a precoat layer. The water discharges through an outlet line by siphon action or by connection to a low pressure source. Just as the belt screen leaves contact with the drum the belt screen passes over a suction tube within the drum. The precoat thus is subjected to a draining and compacting action through the belt screen and through the perforate drum wall by reason of the vacuum. A good deal of water is withdrawn from the deposited fibrous material which remains on the belt screen. From the idler drum the belt screen descends and advances clockwise in contact with the outer surface of a large filtering drum of foraminous nature and rotating within a tank. The tank is open at one end to a supply of water containing harvestable algae. There is a radially inward flow of water and contained algae, the latter depositing on and in the fiber layer. The separated water is removed from the interior of the drum. This water normally is discharged as treated effluent or filtrate. (Sinha - OEIS)
W76-10478

OIL SKIMMER MODULE WITH FREE FLOATING WEIR TROUGH,
A. J. Crisafulli.
U. S. Patent No. 3,951,810, 5 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1349, April 20, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution treatment, *Water pollution control, Water quality control, *Skimming, Weirs, Flow, Equipment, *Separation techniques.
Identifiers: Gravity flow, Oil slicks, Skimmers.

A skimmer is provided by which floating pollutants such as oil along with a thin layer of water can be collected into a sump box or receptacle and then pumped to a storage tank or the like to enable separation of the pollutants and the water after which the water may be returned to the body of water. The sump box is provided with an opening below the water level to enable gravity flow of water and floating pollutants into the sump box. A weir placed in the opening in the sump box controls the quantity of water and pollutants discharged into the sump box. The weir is defined by an edge or edges of float supported members that can move in relation to the sump box to maintain a predetermined relationship to the surface of the body of water and includes flexible means between the sump box and weir to facilitate conveyance of the water and pollutants into the sump box. (Sinha - OEIS)
W76-10482

COALESCING UNIT FOR GRAVITY SEPARATOR,
Minnesota Mining and Mfg. Co., St. Paul. (Assignee).
D. L. Krueger.
U. S. Patent No. 3,951,814, 7 p, 7 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1350, April 30, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution treatment, *Separation techniques, Water quality control, Water pollution control, Dispersion, Sorption, Coalescence.
Identifiers: Oil slicks, Dispersed liquid phase, Continuous liquid phase.

A separator removes a dispersed liquid phase from a continuous liquid phase. The separator is comprised of a housing having an inlet, an outlet, and a separation chamber between the inlet and outlet through which the liquid passes; and a separator element that tightly occupies the inside of the separation chamber. The separator element has discrete sections of two different kinds of media which are coalescing and sorbing media, interspersed in intimate contact with one another. The coalescing media has less resistance to liquid flow that the sorbing media, and extends through the separator element from the point at which the liquid enters to the point at which the liquid leaves the separator elements so as to establish substantially continuous, thin, minimal-pressure-drop channels through the element. The sorbing media is wetted by the dispersed liquid phase in preference to being wetted by the continuous liquid phase, so that the dispersed liquid phase is sorbed into the sorbing media. The most common liquid to be treated is oil-contaminated water, but coalescing and sorbing media are available for treating other liquids also. A separator element is typically used to treat a liquid containing small amounts of a dispersed liquid phase, but it may also be used to treat a more heavily contaminated liquid for a shorter period of time, as when bilge water is removed from a ship or when water carrying an oil slick is treated. (Sinha - OEIS)
W76-10484

HARVEST OF BIOLOGICAL PRODUCTION AS A MEANS OF IMPROVING EFFLUENTS FORM SEWAGE LAGOONS,
J. H. Neil.
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 38, Training and Technology Transfer Division (Water), Environmental Protection Service, Environment Canada, Ottawa, Canada, 1976, 35 p, 38 ref, 9 tab.

Descriptors: *Sewage lagoons, Harvesting, *Harvesting of algae, Effluents, Great Lakes, *Phosphorus, *Nitrogen, *Organic matter, Algae, Zooplankton, Midges, Ponds, Lagoons, *Waste water treatment, Water pollution control, Daphnia, Midges.
Identifiers: Duckweed, *Biological harvesting, Raw sewage.

The feasibility of removing phosphorus, nitrogen and organic matter through the harvesting of algae, duckweek (Lemna sp.), daphnia (Cladocera) or midge larvae (Tendipedidae) has been examined using analytical information from five Ontario sewage lagoons and information on production and chemical composition of the biota derived from the literature. Effluent analyses showed that an average of 1.7 ppm more total phosphorus must be removed to meet a 1 ppm total phosphorus standard for effluents. Harvesting part of the algae or duckweed crop could provide this reduction. Production figures from the literature indicate daphnia culture would provide the necessary removal from two to five lagoons. One instance where midge larvae production for an Ontario lagoon could be calculated indicated that a three-fold increase in standing crop would be required. Daphnia and midge larvae would provide immediately useful products for fish culture, the value of which could be used to offset part of harvesting and sewage treatment costs. Possible means of increasing production and harvesting methods are discussed. The culture and harvest of aquatic organisms provide additional benefits through the removal of nitrogen and other sewage constituents, and their culture is proposed as a possible alternative to the chemical precipitation practices currently in use. (Environment Canada)
W76-10500

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

AN LP-10 MODEL FOR COORDINATING MULTI-GROUP INPUTS IN RESOURCE PLANNING,
Hawaii Univ., Honolulu.
T. Liang.
Water Resources Bulletin, Vol. 12, No. 3, p 601-624, June 1976. 14 fig, 6 tab, 9 ref.

Descriptors: *Water resources development, *Comprehensive planning, *Linear programming, Natural resources, Optimization, Regional analysis, Resource allocation, Water quality, Economics, Water supply, Water demand, Social aspects, Constraints, Equations, Systems analysis, Mathematical models, Alternative planning.
Identifiers: *Multiple-input planning, Hydrographic areas, Kauai County(Hawaii).

The need for a model to quickly assess the impact of one or many proposals has never been greater, since the planning process has become open to almost everyone. The great magnitude of inputs to a planning process in terms of number and the degree of difference requires a model to resolve the difference, evaluate their overall impact, and finally coordinate the inputs into a meaningful as well as acceptable plan to all. Resources planning, perhaps exceeding any other planning process with respect to the great number of divergent opinions from a wide spectrum of specialist and citizen groups, probably needs such a model the most. This paper reports on the development of a linear programming model for guiding public as well as multi-discipline inputs in the planning and management of water and related natural resources. Optimal location of economic activities can be achieved by iterative use of the model. Kauai County, Hawaii is used in an example which illustrates the model use. (Bell-Cornell)
W76-10192

A REVIEW ON DECISION MODELS IN ECONOMICS OF REGIONAL WATER QUALITY MANAGEMENT,
Technical Univ., of Denmark, Lyngby. Instituttet for Kemundustri.
For primary bibliographic entry see Field 5G.
W76-10195

NETWORK MODELS AND THE IMPACT OF MODELING ASSUMPTIONS,
Alyeska Pipeline Service Co., Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-10196

6B. Evaluation Process

BASIN GOVERNANCE,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W76-10130

ARIZONA'S WATER SUPPLY-SOME REFLECTIONS,
Arizona Bureau of Mines, Tucson.
For primary bibliographic entry see Field 4A.
W76-10183

1975 ARIZONA AGRICULTURAL STATISTICS.
Agricultural Research Service, Tucson, Ariz. Statistical Reporting Service.
For primary bibliographic entry see Field 3F.
W76-10187

AN LP-10 MODEL FOR COORDINATING MULTI-GROUP INPUTS IN RESOURCE PLANNING,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6A.
W76-10192

A REVIEW ON DECISION MODELS IN ECONOMICS OF REGIONAL WATER QUALITY MANAGEMENT,
Technical Univ., of Denmark, Lyngby. Instituttet for Kemundustri.
For primary bibliographic entry see Field 5G.
W76-10195

STRENGTHENING LAKE-SHORELAND MANAGEMENT IN MASSACHUSETTS,
Massachusetts Univ., Amherst, Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W76-10264

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COAL GASIFICATION IN SOUTHEASTERN OHIO: WATER SUPPLY AND DEMAND,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3E.
W76-10002

COST-EFFECTIVE GOAL,
For primary bibliographic entry see Field 5D.
W76-10032

1975 ARIZONA AGRICULTURAL STATISTICS.
Agricultural Research Service, Tucson, Ariz. Statistical Reporting Service.
For primary bibliographic entry see Field 3F.
W76-10187

URBAN SERVICE PRICING AND LAND USE: SOME PRELIMINARY RESULTS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
S. S. Skjei, and R. Freed.
Water Resources Bulletin, Vol. 12, No. 3, p 547-560, June 1976.

Descriptors: *Land use, *Pricing, Water resources, Control, Demand, Supply, Taxes, Economics, Regression analysis, Equations, Mathematical models, Urbanization, Cities, Municipal water.
Identifiers: *Economic analysis, Goods and services, *Public policy, Households, Utility function.

The use of public policy variables to control urban land use has been suggested or implied by a number of authors. This paper presents a conceptual foundation for doing so and the results of some empirical analyses based on this foundation. The conceptual analysis, based on a general equilibrium model of an urban economy, suggests functional forms which would appear to be of use and value in the developmental consequences brought about by changes in policy variables over which local units of government have control. Despite multicollinearity, regression analyses reveal that a statistically significant relationship does exist between characteristics of urban form and development and many local governmental policy variables. The method developed herein appears to constitute an alternative to more expensive approaches to the analysis of the relation between policy variables and land use. The empirical results tend to support earlier suggestions advanced by other researchers. (Bell-Cornell)
W76-10193

COST FUNCTIONS FOR ADDITIONAL GROUND WATER DEVELOPMENT,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W76-10194

IMPROVING THE FUEL VALUE OF SEWAGE SLUDGE,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W76-10234

EVALUATION OF THE CIRIA PROTOTYPE MODEL FOR THE DESIGN OF SEWAGE TREATMENT WORKS,
For primary bibliographic entry see Field 5D.
W76-10245

A PRESENT VALUE-UNIT COST METHODOLOGY FOR EVALUATING WASTE WATER RECLAMATION AND DIRECT REUSE AT A MILITARY BASE OF OPERATIONS,
Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Sanitary Sciences Div.
For primary bibliographic entry see Field 5D.
W76-10255

POLLUTANT ANALYSIS COST SURVEY,
National Bureau of Standards, Washington, D. C.
For primary bibliographic entry see Field 5A.
W76-10259

6D. Water Demand

COAL GASIFICATION IN SOUTHEASTERN OHIO: WATER SUPPLY AND DEMAND,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3E.

76-10002

ACOMA'S NORTH FORK WELLS.
or primary bibliographic entry see Field 4B.
76-10089

N ENVIRONMENTAL ASSESSMENT OF IMACTS OF COAL DEVELOPMENT ON THE ATER SOURCES OF THE YAMPA RIVER ASIN, COLORADO AND WYOMING--PHASE-WORK PLAN,
eological Survey, Denver, Colo.
or primary bibliographic entry see Field 4C.
76-10135

E. Water Law and Institutions

OMPILATION AND ANALYSIS OF WATER UALITY RIGHTS AND RESPONSIBILITIES HAWAII,
awaii Univ., Honolulu. Water Resources esearch Center.
or primary bibliographic entry see Field 5G.
76-10001

TERNATIONAL SURVEY ON EXISTING ATER RECHARGE FACILITIES.
ternational Association of Scientific Hydrology, entbrugge (Belgium).
or primary bibliographic entry see Field 4B.
76-10085

.92-500: MID-COURSE CORRECTION RANTS OPTIONS; NEXT MOVE UP TO CONRESS,
or primary bibliographic entry see Field 5G.
76-10106

ASIN GOVERNANCE,
ew York State Coll. of Agriculture and Life iences, Ithaca. Dept. of Agricultural conomics.
J. Allee, H. R. Capener, and W. H. Andrews.
vailable from the National Technical Informaon Service, Springfield, Va 22161, as PB-255 099, .00 in paper copy, $2.25 in microfiche. Cornell gricultural Economics Staff Paper, No. 75-25, ecember 1975. 22 p, 52 ref. OWRT B-136-TAH(1) 14-31-0001-5141

escriptors: *River basins, Regions, Management, *Planning, Organizations, Political pects, Economics, Social aspects, *Regional alysis.
entifiers: *Governance.

is report is the result of three workshop sesons and communications inbetween. Social ientists need this kind of interaction, perhaps ore than the natural and physical scientists who joy a longer history of dealing with natural source problems. The complex organizational oblems of regional and river basin management ll for a major integrated effort of several social ience disciplines. Some of these problems inude analysis and possible restructuring of rizontal and vertical organizational systems of nagement and planning, budgeting at the reonal level, cost sharing at the regional level, inrnational boarder problems, integration of quany and quality planning, research and planning d others. An approach to this research is recomended. Requirements of social science research this problem are: first, support of an interciplinary social science research team through e necessary phases of the broad problem. The pping and inventorying of river basin managent and organization is the first stage of this rk. A second requirement is to support the work rough an adequate period of time to complete e stages necessary.
76-10130

COST FUNCTIONS FOR ADDITIONAL GROUND WATER DEVELOPMENT,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W76-10194

STRENGTHENING LAKE-SHORELAND MANAGEMENT IN MASSACHUSETTS,
Massachusetts Univ., Amherst, Water Resources Research Center.
B. B. Berger, J. A. Kusler, and S. G. Klinginer.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 183, $4.00 in paper copy, $2.25 in microfiche. Publication No. 68, Completion Report FY-76-14, February 1976, 21 p. OWRT A-075-MASS(1)

Descriptors: *Management, Lakes, *Lake shores, *Information exchange, *Massachusetts, *Research priorities, Legislation.
Identifiers: *Lake rehabilitation.

A seminar was conducted in a series of eight sessions during the spring of 1975. Its major objectives were the following: (1) Identify lake problems and possible components of a conjunctive university, state, regional and local program to prevent problems or provide timely control of problems. Such a program might include requirements for data systems, predictive modelling, governance mechanisms, and lake rehabilitation. (2) Provide a basis for effective, continuing exchange of information between university group and public agencies on lake-related problems and research programs. (3) Help formulate research priorities and mechanisms for joint university-public agency research undertakings. (4) Provide a proposal for legislation or other public action designated to protect Massachusetts lakes. The report provides a set of general as well as specific recommendations for strengthening lake-shoreland management in Mass.; also included is a Draft Lake-Shoreland Regulation Bill.
W76-10264

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: CUMBERLAND RIVER, BURKESVILLE, KENTUCKY.
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 4A.
W76-10151

FLOOD PLAIN INFORMATION: EAST ARM LITTLE CALUMET RIVER, SALT CREEK-COFFEE CREEK, PORTER COUNTY, INDIANA.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W76-10152

FLOOD PLAIN INFORMATION: LITTLE EAGLE CREEK AND TRIBUTARIES, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-10153

FLOOD PLAIN INFORMATION: CROOKED CREEK AND WILLIAMS CREEK, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-10154

FLOOD PLAIN INFORMATION: TURKEY AND JOPLIN CREEKS, JOPLIN, MISSOURI.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-10155

FLOOD PLAIN INFORMATION: PORTAGE OPEN BAY AND MAIN DITCH, VICINITY OF PORTAGEVILLE, MISSOURI.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W76-10156

FLOOD PLAIN INFORMATION: SOQUEL CREEK, SANTA CRUZ COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-10157

FLOOD PLAIN INFORMATION: SOUTH FORK SALT RIVER AND DAVIS CREEK, MEXICO, MISSOURI.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-10158

FLOOD PLAIN INFORMATION: BIG SANDY RIVER, LAWRENCE COUNTY, KENTUCKY.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-10159

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER, ARKANSAS CITY, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-10160

SPECIAL FLOOD HAZARD INFORMATION: LABETTE AND LITTLE LABETTE CREEKS, PARSONS, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-10161

SPECIAL FLOOD HAZARD INFORMATION: WHISKEY AND ROCK CREEKS, INDEPENDENCE, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-10162

FLOOD PLAIN INFORMATION: LYNN CAMP AND EAST FORK LYNN CAMP CREEKS, CORBIN, KENTUCKY.
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 4A.
W76-10163

FLOOD PLAIN INFORMATION: CLEAR CREEK-MULBERRY CREEK, VICINITY OF SHELBYVILLE, KENTUCKY.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-10164

FLOOD PLAIN INFORMATION: PIKE CREEK, NEW CASTLE COUNTY, DELAWARE.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W76-10165

FLOOD PLAIN INFORMATION: NORTH FORK KENTUCKY RIVER AND TRACE FORK, VICINITY OF HAZARD, KENTUCKY.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-10166

FLOOD PLAIN INFORMATION: DRY TURKEY AND BULL CREEKS, MCPHERSON, KANSAS.
Army Engineer District, Tulsa, Okla.

For primary bibliographic entry see Field 4A.
W76-10167

6G. Ecologic Impact Of Water Development

HIGHWAY-WILDLIFE RELATIONSHIPS VOLUME 1. A STATE-OF-THE-ART REPORT,
Urban Wildlife Research Center, Inc., Ellicott City, Md.
For primary bibliographic entry see Field 4C.
W76-10003

HIGHWAY-WILDLIFE RELATIONSHIPS VOLUME 2. AN ANNOTATED BIBLIOGRAPHY,
Urban Wildlife Research Center, Inc., Ellicott City, Md.
For primary bibliographic entry see Field 4C.
W76-10004

ECOSYSTEMS ANALYSIS OF THE BIG CYPRESS SWAMP AND ESTUATIES,
Environmental Protection Agency, Athens, Ga. Surveillance and analysis Div.
H. R. Carter, L. A. Burns, T. R. Cavinder, R. R. Dugger, and P. L. Fore.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-233 070, $10.75 in paper copy, $2.25 in microfiche. South Florida Environmental Project: Ecological Report No. DI-SFEP-74-51, June 1973, 375 p, 40 tab, 75 fig, 95 ref.

Descriptors: *Primary productivity, Hydrology, *Ecology, Biological communities, Dominant organism, *Vegetation establishment, *Florida, *Biota, Habitat, Canals, Ditches, *Estuaries, Benthic communities, Benthic plants, Fresh water fish, Wildlife, Fish, *Ecosystems, Nutrients, Sediments, Estuarine fish, Climatology, Macrobenthos, *Swamps, *Wetlands.
Identifiers: Ecosystem analysis, South Florida ecosystem, Snook, Ten Thousand Islands, Fahkahatchee Strand, *Big Cypress Swamp(Fla).

A two year study was conducted to obtain biological and hydrological information on south Florida's land, water, wildlife and fisheries resources. Field investigations during 1971-72 intensively examined the details of biotic community interactions with hydrologic conditions of disturbed and relatively unaffected regions of the Big Cypress Swamp and contiguous tidal wetlands and estuaries. Study results demonstrate the total dependence of the South Florida ecosystem on the hydroperiod. Canal drainage of upland wetlands which include cypress swamps and wet-prairies effected a 10 fold decrease in primary productivity. Drainage also effected a thinning of the forest canopy and induced a reduction in the rate of forest litter decomposition resulting in a buildup of litter as increased fuel for destructive wildfires. (Katz)
W76-10046

WATER, ITS EFFECTS ON LIFE QUALITY.
Water Quality Research Council, Lombard, Ill.
For primary bibliographic entry see Field 5F.
W76-10087

MODELS FOR EVALUATION OF HAZARDOUS WASTES,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5B.
W76-10190

MINERAL CYCLING IN SOUTHEASTERN ECOSYSTEMS.
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5C.
W76-10266

NUTRIENT RECYCLING AND THE STABILITY OF ECOSYSTEMS,
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-10267

A THEORETICAL BASIS FOR ECOSYSTEM ANALYSIS WITH PARTICULAR REFERENCE TO ELEMENT CYCLING,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5C.
W76-10268

7. RESOURCES DATA

7A. Network Design

EVALUATION AND ADAPTATION OF SELECTED COMPUTER PROGRAMS TO WATER RESOURCE PROBLEMS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 7C.
W76-10129

DESIGN A RIVER BASIN SAMPLING SYSTEM,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W76-10131

NETWORK MODELS AND THE IMPACT OF MODELING ASSUMPTIONS,
Alyeska Pipeline Service Co., Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-10196

7B. Data Acquisition

ELECTRICAL WATER PROSPECTING.
For primary bibliographic entry see Field 4B.
W76-10090

RECORDING EQUIPMENT BOOSTER.
For primary bibliographic entry see Field 8G.
W76-10091

WATER WELLS AS POSSIBLE INDICATORS OF TECTONIC STRAIN,
Tokyo Univ. (Japan).
For primary bibliographic entry see Field 8G.
W76-10105

THE MEASUREMENT OF ADENOSINE TRIPHOSPHATE IN PURE ALGAL CULTURES AND NATURAL AQUATIC SAMPLES,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 5A.
W76-10133

PRINCIPLES AND MEASURING TECHNIQUES OF TURBULENCE CHARACTERISTICS IN OPEN-CHANNEL FLOWS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-10134

RESULTS OF INFILTRATION TESTS NEAR SCOTT CITY, WESTERN KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 2G.
W76-10136

TECHNIQUES FOR POWER MEASUREMENT FOR SURFACE AERATOR,
National Environmental Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 5D.
W76-10251

EVALUATION OF THIN FILM OIL SAMPLERS,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5A.
W76-10381

APPLICABILITY OF THE TECHNICON AUTOANALYZER I AND II SYSTEMS FOR SHIPBOARD ANALYSIS OF GREAT LAKES WATER SAMPLES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-10497

APPROACH TO GLACIER MASS-BALANCE ANALYSIS UTILIZING TERRAIN CHARACTERIZATION,
Department of the Environment, Ottawa (Canada). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W76-10499

7C. Evaluation, Processing and Publication

COMPUTER BASED CONTROL FOR WASTEWATER SYSTEMS,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-10019

COMPUTER-AIDED ANALYSIS OF ENVIRONMENTAL DATA, PART I: LINEAR REGRESSION, PRECISION AND ACCURACY,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5A.
W76-10022

COMPUTER-AIDED ANALYSIS OF ENVIRONMENTAL DATA, PART II: BIOCHEMICAL OXYGEN DEMAND MODEL,
Rensselaer Polytechnic Inst., Troy, N. Y.
For primary bibliographic entry see Field 5A.
W76-10023

INTERPRETATION OF INTERNAL TRACER EXPERIMENTS AND LOCAL SOJOURN TIME DISTRIBUTIONS,
City Coll., New York. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-10039

EVALUATION AND ADAPTATION OF SELECTED COMPUTER PROGRAMS TO WATER RESOURCE PROBLEMS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
L. A. Leland, and G. R. Higgins.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 108, $4.50 in paper copy, $2.25 in microfiche. Publication No. 67, Completion Report FY-76-13, June 1975. 68 p, 5 fig, append. OWRT A-070-MASS(1), 14-31-0001-4021.

Descriptors: *Computer programs, Open Channels, Hydraulics, Sampling, Frequency analysis, Evaluation, *Massachusetts, Hydrograph analy-

LIBRARY U. OF I. URBANA-CHAMPAIGN

sis, Precipitation(Atmospheric), *Data processing, Adaptation, Forecasting.
Identifiers: *HYDRO programming system.

The HYDRO programming system consists of a library of computer sub-programs which have been assembled and modified to process hydraulic and hydrologic data under a common format. A total of twenty-five sub-programs are presently included in the system, each of which falls under one of the following categories: precipitation analyses, frequency analyses, hydrograph analyses, or open channel hydraulics. The twenty-five sub-programs selected provide a broad look at many of the more common problems encountered in the field today. They are intended to introduce the basic system to the engineer, satisfy many of his present needs, and be flexible enough to enable the timely inclusion of future programs.
W76-10129

SELECTED STREAMFLOW EXPERIENCE GRAPHS FOR SOUTHWESTERN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
R. M. Beall.
Open-file report, April 1976. 40 p, 37 fig, 1 tab, 5 ref.

Descriptors: *Streamflow forecasting, *Flow characteristics, *Flow rates, *Statistical methods, *Pennsylvania, Systems analysis, Regression analysis, Data collections, Gaging stations, Hydrologic data, Hydrographs, Duration curves.
Identifiers: *Streamflow experience graphs(PA).

Standard streamflow characteristics commonly derived from data sequences include means and standard deviations of annual or monthly flows, low flows or flood volumes of given durations and return periods, and annual flood peaks of given return periods. This report describes and illustrates another analytical/statistical technique, the probability analysis of daily flows recorded during a long period of record, graphically presented in the form of a duration hydrograph. Such hydrographs are given for 34 streamflow records for gaging stations within the upper Ohio River basin principally in southwestern Pennsylvania. Because this method of analysis summarizes and classifies many years of discharge records on a day-to-day basis, its results can be viewed as an experience graph. Some operations and management applications are suggested. (Woodard-USGS)
W76-10132

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 6. ADAMS, BENTON, DOUGLAS, FRANKLIN, GRANT, LINCOLN, WALLA WALLA, AND WHITMAN COUNTIES,
Geological Survey, Tacoma, Wash.
N. P. Dion, G. C. Bortleson, J. B. McConnell, and L. M. Nelson.
Washington Department of Ecology Olympia, Water-supply Bulletin 43, Vol 6, 1976. 407 p, 1 fig, 15 ref.

Descriptors: *Lakes, *Lake morphology, *Lake morphometry, *Water quality, *Washington, *Data collections, Bathymetry, Aerial photography, Lake shores, *Mapping, Water analysis, Physical properties, Chemical analysis.
Identifiers: Southeastern Washington lakes.

A total of 178 lakes in eight counties (Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman) of southeastern Washington was sampled using helicopter or boat to obtain information on lake physical, cultural, and water-quality conditions. Physical parameters were determined from topographic and bathymetric (bottom-contour) maps of the lakes. If bathymetric maps were not available, the lakes were sounded and charted using a continuous-recording fathometer. By use of aerial photographs and lake depths, the bathymetric data were digitized and transferred to computer cards which served as input to a computerized program that calculated lake morphometric parameters (for example, lake volume, surface area, and length of shoreline). Vertical profiles of temperature and dissolved oxygen were measured in the deepest part of each lake. Secchi-disc visibility was determined also. Water samples were collected for color, nutrient, and specific-conductance analyses at depths 3.0 feet below the water surface and 3-5 feet above the lake bottom. Samples for fecal-coliform bacteria were collected at selected nearshore sites, approximately 100 feet offshore at a depth of 1 foot below the water surface. (Woodard-USGS)
W76-10138

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 7. PEND OREILLE, SPOKANE, AND STEVENS COUNTIES,
Geological Survey, Tacoma, Wash.
N. P. Dion, G. C. Bortleson, J. B. McConnell, and L. M. Nelson.
Washington Department of Ecology Olympia, Water-Supply Bulletin 43, Vol 7, 1976. 267 p, 1 fig, 16 ref.

Descriptors: *Lakes, *Lake morphology, *Lake morphometry, *Water quality, *Washington, *Data collections, Bathymetry, Aerial photography, Lake shores, *Mapping, Water analysis, Physical properties, Chemical analysis.
Identifiers: Northeastern Washington lakes.

A total of 90 lakes in three counties (Pend Oreille, Spokane, and Stevens) of northeastern Washington was sampled using helicopter or boat to obtain information on lake physical, cultural, and water-quality conditions. Physical parameters were determined from topographic and bathymetric (bottom-contour) maps of the lakes. If bathymetric maps were not available, the lakes were sounded and charted using a continuous-recording fathometer. By use of aerial photographs and lake depths, the bathymetric data were digitized and transferred to computer cards which served as input to a computerized program that calculated lake morphometric parameters (for example, lake volume, surface area, and length of shoreline). Vertical profiles of temperature and dissolved oxygen were measured in the deepest part of each lake. Secchi-disc visibility was determined also. Water samples were collected for color, nutrient, and specific-conductance analyses at depths 3.0 feet below the water surface and 3-5 feet above the lake bottom. Samples for fecal-coliform bacteria were collected at selected nearshore sites, approximately 100 feet offshore at a depth of 1 foot below the water surface. (Woodard-USGS)
W76-10139

DIGITAL MODEL FOR SIMULATED EFFECTS OF GROUND-WATER PUMPING IN THE HUECO BOLSON, EL PASO AREA, TEXAS, NEW MEXICO, AND MEXICO,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-10140

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
R. M. Slade Jr., and J. M. Taylor.
Open-file report, May 1976. 100 p, 3 fig, 5 tab.

Descriptors: *Hydrologic data, *Storms, *Rainfall-runoff relationships, *Small watersheds, *Urban runoff, *Texas, Streamflow, Basic data collections, Gaging stations, Rain gages, Peak discharge, Hydrographs, Mass curves.
Identifiers: *Fort Worth(Tex).

This report, which is the sixth in a series of reports published annually for the Fort Worth, Texas, area, presents basic hydrologic data collected in four study areas during the 1974 water year (October 1, 1973 to September 30, 1974). The four study areas within the metropolitan area are Sycamore Creek, Sycamore Creek tributary, Dry Branch, and Little Fossil Creek. Each year, storm events are selected for detailed rainfall-runoff analysis. The event during which the annual maximum discharge occurs is usually included in the selection. During the 1974 water year, storms selected for analysis occurred on October 11, October 12-13, 1973, and June 12, 1974 in the Sycamore Creek basin; October 11, 1973, June 7, and August 10, 1974 in the Sycamore Creek tributary basin; October 12-13, 1973, August 26-27, and September 20-21, 1974 in the Dry Branch basin; October 12-13, 1973, August 26, and September 20-21, 1974 in the Little Fossil Creek basin. Summaries of storm rainfall-runoff data for selected individual storms at streamflow stations and crest-stage partial-record stations are given. Detailed storm rainfall and runoff records, hydrographs, and mass curves for each station are shown. (Woodard-USGS)
W76-10141

SALT-LOAD COMPUTATIONS--COLORADO RIVER; CAMEO, COLORADO TO CISCO, UTAH: PART 1. DATA SUMMARY,
Geological Survey, Denver, Colo.
R. Brennan, and R. U. Grozier.
Open-file report, 1976. 15 p, 3 fig, 6 tab.

Descriptors: *Salts, *Movement, *Water quality, *Colorado River, *Streamflow, Basic data collections, Discharge(Water), Chemical analysis, Correlation analysis, Gaging stations, Flow rates, Calcium, Magnesium, Harkness(Water), Sodium, Bicarbonates, Chloride, Dissolved solids, Specific conductivity.
Identifiers: *Salt-load computations.

Salt-load computations for inflow and outflow stations in the Grand Valley area of Colorado have been computed using five methods. The salt-load increase of the Colorado River from the Grand Valley has been computed for the Colorado-Utah State line station and the Colorado River near Cisco, Utah, station. Most of the salt loads give values about +30 percent of the average for all methods used, but differences of 70 percent do occur. Records presented in the basic-data report are regression curves of discharge versus specific conductance and of specific conductance versus calcium, magnesium, hardness, sodium, bicarbonate, chloride, dissolved solids, and sulfate; duration tables of daily discharge and of daily specific conductance for the period of record; and the daily specific-conductance data for the period of record for all stations in the study area. (See also W76-10143) (Woodard-USGS)
W76-10142

SALT-LOAD COMPUTATIONS--COLORADO RIVER; CAMEO, COLORADO, TO CISCO, UTAH: PART 2. BASIC DATA,
Geological Survey, Denver, Colo.
R. Brennan, and R. U. Grozier.
Open-file report, 1976. 222 p, 54 fig, 12 tab.

Descriptors: *Salts, Movement, *Water quality, *Colorado River, *Streamflow, Basic data collections, Discharge(Water), Chemical analysis, Correlation analysis, Gaging stations, Flow rates, Calcium, Magnesium, Hardness(Water), Sodium, Bicarbonates, Chloride, Dissolved solids, Specific conductivity, *Utah, *Colorado.
Identifiers: *Salt-load computations.

Basic data for the salt-load computations, Colorado River, Cameo, Colo., to Cisco, Utah, consists of regression curves of discharge versus specific conductance and specific conductance versus calcium, magnesium, hardness, sodium, bicarbonate, chloride, dissolved solids, and sulfate; duration tables of daily discharge and

daily specific conductance at six stream-gaging sites; and daily specific-conductance data for the period of record for all stations in the study area. Location of streamflow and water-quality stations are shown on a map. (See also W76-10142) (Woodard-USGS)
W76-10143

HYDROLOGIC DATA FOR LITTLE ELM CREEK, TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
R. M. Slade , Jr., and J. M. Taylor.
Open-file report, May 1976. 73 p, 2 fig, 3 tab.

Descriptors: *Hydrologic data, *Streamflow, *Flow rates, *Flood control, *Small watersheds, Texas, Basic data collections, Watershed management, Rainfall, Runoff, Storms, Gaging stations, Water storage, Flood protection.
Identifiers: *Elm Creek(Tex), *Trinity River basin(Tex).

This report, which is the fifteenth in a series of basic-data reports published annually for the Little Elm Creek study area, contains the rainfall, runoff, and storage data collected during the 1974 water year for the 75.5 sq mi area above the stream-gaging station Little Elm Creek near Aubrey, Texas. The locations of floodwater-retarding structures and hydrologic-instrument installations in the area are shown. The average rainfall above the stream-gaging station Little Elm Creek near Aubrey (study area) during the water year was 43.18 inches, or 115 percent of the 18-year (1957-74) average of 37.58 inches. Monthly rainfall totals ranged from 0.82 inch in March to 7.55 inches in June. The yearly mean discharge was 74.6 cfs. Three storm periods were selected for detailed computations. These computations include a time breakdown of rainfall and discharge with hydrographs and mass curves drawn for illustrations. (Woodard-USGS)
W76-10144

HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
R. N. Mitchell.
Open-file report, May 1976. 60 p, 3 fig, 1 tab.

Descriptors: *Hydrologic data, *Storms, *Rainfall-runoff relationships, *Small watersheds, *Urban runoff, *Texas, Basic data collections, Gaging stations, Rain gages, Streamflow, Peak discharge, Hydrographs, Mass curves.
Identifiers: *Austin(Tex).

Rainfall and runoff data are presented for Waller Creek and Wilbarger Creek, Texas, for the 1974 water year (October 1, 1973 to September 30, 1974). The Waller Creek drainage area lies entirely within the city of Austin, with the headwaters originating in the northern part of the city. The creek flows south for 6.6 miles to the Colorado River. Storm sewers and street gutters divert runoff both into and out of the natural drainage area. The headwaters of Wilbarger Creek originate in Travis County near the Williamson County line. The creek flows southeasterly about 40 miles to the Colorado River. The Wilbarger Creek study area is about 15 miles north of the city of Austin. The weighted-mean rainfall in the Waller Creek area upstream from 23d Street was 38.40 in., or 18 percent above the mean annual rainfall for Austin of 32.49 in. Mean daily discharge was 4.12 cfs; annual runoff was 13.54 in., or 35 percent of rainfall. Four storm periods for the Waller Creek area, October 11, 1973; October 12-13, 1973; May 9, 1974; and August 28-29, 1974 were selected for analysis. Weighted-mean rainfall in the Wilbarger Creek area was 31.63 in., or 3 percent below the mean annual rainfall for Austin. Mean daily discharge was 1.72 cfs; annual runoff was 5.05 in., or 16 percent of rainfall. Two storm periods for the Wilbarger Creek area, October 11, 1973 and October 13, 1973 were selected for analysis. A summary of rainfall-runoff data for each storm is shown. Computations with hydrograph and mass curves for each storm are included. (Woodard-USGS)
W76-10145

HYDROLOGIC DATA FOR COW BAYOU, BRAZOS RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
J. K. VanZandt.
Open-file report, May 1976. 63 p, 3 fig, 3 tab.

Descriptors: *Hydrologic data, *Streamflow, *Basic data collections, *Flood control, *Small watersheds, *Texas, Watershed management, Rainfall, Runoff, Gaging stations, Storms, Water storage, Flood protection.
Identifiers: *Cow Bayou watershed(Tex), Brazos River basin(Tex).

This report, which is the fourteenth in a series of basic-data reports published annually for the Cow Bayou study area, contains the rainfall, runoff, and storage data collected during the 1974 water year for the 85.0 sq mi area above the stream-gaging station Cow Bayou at Mooreville, Texas. The location of floodwater-retarding structures and hydrologic instruments in the area are shown. The weighted-mean rainfall over the study area during the water year was 31.61 inches, or 95 percent of the 16-year (1959-74) average of 33.13 inches. Monthly rainfall ranged from 0.58 inch in December to 7.93 inches in October. Yearly mean discharge at the stream-gaging station was 18.4 cfs, compared with the 16-year average of 35.0 cfs. Annual runoff at the stream-gaging station was 13,330 acre-ft. For the water year, one storm (Oct. 11, 1973) was selected for detailed computation. (Woodard-USGS)
W76-10146

HYDROLOGIC DATA FOR NORTH CREEK TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
C. C. Kidwell.
Open-file report, May 1976. 40 p, 2 fig, 3 tab.

Descriptors: *Hydrologic data, *Streamflow, *Flow rates, *Flood control, *Small watersheds, *Texas, Basic data collections, Watershed management, Storms, Rainfall, Runoff, Gaging stations, Water storage, Flood protection.
Identifiers: North Creek(Tex), *Trinity River basin(Tex).

This report contains the rainfall, runoff, and storage data collected during the 1974 water year for the 21.6 sq mi area above the stream-gaging station North Creek near Jacksboro, Texas. The locations of floodwater-retarding structures and hydrologic instrument installations in the area are shown. Five floodwater-retarding structures have a combined capacity of 4,425 acre-ft below flood-spillway crests and regulate streamflow from 16.3 sq mi, or 75 percent of the study area. The weighted-mean rainfall during the water year was 28.76 in., which is slightly less than the 17-year average of 29.69 in. for the period 1958-74. Monthly rainfall totals ranged from 0.00 in. in December to 7.07 in. in August. The yearly mean discharge at the stream-gaging station was 1.13 cfs, compared with the 14-year (1957-70) average of 5.75 cfs, prior to the notable effect caused by the floodwater-retarding structures. The annual runoff from the basin above the stream-gaging station was 821 acre-ft. Two storms were selected for detailed computations for the 1974 water year. The storms selected occurred on Oct. 12, 1973 and Aug. 29, 1974. Rainfall and discharge were computed on the basis of a refined time breakdown. Patterns of the storms are illustrated by hydrographs and mass curves. (Woodard-USGS)
W76-10147

NATIONAL WATER DATA STORAGE AND RETRIEVAL SYSTEM: INSTRUCTIONS FOR PREPARATION AND SUBMISSION OF GROUND-WATER DATA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 10D.
W76-10148

MAPS SHOWING GROUND-WATER CONDITIONS IN THE RANEGRAS PLAIN AND BUTLER VALLEY AREAS, YUMA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
D. W. Wilkins, and W. C. Webb.
Water-Resources Investigations 76-34 (open-file report), April 1976. 3 sheets, 3 ref.

Descriptors: *Groundwater resources, *Water quality, *Water levels, *Irrigation, *Maps, *Arizona, Aquifers, Hydrogeology, Water wells, Pumping, Water yield, Hydrologic data, Water level fluctuations, Chemical analysis.
Identifiers: *Yuma County(Ariz).

This three-map report depicts ground-water level fluctuations (irrigation effects), hydrogeology, and water quality for the study area. The area in Ranegras Plain and Butler Valley in Yuma County, Ariz., where wells are most productive is underlain by sedimentary strata to depths of more than 1,000 ft. The strata consist of silt, sand, and some clay and gravel beds and include a few basaltic lava flows. Well yields are as much as a few thousand gallons per minute, but the specific yield generally is less than 25 gallons per minute per foot of drawdown. The less productive part of the area is mountainous, and the exposed rocks consist of volcanic flows, well-cemented sedimentary rocks, and some crystalline intrusive rocks; well yields generally are not more than 10 gallons per minute. In general water-level changes were minor in the Ranegras Plain and Butler Valley areas through 1975. For 1967-75, measured water-level changes in wells ranged from a rise of 2.2 ft to a decline of 10.8 ft. The water level declined nearly 26 ft in one well. The dissolved solids concentration in groundwater ranges from less than 300 to more than 2,000 mg/litre. (Woodard-USGS)
W76-10149

HYDROLOGIC UNIT MAP--1974, STATE OF WASHINGTON.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.25.
Hydrologic Unit Map, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Washington, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Wash), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in the State of Washington that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-10150

FLOOD PLAIN INFORMATION: CUMBERLAND RIVER, BURKESVILLE, KENTUCKY.
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 4A.

W76-10151

FLOOD PLAIN INFORMATION: EAST ARM LITTLE CALUMET RIVER, SALT CREEK-COFFEE CREEK, PORTER COUNTY, INDIANA.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W76-10152

FLOOD PLAIN INFORMATION: LITTLE EAGLE CREEK AND TRIBUTARIES, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-10153

FLOOD PLAIN INFORMATION: CROOKED CREEK AND WILLIAMS CREEK, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-10154

FLOOD PLAIN INFORMATION: TURKEY AND JOPLIN CREEKS, JOPLIN, MISSOURI.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-10155

FLOOD PLAIN INFORMATION: PORTAGE OPEN BAY AND MAIN DITCH, VICINITY OF PORTAGEVILLE, MISSOURI.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W76-10156

FLOOD PLAIN INFORMATION: SOQUEL CREEK, SANTA CRUZ COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-10157

FLOOD PLAIN INFORMATION: SOUTH FORK SALT RIVER AND DAVIS CREEK, MEXICO, MISSOURI.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-10158

FLOOD PLAIN INFORMATION: BIG SANDY RIVER, LAWRENCE COUNTY, KENTUCKY.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-10159

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER, ARKANSAS CITY, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-10160

SPECIAL FLOOD HAZARD INFORMATION: LABETTE AND LITTLE LABETTE CREEKS, PARSONS, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-10161

SPECIAL FLOOD HAZARD INFORMATION: WHISKEY AND ROCK CREEKS, INDEPENDENCE, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-10162

FLOOD PLAIN INFORMATION: LYNN CAMP AND EAST FORK LYNN CAMP CREEKS, CORBIN, KENTUCKY.
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 4A.
W76-10163

FLOOD PLAIN INFORMATION: CLEAR CREEK-MULBERRY CREEK, VICINITY OF SHELBYVILLE, KENTUCKY.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-10164

FLOOD PLAIN INFORMATION: PIKE CREEK, NEW CASTLE COUNTY, DELAWARE.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W76-10165

FLOOD PLAIN INFORMATION: NORTH FORK KENTUCKY RIVER AND TRACE FORK, VICINITY OF HAZARD, KENTUCKY.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-10166

FLOOD PLAIN INFORMATION: DRY TURKEY AND BULL CREEKS, MCPHERSON, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-10167

MINIMIZATION OF CORE REQUIRED IN ROUTING THROUGH A CHANNEL NEWTWORK,
Hydrocomp International, Palo Alto, Calif.
For primary bibliographic entry see Field 2E.
W76-10243

THE SIMULATION OF SEDIMENT TRANSPORT,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2J.
W76-10244

SYSTEMATIC ANALYSIS OF FIELD SURVEY TECHNIQUES AND OPERATIONAL UTILITY OF ENVIRONMENTAL RESEARCH TO THE NAVY,
David W. Taylor Naval Ship Research and Development Center, Bethesda, Md.
For primary bibliographic entry see Field 5G.
W76-10356

THE NEED FOR MORE INTERCOMPARABLE FIELD DATA AND WIDELY APPLICABLE SHORT-TERM SURVEY,
Naval Undersea Center, Kailua, Hawaii. Hawaii Lab.
For primary bibliographic entry see Field 5G.
W76-10358

UNITED NATIONS ENVIRONMENT PROGRAM EARTHWATCH AND MARINE POLLUTION,
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 5B.
W76-10371

SCIENTIFIC PROBLEMS OF THE SYSTEMS FOR GLOBAL MONITORING AND INVESTIGATION OF OIL POLLUTION IN THE WORLD OCEAN,
State Oceanographic Inst., Moscow (USSR).
For primary bibliographic entry see Field 5B.
W76-10372

MARINE POLLUTION DATA ARCHIVING AND EXCHANGE,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.
For primary bibliographic entry see Field 5A.
W76-10376

CANADIAN PARTICIPATION IN THE INTERNATIONAL HYDROLOGICAL DECADE, FINAL REPORT, (VOLUME 2), RESEARCH REPORTS.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
For primary bibliographic entry see Field 2A.
W76-10489

PROGRAM ESOPH - EXTENDED SOPH, SIMULATION OF TIME-VARIANT PIEZOMETRIC SURFACE IN A CONFINED, LEAKY AQUIFER SUBJECTED TO PUMPING.
Department of the Environment, Ottawa (Canada). Inland Waters Directorate.
A. Vandenberg.
Water Resources Branch, 1976, 33 p. 3 fig., 3 ref. 1 tab.

Descriptors: *Pumping, *Computer programs, *Pumps, *Leakage, *Aquifers, Freshwater, Water quality, Water resources, Computers, Simulation(Analysis), Inland waterways, Efficiencies, Piezometry, Model studies.
Identifiers: Leaky aquifers.

Modifications to the mathematical development, to the computer program, and to the input requirements are described which extend program SOPH to program ESOPH for the simulation of leaky aquifers and for the use of variable dimensions of the elementary rectangle of the finite difference grid. This publication is not complete in itself; it should be read in conjunction with Vanden Berg (1974) on 'A Digital Simulation of Horizontal Salt Water Encroachment Induced by Fresh Water Pumping' (See W75-04875) and Vanden Berg (1974) on 'Program SOPH - Simulation of Time Variant Piezometric Surface in a Confined Aquifer Subjected to Pumping'. (See W75-06737) (Environment Canada)
W76-10498

APPROACH TO GLACIER MASS-BALANCE ANALYSIS UTILIZING TERRAIN CHARACTERIZATION,
Department of the Environment, Ottawa (Canada). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W76-10499

8. ENGINEERING WORKS

8A. Structures

FLOATING STRUCTURE ARRANGEMENT,
D. E. Johnson, and R. M. Jones.
U.S. Patent No. 3,951,085, 8 p, 37 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1115, April 20, 1976.

Descriptors: *Patents, *Engineering structures, *Concrete structures, *Resources development, Water resources development, Islands, Continental Shelf.
Identifiers: *Outer Continental Shelf, Floating structures, Floating islands, Artificial islands, Offshore technology, Modular construction.

The modular construction of floating reinforced concrete structures permits the assembly of man-made islands of almost any desired size. The basic unit in the structure may be provided by a triangular module consisting of three flat slabs of ferroce-

ment interconnected by rods. These units initially are planar, with the rods between the slabs subsequently being bent to provide a triangular configuration. These triangular modules are associated together to form a larger triangular assembly which is secured together by rods extending through the loops formed by the rods at the apexes of the triangular modules. By pointing all of the triangular modules in the same direction in forming the larger triangular structure, the resulting unit has more triangles within its perimeter than the total number of the modules present. The spaces at the apexes of the triangular modules are filled in with more ferrocement, and the larger triangular unit is provided with reinforced skins. Reinforcement comes from wire mesh together with rod units which extend from each apex to a point just beyond the opposite side, providing projecting loops along the sides and at the corners of the triangular unit. The unit is then placed in a mold having a thin layer of ferrocement on the bottom surface, which is vibrated to cause the ferrocement to penetrate the wire mesh. Both surfaces of the unit may be enclosed in this manner. Still larger assemblies are made from the bigger modules. The larger triangular units are provided with vertical walls to give them depth and with additional skin surfaces to define areas upon which subsequent construction may be made. (Sinha - OEIS)
W76-10465

8B. Hydraulics

DESIGN OF A STORMWATER SEWER BY NONLINEAR PROGRAMMING--1,
Sherbrooke Univ. (Quebec). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-10034

CHANGE IN DRAWDOWN CAUSED BY ENLARGING A WELL IN A DOLOMITE AQUIFER,
Geological Survey, Columbus, Ohio. Water Resources Div.
For primary bibliographic entry see Field 4B.
W76-10088

CORROSION,
Plummer and McDannald Co., Galena, Ohio.
For primary bibliographic entry see Field 8G.
W76-10095

PREDICTING PRODUCTIVE TRENDS RELATED TO WRENCH FAULTS,
Exxon Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 8E.
W76-10100

TUBING-CASING RECLAMATION SAVED SHELL OVER $3 MILLION,
Shell Oil Co., New Orleans, La.
For primary bibliographic entry see Field 8G.
W76-10101

HEAVY COLLARS AID HOLE CONTROL,
Shell Development Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W76-10102

WELL FIELD MAINTENANCE AVOIDS CRISES,
Moody and Associates, Inc., Columbus, Ohio.
For primary bibliographic entry see Field 8G.
W76-10103

HOW TO DRILL TROUBLESOME SHALES,
Dresser Industries, Inc., Houston, Tex. Magcobar Div.
For primary bibliographic entry see Field 8G.
W76-10108

EVALUATION AND ADAPTATION OF SELECTED COMPUTER PROGRAMS TO WATER RESOURCE PROBLEMS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 7C.
W76-10129

PRINCIPLES AND MEASURING TECHNIQUES OF TURBULENCE CHARACTERISTICS IN OPEN-CHANNEL FLOWS,
Geological Survey, Reston, Va.
R. S. McQuivey.
Available from Supt. of Documents, GPO, Wash., D.C. 20402, price $1.80. Professional Paper 802-A, 1973. 82 p, 32 fig, 1 tab, 19 ref, append.

Descriptors: *Open channel flow, *Turbulence, *Measurement, *Anemometers, *Methodology, Instrumentation, Equations, Energy, Movement, Heat transfer, Evaluation.
Identifiers: *Hot-film anemometry.

Recent improvement in measurements of turbulence in water is due to the development of hot-film anemometry, which has given the researcher a tool for studying the structure of turbulence in open-channel flows. The fine spatial resolution (due to the small size of the sensor) and the good frequency response of the hot-film anemometer system are unmatched by any other system now available. A detailed description of instrumentation, sensor selection, and theory of operation is presented along with a discussion of calibration characteristics, heat-transfer relations, hot-film and hot-wire measurements, and possible sources of errors in turbulence measurements. Explained in detail is a procedure to circumvent contamination problems so that measurements can be made in natural rivers and streams. Also presented is a mathematical and experimental justification for the procedure. Aspects of analog and digital data reduction are discussed along with some guidelines to insure meaningful measurement of turbulence characteristics. (Woodard-USGS)
W76-10134

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME II.
American Society of Civil Engineers, New York.
Proceedings of the 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE, San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, 1975. 883 p. $30.00.

Descriptors: *Model studies, *Mathematical models, *Hydraulic models, Harbors, Resonance, Coasts, Beaches, Hydrodynamics, Water quality, Water pollution, Estuaries, Sedimentation, Finite element analysis, Storms, Storm surge, Waves(Water), Ocean waves, Hydraulics.

The objective of this symposium was to provide a forum in which the state-of-the-art of various types of models could be discussed and to provide a mechanism by which not only the relative merits of mathematical and physical models could be reviewed but also, and more fundamentally, the applicability of models to specific problems could be evaluated. The program focused on nearly all aspects of modeling as applied to rivers, harbors, oceans, and coastal areas. This volume contained the papers from sessions on harbor resonance, coastal movable-bed models, coastal hydrodynamic processes, water quality, estuaries, coastal sediment processes, finite elements, storm surges, and wave structure interaction. (See also W76-10416 thru W76-10463) (Sims-ISWS)
W76-10415

RESONANCES IN HARBORS WITH VARIABLE DEPTHS,
Florida Atlantic Univ., Boca Raton. Dept. of Ocean Engineering.
C-L. Su.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 803-815, 1975. 2 fig, 2 tab, 11 ref.

Descriptors: *Resonance, *Harbors, *Waves(Water), *Model studies, Mathematical models, Equations, Fluid mechanics, Hydraulics, Coasts, Engineering structures, Estuaries, Oceanography.
Identifiers: *Harbor resonances.

Asymptotic formulas were derived for both the free surface elevation and the velocity at the entrance of an arbitrary harbor along a straight coast. These algebraic formulas depended on the trapped modes and the continuum spectrum of the open ocean and also on the normal modes of the harbor basin. The maximums of the modulus of the averaged entrance velocity were all equal and the corresponding wave numbers were defined as the resonant wave numbers. Determination of the resonant wave numbers did not depend on the spectrums of the open coast, but depended critically on the two neighboring normal modes. In deriving the formulas it was assumed that the width of the harbor entrance is small compared to both the incident wave length and the harbor dimension, but in practice they can be relaxed. (See also W76-10415) (Sims-ISWS)
W76-10416

WAVE RESPONSE OF OFFSHORE BOTTOMLESS HARBORS,
Tehran Univ. (Iran).
H. Raissi.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 816-835, 1975. 22 fig, 1 tab, 20 ref.

Descriptors: *Harbors, *Waves(Water), *Model studies, Hydraulic models, Mathematical models, Laboratory tests, Resonance, Fluid mechanics, Hydraulics, Engineering structures, Oceanography.
Identifiers: *Offshore harbors, *Bottomless harbors, Wave oscillations.

Two and three dimensional bottomless harbors were investigated: a rectangular bottomless harbor and a circular bottomless harbor with no entrance, a 19 deg entrance and a 45 deg entrance. It was found: (1) the theoretically predicted resonant frequencies of a bottomless harbor agrees well with the experimental values, but the experimental amplification factors at resonance are generally somewhat smaller than the theoretical results; (2) the approximate theoretical solution of Evans and Morris agrees with a numerical solution and the bottomless harbor is effectively transparent to the incoming waves for certain frequencies, but the experimental data did not show any significant reduction in reflected waves; and (3) decreasing the depth of immersion of barriers caused a decrease in the amplification factor inside the harbor during oscillation, and narrowing the width of the harbor entrance caused an increase on amplification factor. (See also W76-10415) (Sims-ISWS)
W76-10417

NONLINEAR LATERAL OSCILLATION IN HARBOUR MODEL,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
S. Nakamura.

In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 836-853, 1975. 7 fig, 1 tab, 18 ref, 1 append.

Descriptors: *Harbors, *Waves(Water), *Model studies, Hydraulic models, Laboratory tests, Coasts, Shores, Fluid mechanics, Engineering structures, Estuaries, Hydraulics, Oceanography.
Identifiers: *Wave oscillations.

This paper described a part of the experimental results which have been carried out for control or suppression of water waves on coast and in harbor. Two cascaded pairs of breakwaters were considered in a harbor model. The period of the wave was in the range of 0.15 min to 1.5 min. The trend of the wave height ratio may be understood by linear theory of harbor oscillation or of edge wave. An experiment with a wave of 9 sec in period showed that the wave form is edge wave like and fairly stable in the lateral oscillation between the two pairs of the breakwaters. The result indicated an existence of a conoidal edge wave as a solution of two dimensional nonlinear equations for harbor oscillation. The nonlinear lateral oscillation can be easily regulated by a simple arrangement of the boundary condition in the harbor model, for example, by changing the width of the opening at the first pair of the breakwaters, by increasing the water depth in the harbor, by giving gentle slopes to both sides of the lateral wall in the harbor model, or by changing the area of the harbor model. (See also W76-10415) (Sims-ISWS)
W76-10418

NUMERICAL PREDICTION OF HARBOR RESPONSES,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
C. T. Lee, and M. A. Sklarz.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 854-873, 1975. 11 fig, 1 tab, 4 ref.

Descriptors: *Harbors, *Waves(Water), *Model studies, *Hawaii, Mathematical models, Hydraulic models, Ocean waves, Beaches, Barriers, Engineering structures, Hydraulics, Fluid mechanics, Hydrodynamics.
Identifiers: *Small-boat harbors, Honolulu(Hawaii), Harbor improvements.

This paper covered the use of a numerical simulation model to predict the harbor responses as excited by a periodic wave action. The method was applied to a small boat harbor improvement project located near Honolulu, Hawaii. The results obtained from the numerical model were compared with those measured from a hydraulic model. Despite the fact that the relationship of numerical prediction to measurement in the hydraulic model was uneven, the comparison seemed fair for berthing areas but poor in the vicinity of the entrance channel. It should be emphasized that at this stage of its development, the shallow water wave model cannot be expected to give an absolute quantitative picture of the harbor and environs. If the reflectance functions at beaches, barriers, harbor walls, and open boundaries can be improved, it is practicable that the numerical model could be fully developed as an effective tool in the determination of the best harbor improvement plan among a variety of alternatives. This paper described the basic theory, computational aspects, and considerations that went into adapting this general shallow water wave numerical model as written by H.G. Loomis. The model assumed that the fluid obeys the Navier-Stokes equations of momentum and continuity with the assumption that the velocities are uniform along a vertical line from the water surface to the sea floor and that the water-level change is small compared to the depth. Also, the non-linear advection and coriolis terms were neglected. (See also W76-10415) (Sims-ISWS)
W76-10419

FREE OSCILLATIONS IN BAYS AND HARBORS,
Department of the Environment, Ottawa (Ontario). Oceanography Branch.
T. S. Murty, and J. D. Taylor.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 874-887, 1975. 5 fig, 7 tab, 5 ref.

Descriptors: *Bays, *Harbors, *Waves(Water), *Model studies, Mathematical models, Computer models, Hydrodynamics, Hydraulics, Water level fluctuations, Water levels, Winds, Atmospheric pressure, Numerical analysis.
Identifiers: *Wave oscillations, Free oscillations, Oscillation spectra.

A method was described which has been used to calculate the frequencies of natural oscillations in bays and harbors. The method consisted of the generation of waves in a computer model of the bay in question and the use of spectranalysis to calculate the energy vs. frequency at selected points in the bay. The modeling program was a two-dimensional finite difference representation of the vertically integrated equations of hydrodynamics. The grid used was equally spaced in latitude and longitude. The model may be applied to any body of water by simply feeding in the depths at the grid points. When applied to oscillations in a bay, the water heights across the mouth of the bay were set to zero and any appropriate forcing function (wind or pressure) was applied. After running the model, the time series of water heights at any point of interest in the basin were saved and fed into a spectrum analysis program. Computer plots of the spectrum and of the spectrum vs. time may be obtained. Tests have been made showing the validity of the method and some of its limitations. Results were shown for some of the bays the method has been applied to. (See also W76-10415) (Sims-ISWS)
W76-10420

COMPUTATIONS OF HARBOR OSCILLATIONS BY RAY METHODS,
Technical Univ., of Denmark, Lyngby. Lab., of Applied Mathematical Physics.
J. Larsen, and P. L. Christiansen.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 888-906, 1975. 11 fig, 16 ref.

Descriptors: *Harbors, *Waves(Water), *Model studies, Mathematical models, Fluid mechanics, Hydraulics, Shores, Coasts, Refraction(Water waves), Reflectance, Shallow water, Oceanography.
Identifiers: *Denmark, *Wave oscillations.

A numerical investigation of oscillations in harbor basins based on ray methods was presented. A computer program has been developed for the tracing of all possible reflected and diffracted rays produced by an incident gravity wave in an arbitrary basin with straight walls and constant water depth. Attenuation mechanisms that limit the number of rays needed for the computation of the field at a given point with a certain accuracy were discussed. Amplitude diagrams for the harbor oscillations in actual harbors obtained by application of the programs were shown. (See also W76-10415) (Sims-ISWS)
W76-10421

TESTS ON THE EQUILIBRIUM PROBILES OF MODEL BEACHES AND THE EFFECTS OF GRAIN SHAPE AND SIZE DISTRIBUTION,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 2L.
W76-10422

PHYSICAL MODELING OF SCOUR INITIATION AND SEDIMENT TRANSPORT IN DISTORTED TIDAL MODELS,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10423

TIME GROWTH OF TIDAL DUNES IN A PHYSICAL MODEL,
Queen's Univ., Kingston, Ontario. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10424

LABORATORY EFFECTS IN COASTAL MOVABLE-BED MODELS,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W76-10425

SIMULATION OF DELTA BUILDING PROCESS,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 2L.
W76-10426

MOVABLE-BED MODEL INVESTIGATION OF TAICHUNG HARBOR, TAIWAN, REP. OF CHINA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10427

COASTAL MOBILE BED MODEL - DOES IT WORK,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10428

MULTILAYER HYDRODYNAMICAL-NUMERICAL MODELS,
Naval Environmental Prediction Research Facility, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-10429

MULTI-PHASED MODEL STUDY OF THE SETO INLAND SEA,
Chugoku Inst., of Industrial Technology, Kure (Japan). Hydraulic Research Section II.
For primary bibliographic entry see Field 2L.
W76-10430

TIDAL RESIDUAL CIRCULATIONS IN THE HYDRAULIC MODEL,
Ehime Univ., Matsuyama (Japan). Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2L.
W76-10431

MODELING OF TURBULENCE IN THE SURF ZONE,
Technische Hogeschool, Delft(Netherlands). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10432

NEARSHORE WATER CIRCULATION INDUCED BY WIND AND WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10433

NUMERICAL MODEL FOR WAVE REFRACTION BY FINITE AMPLITUDE WAVE THEORIES,
California State Univ., Long Beach. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10434

SCALE EFFECTS ON PHYSICAL/MATHEMATICAL MODELING,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
T. T. Lee.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1101-1120, 1975. 20 fig, 22 ref.

Descriptors: *Model studies, *Mathematical models, *Hydraulic models, Harbors, Waves(Water), Inlets(Waterways), Channels, Ships, Loads(Forces), Estuaries, Ocean waves, Hydraulics.
Identifiers: *Scale effects, Wave forces.

Model and scale effects on physical and/or mathematical modeling were discussed. The objective was to disclose some pitfalls based on the direct experience of the author. Subjects included: (1) Wave Characteristics in Harbor. Scale effects on wave attenuation in model due to viscous damping (bottom friction) were discussed in determining the scale of hydraulic model. Scale effect on multiple waves was considered. The effects of wave gage locations on the maximum wave height in the harbor were described. Model effects on the seiche period displacements were evaluated based on experimental, mathematical and field measurements. The effect of training-walls in the model on these parameters was described. (2) Inlet Channel Stabilization. Special emphasis was placed on the uses of three model scaling criteria for a movable-bed, estuary model. These involved calibration of the model by comparing the sediment deposition in the entrance channel with the prototype and model results. The effects of model sediment characteristics on the time scale of bottom evolution were discussed. (3) Wave Forces on a Pile. Discussions were made on the errors in the prediction of wave forces due to discrepancies in the prediction of free surface profiles, wave kinematics, drag and inertia coefficients by using linear, Stokes Third and Fifth Order wave theories. (4) Impact Forces, Mooring Forces, and Ship Motions of a Supertanker. The limitations of both mathematical and physical modeling were given. The effects of hydrodynamic mass and damping coefficients on the unit amplitude response operators show significant discrepancies in physical and mathematical modeling. (See also W76-10415) (Sims-ISWS)
W76-10435

TIME-DEPENDENT MASS DISPERSION IN NATURAL STREAMS,
Dames and Moore, Bethesda, Md.
For primary bibliographic entry see Field 5B.
W76-10436

SCALING AND SIZING CRITERIA FOR THERMAL-HYDRAULIC MODELS,
Acres Consulting Services Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 5B.
W76-10437

APPLICATION OF A WATER QUALITY MODEL TO THE DENVER METROPOLITAN AREA,
Black and Veatch, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-10438

COMBINED USE OF PHYSICAL AND MATHEMATICAL MODELS FOR ANALYSIS OF RESERVOIR WATER QUALITY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W76-10439

APPLICATION OF A DYNAMIC NETWORK MODEL TO HYDRAULIC AND WATER QUALITY STUDIES OF THE ST. LAWRENCE RIVER,
For primary bibliographic entry see Field 5B.
W76-10440

FINITE DIFFERENCE APPROXIMATION TO THE CONVECTIVE TRANSPORT EQUATION,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5B.
W76-10441

MEASURED CONTRIBUTIONS OF THE TERMS OF THE VERTICALLY INTEGRATED HYDRODYNAMIC EQUATIONS,
Delta Service, Rijkswaterstaat (Netherlands).
For primary bibliographic entry see Field 2L.
W76-10442

SIMULATION OF THE SALINITY DISTRIBUTION IN THE ST. LAWRENCE ESTUARY BY A TWO-DIMENSIONAL MATHEMATICAL MODEL,
Laval Univ., Quebec. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-10443

OVERVIEW OF PHYSICAL ESTUARY PRACTICE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 2L.
W76-10444

COMPARISON BETWEEN PHYSICAL AND MATHEMATICAL MODELLING OF A TIDAL FJORD SYSTEM IN NORTHERN NORWAY,
Trondheim Univ. (Norway). Vassdrags- og Havnelaboratoriet.
For primary bibliographic entry see Field 2L.
W76-10445

COMPARISON OF HYDRAULIC AND NUMERICAL TIDAL MODELS,
Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-10446

MODELING SEDIMENT DEPOSITION IN A TIDAL RIVER,
Dames and Moore, Cranford, N.J.
For primary bibliographic entry see Field 2L.
W76-10447

COMPUTER SIMULATION OF BEACH EROSION AND PROFILE MODIFICATION DUE TO WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10448

MODELLING OF SUSPENSION CURRENTS,
Trondheim Univ. (Norway). Vassdrags-og Havnelaboratoriet.
For primary bibliographic entry see Field 5B.
W76-10449

ANALYTICAL MODEL OF DUCT-FLOW FLUIDIZATION,
Scripps Institution of Oceanography, La Jolla, Calif.
J. A. Bailard, and D. L. Inman.
In: Symposium on Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1402-1421, 1975. 7 fig, 2 tab, 4 ref.

Descriptors: *Model studies, *Sands, *Excavation, Dredging, Mathematical models, Laboratory tests, Pipes, Flow, Fluid mechanics, Hydraulics.
Identifiers: *Duct-flow fluidization, Sand transport, Fluidizing pipes.

An analytical model of the duct-flow fluidization technique for transporting sand was developed, using unidirectional flow theory. Dimensionless pressures and velocities were obtained from the numerical solution of six difference equations and three boundary conditions. Preliminary laboratory tests were made of a 6.1 m long fluidizing pipe oriented both horizontally and with a 3 degree downward slope. The good agreement between experiment and theory suggested that the model provides a basis for further development of this method of sand transport. The model showed that for similar flow conditions, the length of unvented duct-flow increases with increasing thickness of overburden. (See also W76-10415) (Sims-ISWS)
W76-10450

PROBLEMS OF PHYSICAL MODEL TESTS WITH HARBOURS,
Danish Hydraulic Inst., Copenhagen.
H. Gravesen, J. Kirkegaard, and A. H. Nielsen.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1422-1447, 1975. 20 fig, 3 ref.

Descriptors: *Model studies, *Harbors, *Waves(Water), Ocean waves, Hydraulic models, Coastal engineering, Coastal structures, Ships, Laboratory equipment, Laboratory tests, Hydrodynamics, Hydraulics.
Identifiers: *Harbor models.

A description was presented of the experience gained on the following subjects by using the Danish Hydraulic Institute (DHI) method for model tests with harbor facilities: (1) evaluation of the experience from existing harbors, (2) evaluation of the requirements to site wave recordings, and (3) methods for selecting the critical wave situation. The wave generators at DHI consist of a hydraulic servosystem, which gives a vertical wave paddle a horizontal translational movement. The position of the paddle is controlled by an electric signal from the 'Wave Function Generator' (WFG). The control signal is generated on the basis of a punched tape record of nature waves. This digital record is converted to an analog electric signal, which after integration over time is fed

LIBRARY U. OF L. Hydraulic Engr. Lab.

into the servosystem of the wave generator. The mean period of the model wave train is controlled by the reading speed of the punched tape, and the amplification in the WFG determines the wave heights. Wave disturbance tests carried out at the DHI with irregular waves have provided strong indications of the superiority of irregular wave tests over regular wave tests. Results from the model tests have been compared with simultaneous recordings in the nature of waves outside and inside the Hanstholm harbor. The comparison indicated that the irregular wave model represents a good reproduction of the prototype. (See also W76-10415) (Sims-ISWS)
W76-10451

FINITE ELEMENT MODEL FOR BACKWATER COMPUTATION,
Office of the Chief of Engineers (Army). Washington, D.C.
M-T. Tseng.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1448-1466, 1975. 7 fig, 1 tab, 11 ref.

Descriptors: *Model studies, *Flood plains, *Bridges, Mathematical models, Water levels, Floods, Highways, Embankments, Streamflow, Rivers, Finite element analysis, Analytical techniques, Bridge design.
Identifiers: *Bridge backwater.

A mathematical model describing the steady, two-dimensional subcritical flow in wide, heavily vegetated flood plains of bridge waterways has been developed using the finite element method. The flow equations were solved simultaneously by numerical methods to yield the spatial distribution of water surface elevations and velocities within the flow region for prescribed boundary conditions. Galerkin's method of weighted residuals has been applied to the basic differential equations to form the finite element representation. The element shape selected for the model was the triangle, with quadratic shape functions defined for unit flows and linear shape functions defined for the depth. Flow simulations for normal, skewed and eccentric type of stream crossings can be performed by the model. Hydraulic computations for flow overtopping approach embankment and multi-bridge openings across a stream valley can be carried out without requiring prior assumption of flow distribution for each bridge opening. (See also W76-10415) (Sims-ISWS)
W76-10452

TWO-DIMENSIONAL FINITE ELEMENT DISPERSION MODEL,
Dames and Moore, Cranford, N.J.
For primary bibliographic entry see Field 5B.
W76-10453

FLOW2D: A TWO-DIMENSIONAL FLOW MODEL FOR FLOOD PLAINS AND ESTUARIES,
Resource Analysis, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 2L.
W76-10454

ANALOGOUS MODELLING OF AQUIFEROUS SYSTEMS IN COASTAL ZONES,
Akademiya Nauk SSSR, Moscow. Interagency Geophysical Committee.
For primary bibliographic entry see Field 2L.
W76-10455

NUMERICAL MODEL FOR STORM SURGE AND TIDAL RUN-UP STUDIES,
Dames and Moore, Los Angeles, Calif. Advance Technology Group.
For primary bibliographic entry see Field 2L.
W76-10456

NUMERICAL SIMULATION OF STORM SURGES IN BAYS,
Danish Hydraulic Inst., Horsholm.
For primary bibliographic entry see Field 2L.
W76-10457

WAVE INDUCED LOADS ON MULTI-ELEMENT STRUCTURES,
Scripps Institution of Oceanography, La Jolla, Calif.
R. J. Seymour.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1552-1567, 1975. 8 fig, 5 tab, 6 ref.

Descriptors: *Model studies, *Waves(Water), *Loads(Forces), *Breakwaters, Mathematical models, Hydraulic models, Structures, Hydraulic structures, Barriers, Harbors, Peak loads, Hydrodynamics, Fluid mechanics.
Identifiers: *Tethered float breakwaters, Mooring forces, Floating breakwaters.

A linearized mathematical model was derived for summing the wave induced mooring forces on a tethered float breakwater, a floating structure with a large number of identical compliant elements. This necessitated considering, in addition to the hydrodynamic loads on the structure elements, the transfer function for structural response to wide band random waves, the effects of energy attenuation within the structure and a spectral function for the phase relationships among the individual elements and the incident wave field. The theoretical model was tested at large laboratory scale by subjecting a 4 meter long model breakwater to simulated random seas with actual peak energy periods ranging from 4 to 1.1 seconds. The measured load statistics were found to be in good agreement with those calculated by the mathematical model. It was further found that the peak load could be reliably estimated from knowledge of the incident wave spectrum. (See also W76-10415) (Sims-ISWS)
W76-10458

PORTABLE BREAKWATER WITH SHIP HULKS,
Dames and Moore, New York.
H. M. Noble, T. T. Lunde, and T. S. Winslow.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1568-1584, 1975. 8 fig, 2 tab.

Descriptors: *Model studies, *Breakwaters, Ships, Mathematical models, Hydraulic models, Scour, Sands, Erosion, Harbors, Waves(Water), Storms, Storm surge, Hydrodynamics, Australia.
Identifiers: *Botany Bay(Australia), Portable breakwaters, Ship hulks.

This paper describes the concept and modeling of two ship hulks bearing on a sand bottom to form a portable breakwater to provide temporary protection from ocean waves for construction of a tribar-covered revetment at the entrance to Botany Bay, Australia. Stability of the breakwater to resist sliding and overturning without exceeding local bottom bearing pressure from incident wave action was analyzed mathematically by a computer program. Four hydrodynamic model tank tests were run to analyze effects and extent of bottom foundation scouring. These tests included the study of scour prevention by use of an anti-scour cloth cover placed over the sand bottom in vicinity of hulk bottoms. Modeling proved anti-scour cloth successfully prevented bottom scouring. (See also W76-10415) (Sims-ISWS)
W76-10459

ANALYSIS OF FLOATING BREAKWATER PERFORMANCE,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
B. H. Adee.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1585-1602, 1975. 9 fig, 4 ref, 1 append.

Descriptors: *Model studies, *Breakwaters, *Waves(Water), Mathematical models, Hydraulic models, Harbors, Marinas, Hydraulics, Hydrodynamics.
Identifiers: *Floating breakwaters, Transmission coefficients.

A two-dimensional-linear theoretical model has been developed which can predict the performance of floating breakwaters of arbitrary cross-sectional shape, including catamarans. This theory was applied to various breakwaters of different shapes and results were compared with measurements from the model tank and prototype installation in the field. These results indicated that the theoretical model may be very useful as a design and research tool and where additional development of the theoretical model is required. (See also W76-10415) (Sims-ISWS)
W76-10460

RELIABILITY OF RUBBLE-MOUND BREAKWATER STABILITY MODELS,
R. Y. Hudson, and D. D. Davidson.
In: Symposium On Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1603-1622, 1975. 6 fig, 14 ref.

Descriptors: *Model studies, *Breakwaters, *Waves(Water), Hydraulic models, Structures, Structural stability, Structural analysis, Stability, Structural design, Structural models, Hydraulics, Fluid mechanics, Hydrodynamics.
Identifiers: *Rubble-mound breakwaters.

The design of rubble-mound breakwaters to withstand the forces of wave action, in such a way as to obtain safe and economical structures, is difficult. It is usually necessary to conduct scale-model investigations to determine the optimum design. The lack of data for postconstruction verification of such models is sparse because of the difficulty and cost of obtaining such data, the extended time required for observation of prototype structure performance, uncertainty of the prototype wave climate that the structure was actually subjected to, and oftentimes changes in final design subsequent to model tests. The objectives of this paper were to explain the basis upon which rubble-mound stability models are designed, constructed and operated, and to provide information from which the accuracy of such models can be obtained. Comparisons were made between model tests at various scales and between some specific prototype structures and scale model tests performed of these structures. It was concluded that hydraulic scale models can be used to determine the stability of rubble-mound breakwaters against wave attack, and that the accuracy of test results will be within the limits required to design safe and economical prototype structures provided the model is designed and operated properly and test conditions are selected judiciously. (See also W76-10415)
W76-10461

MODELING OF INLET-BAY SYSTEMS IN RELATION TO SAND TRAPPING,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W76-10462

LCHF COASTAL SEDIMENT MODELING TECHNIQUES,
Laboratoire Central d'Hydraulique de France, Paris.
For primary bibliographic entry see Field 2L.
W76-10463

FLOATING STRUCTURE ARRANGEMENT,
For primary bibliographic entry see Field 8A.
W76-10465

8C. Hydraulic Machinery

WHAT TYPE OF RIG SHOULD YOU BUY,
R. B. McDannald.
Water Well Journal, Vol. 30, No. 6, p 30-31, June, 1976. 1 tab.

Descriptors: *Drilling, *Water wells, *Rotary drilling, Economic feasibility, Cost comparisons, Operation and maintenance, Operating costs.
Identifiers: *Cable tool drilling, Combination rigs, Employee training expense, Drilling efficiency, Effect of varying lithologies.

Two types of drilling systems are used by the majority of water well contractors today. One type is the percussion cable tool drill which drills by lifting and dropping a drill bit to break and loosen the material in the drill hole. The other type is the rotary drilling machine which uses a rotary bit with mud or air to carry away the cuttings. There is a third type of drilling rig which combines both the percussion and rotary methods to drill. This is called a combination rig. The cable tool rig is the least expensive to purchase while the combination rig is the most expensive. Other factors besides price should be considered by the prospective rig buyer. The operating expense, spare parts, number of drillers' helpers and the life expectancy of the rig should all be researched and considered. Each drilling system offers advantages and disadvantages of it's own. A driller must consider the system that offers the best balance of purchase and operating cost, and features that fit his needs and operating perameters. (Heiss-NWWA)
W76-10094

RUN DRILL PIPE SLOWER AND REDUCE FORMATION DAMAGE,
Louis Records and Associates Inc., Lafayette, La.
For primary bibliographic entry see Field 8G.
W76-10097

EXXON USES HANDS-ON METHODS TO TRAIN DRILLING PERSONNEL,
Exxon Co., New Orleans, La.
For primary bibliographic entry see Field 8G.
W76-10098

HOW TO GET THE MOST FROM MUD PUMP PARTS,
Reed Tool Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W76-10112

HOW TO AVOID DOWNHOLE FAILURES AND MAXIMIZE PIPE USE,
AMF Tuboscope, Inc., Houston, Tex.
For primary bibliographic entry see Field 8G.
W76-10114

SEWER PEST CONTROL CHECK VALVE,
B. Diaz.
United States Patent 3,955,596. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 560, May, 1976. 1 fig.

Descriptors: *Patents, *Sewers, *Valves, :pipes, *Flow control, Screens, Mechanical equipment, Outlets.

A valve section for sewer pipe was patented. It has a pipe portion having opposite circular ends to interconnect with adjoining pipe sections and a housing extending upward from the midportion of the pipe portion with an open top that has a removable cover. A lower end of the pipe portion has an interior shoulder. The valve support frame, which rests on this shoulder, can be removed vertically through the open top. A one-way flapper valve pivotally mounted on a horizontal axis in the frame connected from it into the pipe portion, swinging from a normal closed position that obstructs reverse sewage flow to a position responsive to flow of material towards a sewer outlet. A rod is upstanding from the frame. A screen upstream of the valve is mounted in the housing to move vertically from a normal raised inoperative position in the housing to the operative lowered position in the pipe portion. Disengageable linkage means act between the rod and screen to secure the screen in the raised position when the frame rests on the shoulder and are disengaged to release the screen for lowering to the operative position when the valve and frame are removed to clean the pipe. (Snyder-FIRL)
W76-10199

8E. Rock Mechanics and Geology

PREDICTING PRODUCTIVE TRENDS RELATED TO WRENCH FAULTS,
Exxon Production Research Co., Houston, Tex.
T. P. Harding.
World Oil, Vol. 182, No. 7, p 64-69, June, 1976. 7 fig, 6 ref.

Descriptors: *Faults(Geology), *Fractures(Geology), *Rock mechanics, *Structure, Oil wells, California, Foreign countries.
Identifiers: *Wrenching deformation, Enechelon folds, Strike-slip faults, Los Angeles basin, San Joaquin Valley(Calif), Venezuela, Sumatra.

Wrenching deformation is inherently effective in producing hydrocarbon traps and perhaps more than any other type structuring-readily lends itself to the prediction of major oil-play trends, and patterns of their individual prospects. Predictability derives from the systematic areal distribution of compressive and extensional forces along finite, linear zones of deformation. Different play patterns arise as a result of the interaction of three factors: (1) Magnitude or evolutionary stage of wrench faulting, (2) Gross geometry of regional deformation, (3) Structural response within deformed terrain. A number of major producing areas have been developed using this criteria including the California basins, certain North American Mid-Continent areas, as well as Venezuela and Sumatra. (Heiss-NWWA)
W76-10100

WATER WELLS AS POSSIBLE INDICATORS OF TECTONIC STRAIN,
Tokyo Univ. (Japan).
For primary bibliographic entry see Field 8G.
W76-10105

8G. Materials

FLOATING STRUCTURAL PLASTIC TRUSS SYSTEM PROTECTS WASTE LAGOON LINING,
FMC Corp., San Jose, Calif.
For primary bibliographic entry see Field 5G.
W76-10007

FIELD RESEARCH AND TESTING OF A WATER HAND PUMP FOR USE IN DEVELOPING COUNTRIES,
Battelle Columbus Lab., Ohio.
R. D. Fannon.
Final Research Report to Agency for International Development, 43 p., January 31, 1975, 2 fig., 4 tab.

Descriptors: *Pumps, Research and development, *Pump testing, Deep wells, Shallow wells, Rural areas.
Identifiers: *Hand pumps, *Field research and testing, *Developing countries, Thailand, Nigeria, Bangladesh.

Discussion between the Agency for International Development (AID) and the Battelle-Columbus Laboratories (BCL) resulted in a field research program to develop and test a water hand pump for use in developing countries. The basic requirements for a dependable and durable pump were (1) low production cost, (2) long life under severe conditions, and (3) easy to maintain with simple tools and unskilled labor. Two pump types, shallow well, and deep well were designed. The deep well pump having the cylinder separate from the pump body and submerged below the pumping water level. Both pumps were assembled from a few basic, interchangeable parts. These parts being: handle, cap, fulcrum, body, cylinder, stand, plunger assembly, valve assemblies, nuts and bolts. General pump design provided for ease of pumping from deep and shallow wells by varying the handle length and cylinder size. Every effort was made to keep the handle force below 40 pounds to permit operation by women and children. Three test areas were designated; Thailand, Nigeria and Bangladesh. Complete sets of patterns, core boxes, two assembled demonstration pumps and supplies were sent to each country. Design adjustments were made during follow-up visits for problems encountered in each country. (Heiss-NWWA)
W76-10086

RECORDING EQUIPMENT BOOSTER.
Ground Water Age, Vol. 10, No. 9, p 19, 30-31, May, 1976. 4 fig.

Descriptors: *Drilling equipment, *Drill monitors, *Instrumentation, Boreholes, Logging(Recording), *Water wells, Florida.
Identifiers: *Drilling recorder, *Inclinometer, *Drilling rate, Drilling standards, Drill bit pressure, Alsay-Pippin Corporation.

Alsay-Pippin Corporation uses two types of recording devices, a borehole inclinometer and a drilling recorder. The inclinometer helps avoid wear on tool joints and the drill string. In the case of drilling through a cavern an inclinometer will insure penetration of the floor directly below the entrance hole. The inclinometer is essential in drilling large diameter wells due to the fact that large diameter casing will not bend. The other recorder used by Alsay-Pippin is a recorder which measures drilling rate and bit weight. The recorder provides a record of penetration rate through a particular formation as well as the penetration rate per drilling shift. The weight required on the bit indicates the lithology of the formation, and helps control bit wear. (Heiss-NWWA)
W76-10091

LIBRARY U. S. DEPARTMENT OF THE INTERIOR

PITLESS UNIT AND ADAPTER UPDATE.
Ground Water Age, Vol. 10, No. 9, p 25, 38-39, May, 1976.

Descriptors: *Water wells, Equipment, Administrative agencies, Design standards, Sanitary engineering, *Well regulations.
Identifiers: *Pitless adapters.

Many sanitarians and county agents are not aware of the variety of styles and sizes of pitless adapter equipment available. The last time an intensive, broad study of state regulations regarding pitless adapters and units was made by the WSC Pitless Adapter Division in 1973. At that time all states did not respond. Most of the states have a confusing variety of regulations, semiregulations, and nonregulations. Some state publications refer specifically to adapters, while others talk only generally about how the well should be completed. Some state codes use language which indicates that well pits 'Aren't very good' and then proceed to tell how a pit should be constructed. In nearly every area of the country pitless adapters and units are installed and in the vast majority of cases are approved. Pitless adapters do the sanitary job. (Heiss-NWWA)
W76-10092

WHAT TYPE OF RIG SHOULD YOU BUY,
For primary bibliographic entry see Field 8C.
W76-10094

CORROSION,
Plummer and McDannald Co., Galena, Ohio.
R. B. McDannald.
Water Well Journal, Vol. 30, No. 7, p 30-31, July, 1976. 1 tab.

Descriptors: *Corrosion, *Chemical reaction, *Well casings, Damages, *Corrosion control, Wells, Ground water, Well screens, Pumps.
Identifiers: *Corrosion damage, Corrosion damage cost, Galvanic series.

Corrosion is a natural electro-chemical errosive process which causes billions of dollars damage each year. Corrosion in water wells can limit their useful life. Commonly, damage suffered by water wells are: (1) Failure by corrosion of steel fittings in the pumping system, (2) Holes corroded through steel shells and cast housings of submersible pumps, (3) Well screen slot enlargement, followed by pumping of sand, (4) Strength reduction of casings and screens, leading to collapse, and (5) Redepositing of corrosion products on pump inlet screens and well screens, reducing flow. Generally corrosion takes place between metals of different chemical reactivities according to the galvanic series. Corrosion problems may be circumvented by a careful selection of metals with similar reactivities which will not corrode by close contact. (Heiss-NWWA)
W76-10095

RUN DRILL PIPE SLOWER AND REDUCE FORMATION DAMAGE,
Louis Records and Associates Inc., Lafayette, La.
L. Records.
World Oil, Vol. 182, No. 7, p 83-84, June, 1976. 5 fig, 1 ref.

Descriptors: *Drilling equipment, *Boreholes, Drilling fluids, Measuring instruments.
Identifiers: *Surge pressure, *Formation damage, Stand-per-minute rates, Surge-Swab Director, Drilling well control, Incorporated.

Running drill pipe into a well at excessive speeds induces significant surge pressures that can lead to damage of the formation being drilled. Causes of formation damage are varied, but generally are regarded as exposure of the formation to conditions that change its natural fluid content for some distance from the well bore. To circumvent this condition minimum weight drilling fluids are used as often as practical. Excessive downhole surge pressures can also be caused by high stand-per-minute rates of drill pipe running. The maximum surge pressure magnitude is determined by the length and size of the drill string lowered into the hole, properties of the drilling fluid, hole size and the maximum moving speed of the drill string. Drill string running speeds are measured using a Surge-Swab Director which gives an instantaneous readout of pipe speed in both feet per minute and seconds per stand. The unit is equipped with an alarm which sounds when pipe speeds reach excessive values. A strip chart recorder records the maximum speed of drill pipe going into the borehole. Careful monitoring of the drilling fluid condition and the Surge-Swab Director can preclude formation damage by excessive surge pressure. (Heiss-NWWA)
W76-10097

EXXON USES HANDS-ON METHODS TO TRAIN DRILLING PERSONNEL,
Exxon Co., New Orleans, La.
J. B. Day.
World Oil, Vol. 182, No. 7, p 95-98, June, 1976. 1 fig, 1 ref.

Descriptors: *Training, *Drilling, Drilling equipment, Wells.
Identifiers: *Hands-on training, *Blow-out preventer equipment, *Well control.

The hands-on concept of training can be applied effectively in teaching well control techniques and in gaining familiarity with equipment. Exxon Company, USA conducts two hands-on training seminars - 'Blow-out Preventer Equipment Systems' and 'Well Control'. Drilling superintendents, technicians and engineers trained by the hands-on method have confidence in the application of well control techniques and in the use of the equipment when faced with well control situations. (Heiss-NWWA)
W76-10098

SELECTING PACKER FLUIDS: HERE'S WHAT TO CONSIDER,
Delta Mud and Chemical Co., Houma, La.
D. J. Chauvin.
World Oil, Vol. 182, No. 7, p 87-91, June, 1976. 3 fig.

Descriptors: *Drilling fluids, *Brines, *Clays, *Slurries, *Emulsions, *Corrosion control, Economic life, Environmental effects, Physical properties, Chemical properties.
Identifiers: Packer fluid, Contaminant control, Formation damage control.

Every packer fluid in use today has specific advantages and disadvantages inherent to their physical and chemical composition. Selection of a packer fluid for a job can be simplified by using a checklist of requirements to satisfy the permameters of the job. The twelve most important requirements of a packer fluid are: (1) Density-how much density is necessary, (2) Minimum corrosion level-both corrosio rate and type should be considered, (3) Circulatability- packer fluids become so viscous with time, temperature and pressure that they cause expensive workovers, (4) Contaminant resistance, (5) Carrying capacity-the capability of carrying metal and cement cuttings during workover, (6) Formation damage prevention-the fluid should not be detrimental to production, (7) Economics-the packer fluid should be low in cost, both initial and long term, (8) Low Solids-material which fails to remain in suspension can settle and jam packers or tubing, (9) Drilling fluid application flexibility, (10) Availability, (11) Safe to work with, (12) Environmentally safe. (Heiss-NWWA)
W76-10099

TUBING-CASING RECLAMATION SAVED SHELL OVER $3 MILLION,
Shell Oil Co., New Orleans, La.
F. G. Smith.
World Oil, Vol. 182, No. 7, p 79-81, June, 1976. 3 fig, 1 tab, 6 ref.

Descriptors: *Drilling equipment, *Quality control, Evaluation, Test procedures, Corrosion control, Mechanical damage, Measuring equipment, Louisiana.
Identifiers: *Well casing, *Well tubing, *Reclamation program(Wells), Commercial inspection companies, Gulf coast.

Significant savings have resulted from Shell Oil Company's closely supervised tubing/casing inspection and reclaiming program initiated recently in the Louisiana Gulf Coast. During 1975, 2.3 million feet of tubing and casing were recovered at an estimated savings of 3.6 million dollars. During periods of tubular shortages the program permitted drilling and recompletion of many wells for which new pipe could not be purchased. The program also provided information on corrosion effects and past and future corrosion control methods. Data on typical mechanical damage was also collected. The key to the program was insistance on quality control from commercial inspection companies. Shell approached the problem by critical comparison of seven companies to judge if industry methods were adequate. Presently control is maintained primarily by certifying operators of commercial inspection equipment. (Heiss-NWWA)
W76-10101

HEAVY COLLARS AID HOLE CONTROL,
Shell Development Co., Houston, Tex.
W. B. Bradley, C. E. Murphey, L. L. Dickson, and R. T. McLamore.
Oil and Gas Journal, Vol. 74, No. 21, p 72, 75-76, 78-80, May 24, 1976. 9 fig, 5 tab, 4 ref.

Descriptors: *Drilling equipment, *Drilling, *Boreholes, Drilling fluids, Well, Rotary drilling.
Identifiers: *Heavy drill collars, *Borehole deviation, *Penetration rates, Nonmagnetic properties, Surveying drill collar, Downhole motors.

A heavy, stiff-bottom drill collar can substantially improve deviation performance, theoretically increasing penetration rates by 50-100 percent in deviation-prone areas. In studying heavy metal collars in directional drilling, these theoretical conclusions were reached: (1) Deviation performance can be increased by adding a limited length heavy-metal bottom drill collar, (2) Penetration-rate increases of 50-100 percent can be achieved without sacrificing hole angle in deviation-prone areas where the weight response is reasonably linear, (3) Alternately, the hole-angle dropping rate can be substantially increased, (4) The deviation-controlling advantages of a heavy-metal collar increase with increasing mud weight, (5) The nonmagnetic properties of some heavy-metals may allow the heavy-metal drill collar to also be used as a surveying drill collar, (6) Costs for the heavy-metal collar are comparable with other drill-string hardware such as nonmagnetic drill collars and down-hole motors. Therefore, no unreasonable risk is incurred by use of heavy-metal drill collars. (Heiss-NWWA)
W76-10102

WELL FIELD MAINTENANCE AVOIDS CRISES,
Moody and Associates, Inc., Columbus, Ohio.
H. B. Eagon.
Opflow, Vol. 2, No. 4, p 1, 4-5, April, 1976. 3 fig.

Descriptors: *Water wells, *Well spacing, *Water management(Applied), *Groundwater, Specific capacity, Aquifers, Economic efficiency, Data collections, Hydrogeology, Environment.

Identifiers: *Well fields, *Well field maintenance, Operation guidelines, Rating curves, Well redevelopment.

Many organizations fall short in regard to management and maintenance of a well field system after installation. A crises situation could develop within the system because many factors affecting its operation change with time. Ground water is a dynamic, not a static, resource. Sudden failure of a well is rare. A water well loses capacity slowly, giving ample time to detect this deterioration and plan corrective action. Establishment of baseline data and analysis of changes over a period of years is essential to diagnose a problem or predict the probable occurance of one. Development of a well field management program will guarantee the most efficient and economical operation and reliability of a well field. (Heiss-NWWA)
W76-10103

WATER WELLS AS POSSIBLE INDICATORS OF TECTONIC STRAIN,
Tokyo Univ. (Japan).
H. Wakita.
Science, Vol. 189, No. 4202, p 553-555, August 15, 1975. 2 fig, 10 ref.

Descriptors: *Water wells, *Observation wells, *Water level fluctuations, *Earthquakes, Faults, Seismic waves, Japan.
Identifiers: *Tectonic strain, *Coseismic water level changes, *Izu-Hanto-oki earthquake, Water well earthquake monitor.

Coseismic water level changes associated with the Izu-Hanto-oki earthquake of May 9, 1974, were recorded in 59 among 95 observation wells located in the districts of Tokai and Kanto, Japan. The spatial distribution of wells in which the groundwater level rose or fell was systematic. The area in which these wells are located closely coincide with the areas of contraction and dilatation expected by the faulting. This strongly suggests a possible correlation between the observed changes in groundwater level and the tectonic strain. The results may indicate that the water level of wells is able to monitor acute coseismic strain changes. (Heiss-NWWA)
W76-10105

HOW TO DRILL TROUBLESOME SHALES,
Dresser Industries, Inc., Houston, Tex. Magcobar Div.
N. Davis.
Drilling-DCW, Vol. 37, No. 9, p 33-34, June, 1976. 2 fig, 3 ref.

Descriptors: *Shales, Drilling, *Drilling fluids, *Potassium compounds, *Boreholes, Laboratory tests, Wells, Rocky Mountain Region.
Identifiers: Potassium chloride-polyacrylamide polymer-mud system, Sloughing shales, Water sensitive shales.

The potassium chloride, polyacrylamide polymer mud system has been successfully used in the Rocky Mountain area to drill a variety of hard, water sensitive, sloughing shales. Investigation of the hole problems indicate excessive hole erosion of the sloughing shales was caused by three main sources: Mechanical, chemical, and abnormal pressure - or a combination of each. Many times the driller was able to overcome the problems with additional mud weight or viscosity. When chemical or physical alteration of the shale occurred because of excessive stresses from water wetting by mud filtrate, the use of potassium chloride polyacrylamide mud system was successful in hole stabilization. Laboratory analysis of the clay content of the shale either by X-ray defraction or scanning electron microscope proved beneficial in assisting to correctly formulate the system. (Heiss-NWWA)
W76-10108

HOW TO MAKE YOUR DRILL STRING LAST LONGER,
Hughes Tool Co., Houston, Tex.
T. B. Smith.
Drilling-DCW, Vol. 137, No. 9, p 55-56, June, 1976.

Descriptors: *Drilling equipment, *Drilling, *Corrosion.
Identifiers: *Drill string wear, Abrasive wear, Torsional failures, Embrittlement failures, Washouts(Drilling), Slip damage.

Careful attention must be given to possible damage resulting from abrasive wear to the outside diameter of the drill pipe, torsional failures of pins or boxes, embrittlement failures, washouts or slip damage, as well as wear caused by normal everyday use. A basic step in problem solving is to state the problem clearly and completely; this may help in arriving at answers. List the ways in which drill strings wear out and/or fails: (1) abrasive wear of the outer surfaces, (2) torsional failures of pins or boxes, (3) hydrogen embrittlement failures, (4) washouts, (5) slip damage. Understanding of these drill string wear mechanisms and close visual inspection will do much to preclude drill string damage resulting from physical and chemical wear. (Heiss-NWWA)
W76-10109

HOW TO FREE A STUCK STRING,
GOTCO International, Inc., Houston, Tex.
M. W. Aulenbacher.
Drilling-DCW, Vol. 137, No. 9, p 37-38, 40, June, 1976. 4 fig.

Descriptors: Drilling, *Drilling equipment, *Wells, Equipment, Casings, Corrosion.
Identifiers: *Stuck drill string, *Fishing operations, Free point instrument, String shot machine, Taper tap, Circulating and releasing spear, Retrieving tool, Accelerator, Drill collars, Hydraulic jar, Bumper sub, Safety joint, Overshot tool, Internal cutter, Jet cutter, Chemical cutter.

One of the most serious cased hole fishing challenges is the stuck drill string. Remedial action must be immediately initiated to prevent formation invasion and/or mud dehydration in the borehole. The first pipe releasing technique is working the pipe in tension and circulation for a time. In many cases this procedure will free the string. The fishing operation begins with the location of the string sticking point, this is found using an electronic free point system. Back-off is then begun above the stuck point using a string shot. When the section is free it is sometimes possible to free the stuck fish by a powerful upward jar or by a steady high tensile pull. Washover operations may be necessary if jarring and pulling fails to release the fish. Other options are the use of an internal cutter, chemical cutter of jet cutter. Since each fishing problem is unique these methods can be modified to meet specific requirements of the job. (Heiss-NWWA)
W76-10110

HOW TO DRILL WITHOUT TROUBLESOME DOG-LEGS,
DRILCO, Houston, Tex.
G. E. Wilson.
Drilling-DCW, Vol. 137, No. 9, p 62, June, 1976.

Descriptors: *Drilling equipment, *Rotary drilling, Geologic formations.
Identifiers: *Dog-legs, *Borehole deviation, *Preventative methods, Packed hole assembly, Drill collars, Packed pendulum assembly, Bottomhole assemblies, Borehole stabilizers.

Perfectly vertical holes are virtually impossible to drill using the rotary method. Two logical theories have been stated as to the cause. One concerning the tendency a drill bit has to drill updip in formations with dips up to 40 degrees from horizontal. The other being that the bit can be deflected when weight is applied, due to the bending of the drill stem. Undersized holes and dog-legs can develop as a result of these conditions. The most commonly used methods for preventing crooked holes and dog-legs is the packed hole assembly with large diameter drill collars. A packed hole assembly will decrease the rate of hole deviation, but all assemblies will bend regardless of how stiff they are and angle deviation may still continue to build. In most instances the well will be drilled to a total depth without exceeding maximum deviation limits. When it becomes necessary to reduce inclination from vertical a packed pendulum assembly should be used. Careful study of geological conditions and proper selection of tools and assembly should prevent dog-legs in the borehole. (Heiss-NWWA)
W76-10111

HOW TO GET THE MOST FROM MUD PUMP PARTS,
Reed Tool Co., Houston, Tex.
E. Way.
Drilling-DCW, Vol. 137, No. 9, p 67-68, June, 1976. 3 fig, 2 tab.

Descriptors: *Drilling equipment, Drilling fluids, Maintenance, Hydraulic equipment, Hydraulic valves, Monitoring, Inspection, Reliability, Seals.
Identifiers: *Mud pumps, *Preventive maintenance, Pump valves, Flex lines, Wear gauge.

Mud pump malfunction and downtime is expensive and avoidable. Three groups of individuals, manufactures, contractors, and operators, are involved with mud-pump parts and have a role to play in insuring optimum operation of the pumping system. Attention cannot focus solely on specific pump parts but, rather, must look critically at suction and discharge conditions and equipment as well. Seals, flex lines, pump-input connections and suction lines, and discharge lines must be closely monitored for failure. A wear gauge will show wear better than other simple forms of inspection. Proper tools provided by pump-part manufacturers will extract maximum life at minimum cost from mud-pump parts. Accurate records of pump maintenance will reflect when and where pump part inspections should be made. Parts should be replaced with 'matching components' designed to fit specific mechanisms. These tools, parts and procedures will provide maximum operation life and minimum failure rate in mud pump systems. (Heiss-NWWA)
W76-10112

HOW TO PERFORM A THROUGH-TUBING GRAVEL PACK,
Dowell Div., Tulsa Okla.
D. G. Gurley, M. D. Bowman, and W. R. Landrum.
Drilling-DCW, Vol. 37, No. 9, p 28-30, June, 1976. 2 fig.

Descriptors: *Drilling, *Boreholes, *Wells, *Drilling equipment, Economic efficiency.
Identifiers: Through-tubing gravel pack, *Sand control methods(Wells), Well screen, Gravel packs, Well tubing.

Driller economics, accelerated by the need to produce all wells to their maximum, has created an emphasis on durable sand control systems which do not impair formation permeability. Through-tubing gravel packs are usually applied to wells which have produced for some time and which begin to show unacceptable amounts of sand in the produced fluid. The procudure is also applicable in wells with partial casing collapse or eroded perforations. A through-tubing gravel pack allows all the production packers and tubing to remain undisturbed and no expensive workover rig is required. In most instances the operation is performed with a snubbing unit with concentric tubing and special Dowell mixing and pumping equip-

ment. Gravel and screen selection are two of the most important aspects of designing a gravel pack for maximum productivity. Generally, the smallest gravel possible is used that will not restrict productivity. The most widely used screen for the process is 304 stainless steel, Keystone-shaped wire resistance-welded to stainless steel rods around the inner tubing. Low cost is a major advantage of through-tubing gravel packs over other sand control methods. The through-tubing gravel pack procedure is simple and straight forward. In most cases placement and pack can be performed in one day. (Heiss-NWWA)
W76-10113

HOW TO AVOID DOWNHOLE FAILURES AND MAXIMIZE PIPE USE,
AMF Tuboscope, Inc., Houston, Tex.
W. Rogers.
Drilling-DCW, Vol. 137, No. 9, p 61, June, 1976.

Descriptors: *Drilling equipment, *Inspection, *Quality control, Drilling, Corrosion, Nondestructive tests, Test procedures, Ultrasonics, Electronic equipment.
Identifiers: *Drill pipe, Service induced defects, Magnetic particle inspection.

The high cost of replacement pipe makes maximum use from drill pipe an economic necessity. Inspection can help maximize drill pipe usage and help avoid expensive downhole failures. AMF Tuboscope uses three separate procedures when inspecting drill pipe. Ultrasonic and visual inspection for service-induced defects in the pipe body, electronic end area inspection and magnetic particle inspection monitors the progression and severity of corrosion and/or service damage. The pipe is then classified and identified to customer or American Petroleum Institute-International Association of Drilling Contractors specifications. (Heiss-NWWA)
W76-10114

HOW TO USE A SYSTEMS APPROACH TO COMBAT LOST CIRCULATION,
K. Williams, and E. Williams.
Drilling-DCW, Vol. 137, No. 9, p 73-74, June, 1976. 2 fig.

Descriptors: *Drilling, Drilling fluids, *Boreholes, Geological surveys, Fractures(Geology), *Systems analysis.
Identifiers: *Drilling fluid additives, Lost circulation, Spinner surveys, Temperature surveys, Vugular formations, Unconsolidated formations.

The most effective and inexpensive method for stopping lost circulation is the Systems Approach. The system may consist of only one product or a number of products which when used together act synergistically. The use of the Systems Approach requires adequate information such as local drilling reports, spinner, temperature or radioactive surveys, history of the well field, evaluation of cuttings, geological surveys and well logs from nearby wells. The Systems Approach can be used for sealing fractured, vugular, or unconsolidated formations. (Heiss-NWWA)
W76-10115

HOW TO COPE WITH SULFIDE CORROSION,
D. Reynolds.
Drilling-DCW, Vol. 37, No. 9, p 31, June 1976.

Descriptors: *Corrosion control, *Hydrogen sulfide, Drilling fluids, Sulfates, Drilling equipment.
Identifiers: *Sulfide stress cracking, Hydrogen embrittlement, Thermal degradation, Hatch test, Garrett Gas Train, Corrosion coupons, Corrosion monitoring, Sulfide scavengers, Drill pipe, Copper carbonate, Zinc chromate, Zinc carbonate, Magnitite.

Hydrogen sulfide has been a source of great concern in the oil industry for many years; first as a safety program, but also as cause of sulfide stress cracking and hydrogen embrittlement. The primary source of hydrogen sulfide is produced fluids. However, it may also be produced by the thermal degradation of mud additives or bacterial degradation of sulfates. Methods such as the 'Hatch test', the Garrett Gas Train, acid arsenate, and drill pipe corrosion coupons are used for detection of hydrogen sulfide in drilling muds. The detection of hydrogen sulfide in a drilling fluid is a preliminary step in corrosion control. Next a corrosion control program must be implemented. Generally this consists of raising the mud to a pH of 11.5 with an oil soluble amine for spraying and slugging the drill pipe and a sulfide scavenger. Copper carbonate, zinc chromate, magnitite and zinc carbonate are materials which have been used as sulfide scavengers. (Heiss-NWWA)
W76-10116

HOW TO SAND FRAC MULTIPLE ZONE OPEN HOLE SECTIONS,
L. Sanford.
Drilling-DCW, Vol. 137, No. 9, p 41, June, 1976.

Descriptors: *Drilling equipment, *Fractures(Geology), Boreholes, Wells.
Identifiers: *Inflatable packer system(Wells), *Open-hole fracturing(Wells).

TAM International has developed an inflatable packer system which has been used in several open-hole fracturing operations, with results consistantly equal to cased hole jobs. The design and construction of this new packer allows significantly higher inflating pressures to be used, resulting in a surer packer seat in the hole. The new inflatable packer system is easily used for fracturing multiple zones in one operation. The key to the operation is the ease of which the packers are operated; that is, setting and retrieval. (Heiss-NWWA)
W76-10117

PRINCIPLES AND MEASURING TECHNIQUES OF TURBULENCE CHARACTERISTICS IN OPEN-CHANNEL FLOWS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-10134

POLLUTION-FREE WELL CUTTINGS DISPOSAL APPARATUS,
NL Industries, Inc., New York. (Assignee).
For primary bibliographic entry see Field 5G.
W76-10464

METHOD FOR CONTROLLING SCALE,
Texaco Inc., New York. (Assignee).
For primary bibliographic entry see Field 5G.
W76-10469

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM, A CONDENSED GUIDE TO CHEMICAL HAZARDS,
Coast Guard, Washington, D. C. Office of Marine Environment and Systems.
For primary bibliographic entry see Field 5A.
W76-10047

EFFECTS OF THERMAL AND CHEMICAL DISCHARGES FROM NUCLEAR POWER PLANTS,
Battelle Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5C.
W76-10051

A REVIEW OF THE LITERATURE ON THE USE OF SIMAZINE IN FISHERIES,
Fish and Wildlife Service, LaCrosse, Wis. Fish Pesticide Research Unit.
For primary bibliographic entry see Field 5C.
W76-10052

CONSIDERATIONS ON THE EFFECTS OF HIGH TEMPERATURES ON ALGAE AND FISHES, A LITERATURE REVIEW, 1954,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-10055

POLLUTION EFFECTS ON SURFACE WATERS AND GROUND WATERS, (LITERATURE REVIEW),
Ontario Ministry of the Environment (Toronto).
For primary bibliographic entry see Field 5C.
W76-10104

CANADIAN PARTICIPATION IN THE INTERNATIONAL HYDROLOGICAL DECADE, FINAL REPORT, (VOLUME 2), RESEARCH REPORTS.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
For primary bibliographic entry see Field 2A.
W76-10489

INFORMATION BOOKLET FOR ICEREF, THE BIBLIOGRAPHY OF CANADIAN GLACIERS, GLACIER INVENTORY NOTE NO. 8,
Department of the Environment, Ottawa (Canada). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W76-10494

10D. Specialized Information Center Services

NATIONAL WATER DATA STORAGE AND RETRIEVAL SYSTEM: INSTRUCTIONS FOR PREPARATION AND SUBMISSION OF GROUND-WATER DATA,
Geological Survey, Reston, Va.
C. H. Baker, Jr., and D. G. Foulk.
Open-file report 75-589, November 1975. 127 p, append.

Descriptors: *Data storage and retrieval, *Groundwater resources, *Hydrologic data, *Data processing, Methodology, Groundwater, Water wells, Aquifers, *Data collections.
Identifiers: *National Water Data Storage and Retrieval System(WATSTORE).

The Groundwater File of the Geological Survey's National Water Data Storage and Retrieval System (WATSTORE) contains physical, hydrologic and geologic data about sites where groundwater is, or can be, withdrawn from the aquifer, or sites where potential aquifers are exposed. This report, which pertains to the preparation and submission of data to the groundwater file, is the first of several reports that will explain the groundwater file. The present report is divided into four sections. Section A gives a brief description of the data bases, their logical and physical structure, the storage and retrieval mechanisms used, and the philosophy and methodology adopted for their maintenance. Section B describes the input forms, and gives detailed in-

structions for entering data on the forms in the field or office. Section C deals with the special input procedures and Section D gives instructions for key punching and processing data for input to the data bases. Five appendices contain sample forms and codes used in recording groundwater data and a discussion of input procedures. (Woodard-USGS)
W76-10148

LIBRARY U. OF L. BRANCH

SUBJECT INDEX

ABANDONED FEEDLOTS
Alfalfa Safeguards Ground Water.
W76-10093 5G

ABSORPTION
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

Bodily Distribution, Accumulation and Excretion of Mercury in a Fresh-Water Mussel,
W76-10081 5C

Effects of Environmental Levels of Mercury and Cadmium on Rates of Metal Uptake and Growth Physiology of Selected Genera of Marine Phytoplankton,
W76-10280 5C

Heavy-Metal Concentrations in Selected Georgia Estuarine Organisms with Comparative Food-Habit Data,
W76-10282 5C

Uptake and Elimination of Radiotungsten in Black Bullheads,
W76-10293 5C

Radiocesium Concentrations in Whole-Body Homogenates and Several Body Compartments of Naturally Contaminated White-Tailed Deer,
W76-10304 5C

Relationship Between Potassium Intake and Radiocesium Retention in the Reindeer,
W76-10305 5C

A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

ACCIDENTS
Maritime Consideration of Oil Transportation,
W76-10375 5G

ACID BASE EQUILIBRIUM
Mobilization of Nutrients in Soil by Acids of Sulfur and Chelating Agents,
W76-10316 5B

ACIDIC WATER
Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

Some Effects of Acidified Water on the Early Development of Roach (Rutilus Rutilus L.) and Perch (Perca Fluviatilis L.),
W76-10076 5C

ACTIVATED ALUMINA COLUMNS
Effluent Polishing by Filtration Through Activated Alumina, Volume I.
W76-10491 5D

ACTIVATED SLUDGE
Biochemical and Physical Properties of an Activated Sludge on Settling Characteristics,
W76-10037 5D

Method and Apparatus for the Activated Sludge Treatment of Wastewater,
W76-10208 5D

Hydrogen Peroxide Solves Sludge Odor Problem,
W76-10211 5D

Four-Mode Treatment Plant Will Generate Sodium Hypochlorite Onsite.
W76-10213 5D

Application of Activated Sludge Design and Operation,
W76-10221 5D

Biological Treatment Process in Cold Climates,
W76-10222 5D

Important Considerations in Designing Activated Sludge Processes,
W76-10227 5D

Virus Removal in an Activated Sludge Plant,
W76-10230 5D

Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

Design Criteria for Microscreening Biological Wastewater Plant Effluents,
W76-10232 5D

Anionic and Non-Ionic Surfactant Biodegradation in a Purifying Plant using Activating Muds (Biodegradazione de Tensioattivi Anionici e Non-Ionici in un Impianto di Trattamento a Fanghi Attivati),
W76-10238 5A

Effect of Wastewater Composition and Cell Residence Time on Phosphorus Removal in Activated Sludge,
W76-10239 5D

Fluctuations of the Runoff of Two Activated Sludge Plants and Its Consequences for the Observance of Limit Values (Schwankungen der Ablaeufe Zweier Schlammbelebunsanlagen und Inre Konsequenzen Fuer die Einhaltbarkeit von Grenzwerten),
W76-10242 5D

ADAPTATION
Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

ADENOSINE TRIPHOSPHATE
The Measurement of Adenosine Triphosphate in Pure Algal Cultures and Natural Aquatic Samples,
W76-10133 5A

ADMINISTRATION
Small Sewage Works that Function Satisfactorily,
W76-10228 5D

Systematic Analysis of Field Survey Techniques and Operational Utility of Environmental Research to the Navy,
W76-10356 5G

ADMINISTRATIVE AGENCIES
Maritime Considerations,
W76-10377 5G

ADSORPTION
Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

AERATION
Optimal Allocation of Measurement and Control Resources with Application to River Depollution,
W76-10017 5A

Method and Apparatus for the Activated Sludge Treatment of Wastewater,
W76-10208 5D

Biological Treatment Process in Cold Climates,
W76-10222 5D

Vertical Static Tube Aerators: Evaluating Their Performance,
W76-10223 5D

Diffused Air in Deep Tank Aeration,
W76-10226 5D

Techniques for Power Measurement for Surface Aerator,
W76-10251 5D

AERATION TANKS
Diffused Air in Deep Tank Aeration,
W76-10226 5D

AERIAL RECONNAISSANCE
Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

AEROBIC BACTERIA
Verification Studies of the Biofilm Model for Bacterial Substrate Utilization,
W76-10247 5D

AEROBIC TREATMENT
Application of Activated Sludge Design and Operation,
W76-10221 5D

AGGREGATES
Apparatus and Method for Removing Pollutants from Wastewater,
W76-10200 5D

AGRICULTURE

AGRICULTURE
1975 Arizona Agricultural Statistics.
W76-10187 3F

AHUPUA'A
Compilation and Analysis of Water Quality Rights and Responsibilities in Hawaii,
W76-10001 5G

AIRBORNE LASER SYSTEM
Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

AIRCRAFT
Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

ALASKA
Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

Sampling Marine Organisms and Sediments for High Precision Gas Chromatographic Analysis of Aromatic Hydrocarbons,
W76-10401 5A

ALFALFA
Alfalfa Safeguards Ground Water.
W76-10093 5G

ALGAE
Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

The Measurement of Adenosine Triphosphate in Pure Algal Cultures and Natural Aquatic Samples,
W76-10133 5A

The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

Algae Harvester,
W76-10478 5G

ALGAL BIOASSAY
A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

ALKALINITY
Sodium Bicarbonate Doses Upgrade Plant to '77 Standards.
W76-10233 5D

AMINO ACIDS
Aspects of Physiological Condition in Mytilus Edulis L., with Special Reference to the Effects of Oxygen Tension and Salinity,
W76-10070 5C

The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

Characteristics of the Accumulation of Free Amino Acids by Some Nonsporulating Bacteria from Typical Irrigated Sierozem, (In Russian),
W76-10188 5B

AMMONIA
Nitrogen Removal Depends on Form Nutrient Takes,
W76-10174 5D

AMMUNITION INDUSTRY WASTES
Preliminary Environmental Survey, Newport Army Ammunition Plant, Newport, Indiana, January, 1973,
W76-10056 5C

ANAEROBIC DIGESTION
Assessment of the Maximum Concentration of Heavy Metals in Crude Sewage Which Will Not Inhibit the Anaerobic Digestion of Sludge,
W76-10040 5D

Swine Waste Digestion Enhancement with Nutrient Separation,
W76-10128 5D

ANALYTICAL METHODS
Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop,
W76-10370 5B

Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

ANALYTICAL TECHNIQUES
Computer-Aided Analysis of Environmental Data, Part I: Linear Regression, Precision and Accuracy,
W76-10022 5A

Asymmetry Analysis in Fishes: A Possible Statistical Indicator of Environmental Stress,
W76-10121 5C

The Measurement of Adenosine Triphosphate in Pure Algal Cultures and Natural Aquatic Samples,
W76-10133 5A

Analytical Notes--Electrochemical Method for Early Detection and Monitoring of Coliforms,
W76-10237 5A

Analyzing for Asbestos in Drinking Water,
W76-10240 5A

Important Aspects of Phosphorus Analysis,
W76-10241 5A

Minimization of Core Required in Routing Through a Channel Newtwork,
W76-10243 2E

The Simulation of Sediment Transport,
W76-10244 2J

Water Pollution Sampler Evaluation,
W76-10261 5A

Survey Analyses for Petroleum Derived Hydrocarbons in the Ocean,
W76-10374 5B

Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

Determination of Aromatic Hydrocarbons in Sea Water using an Electrolytic Stripping Cell,
W76-10390 5A

Determination of Aromatic and Total Hydrocarbon Content in Submicrogram and Microgram Quantities in Aqueous Systems by Means of High Performance Liquid Chromatography,
W76-10391 5A

Determination of C1-C10 Hydrocarbons in Water,
W76-10392 5A

Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage,
W76-10399 5A

Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

Analytical Techniques for Isolating and Quantifying Petroleum Paraffin Hydrocarbons in Marine Organisms,
W76-10406 5A

Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

Ohio River Cooling Water Study,
W76-10414 5C

ANEMOMETERS
Principles and Measuring Techniques of Turbulence Characteristics in Open-Channel Flows,
W76-10134 8B

ANEMONIA SP.
The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

ANIMAL METABOLISM
The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

Uptake and Elimination of Radiotungsten in Black Bullheads,
W76-10293 5C

ANIMAL PHYSIOLOGY
On the Relationship Between Oxygen Consumption and Feeding Level in Decapods,
W76-10072 5C

ANNUAL
Seasonal and Annual Variations in the Quantities of Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, and Manganese Reaching the Forest Floor as Mast in Pennsylvania and Vermont Forests,
W76-10306 5B

ANTIFOULING AGENTS
Biological Consideration of a Bioassay System,
W76-10359 5C

APALACHEE BAY (FLORIDA)
Effects of Kraft Mill Effluents on Benthic Macrophyte Assemblages in a Shallow-Bay System (Apalachee Bay, North Florida, U.S.A.),
W76-10077 5C

LIBRARY U. OF I. UNIVERSITY OF

APPLICATION METHODS
Moisture use Efficiency of Dryland Crops as Influenced by Fertilizer Use II. Rabi Cereals,
W76-10186 3F

Reclamation of A Burned Anthracite Refuse Bank with Municipal Sludge,
W76-10249 5E

AQUATIC ALGAE
The Fouling Community as a Field Monitoring Technique,
W76-10354 5C

Algae Harvester,
W76-10478 5G

AQUATIC ANIMALS
Savannah River Biological Survey, South Carolina and Georgia, August, 1954.
W76-10044 5C

AQUATIC BIOLOGY
Ohio River Cooling Water Study,
W76-10414 5C

AQUATIC DRIFT
Movement of Spilled Oil in San Francisco Bay as Predicted by Estuarine Nontidal Drift,
W76-10385 5B

AQUATIC INSECTS
Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

AQUATIC LIFE
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

AQUATIC MICROORGANISMS
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

Deep-Sea Bacteria: Growth and Utilization of Hydrocarbons at Ambient and in Situ Pressure,
W76-10349 5B

Microbial Petroleum Degradation: Use of Mixed Hydrocarbon Substrates,
W76-10350 5B

AQUATIC PLANTS
Savannah River Biological Survey, South Carolina and Georgia, August, 1954.
W76-10044 5C

The Fouling Community as a Field Monitoring Technique,
W76-10354 5C

AQUATIC PRODUCTIVITY
Aquiculture - New Broom Cleans up Wastewater,
W76-10180 5G

AQUICULTURE
Aquiculture - New Broom Cleans up Wastewater,
W76-10180 5G

AQUIFER MANAGEMENT
The Fate of Pollutants in Subsurface Environments,
W76-10253 5B

AQUIFERS
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

The Fate of Pollutants in Subsurface Environments,
W76-10253 5B

Program Esoph - Extended Soph, Simulation of Time-Variant Piezometric Surface in a Confined, Leaky Aquifer Subjected to Pumping.
W76-10498 7C

ARID LANDS
Use of Saline Water in Agriculture. I. Description of the System,
W76-10168 3C

Obstacles to the Development of Arid and Semi-Arid Zones.
W76-10179 3F

ARIZONA
Maps Showing Ground-Water Conditions in the Ranegras Plain and Butler Valley Areas, Yuma County, Arizona--1975,
W76-10149 7C

Arizona's Water Supply-Some Reflections,
W76-10183 4A

1975 Arizona Agricultural Statistics.
W76-10187 3F

Percolation Tests for Septic Tank Suitability in Southern Arizona Soils,
W76-10248 5D

ARKANSAS RIVER (KS)
Special Flood Hazard Information: Arkansas River, Arkansas City, Kansas.
W76-10160 4A

AROCLOR
Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

ARSENIC
Boron and Arsenic Studies in Florida Waters,
W76-10265 5B

Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

ARSENIC COMPOUNDS
Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

ARTIFICIAL RECHARGE
International Survey on Existing Water Recharge Facilities.
W76-10085 4B

ASBESTOS
Analyzing for Asbestos in Drinking Water,
W76-10240 5A

ASPHALT
Recent Developments in the Identification of Asphalts and Other Petroleum Products,
W76-10396 5A

ASYMMETRY ANALYSIS
Asymmetry Analysis in Fishes: A Possible Statistical Indicator of Environmental Stress,
W76-10121 5C

ATLANTIC OCEAN
Deep-Sea Bacteria: Growth and Utilization of Hydrocarbons at Ambient and in Situ Pressure,
W76-10349 5B

Tar Ball Loadings on Golden Beach, Florida,
W76-10379 5B

Tar Ball Sampling in the Western North Atlantic,
W76-10380 5B

Hydrocarbon Concentrations in Seawater along the Halifax-Bermuda Section: Lessons Learned Regarding Sampling and some Results,
W76-10388 5A

Hydrocarbon Content and Chlorophyll Correlation in the Waters Between Nova Scotia and the Gulf Stream,
W76-10389 5B

ATPASE
The Effect of In Vivo Chromium Exposure on Na/K- and Mg-ATPase Activity in Several Tissues of the Rainbow Trout (Salmo Gairdneri),
W76-10337 5C

AUSTIN (TEX)
Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1974,
W76-10145 7C

AUSTRALIA
Comparison of Sheep and Cattle Grazing on Semiarid Grassland,
W76-10181 4C

Interaction of Water Potential and Temperature Effects on Germination of Three Semi-Arid Plant Species,
W76-10185 2I

AUTOMATION
Application of a Computer-Based Chromatograph for Automated Water Pollution Analyses,
W76-10038 5A

AUTUMN
Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

BACTERIA
Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

Characteristics of the Accumulation of Free Amino Acids by Some Nonsporulating Bacteria from Typical Irrigated Sierozem, (In Russian),
W76-10188 5B

Deep-Sea Bacteria: Growth and Utilization of Hydrocarbons at Ambient and in Situ Pressure,
W76-10349 5B

BAKING SODA ADDITIVES
Beneficial Effects of Baking Soda Added to Septic Tanks,
W76-10012 5D

BALANCE OF NATURE
Nutrient Recycling and the Stability of Ecosystems,
W76-10267 5C

BALLAST HANDLING OPERATIONS
Maritime Considerations,
W76-10377 5G

BALSAM MOUNTAINS (NC)
The Quantity and Distribution of Four Nutrient Elements in High-Elevation Forest Ecosystems, Balsam Mountains, North Carolina,
W76-10319 5B

BARLEY
Different Levels of Soil Organic Matter in Desert Soil and Nitrogen Fertilizer on Yields and Mineral Composition of Barley Grown in the Soil,
W76-10170 3F

BARNACLES
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

BARNEGAT BAY (NJ)
Tube-Worm-Sediment Relationships in Populations of Pectinaria Gouldii (Polychaeta: Pectinariidae) from Barnegat Bay, New Jersey,
W76-10061 2L

BASIC DATA COLLECTIONS
Hydrologic Data for Cow Bayou, Brazos River Basin, Texas, 1974,
W76-10146 7C

BASINS
Arizona's Water Supply-Some Reflections,
W76-10183 4A

The Effect of Various Designs of Rain Catching Basins on the Pollution of the Receiving Water and the Economy of the Sewer System (Die Auswirkung Der Verschiedenen Bauarten Von Regenuberlaufbecken Auf Die Schmutzbelastung Des Vorfluters Und Die Wirtschaftlichkeit Des Kanalnetzes),
W76-10198 5D

BAYS
Free Oscillations in Bays and Harbors,
W76-10420 8B

Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

Comparison of Hydraulic and Numerical Tidal Models,
W76-10446 2L

Modeling of Inlet-Bay Systems in Relation to Sand Trapping,
W76-10462 2L

BEACH EROSION
Computer Simulation of Beach Erosion and Profile Modification Due to Waves,
W76-10448 2L

BEACHES
Tar Ball Loadings on Golden Beach, Florida,
W76-10379 5B

Tests on the Equilibrium Probiles of Model Beaches and the Effects of Grain Shape and Size Distribution,
W76-10422 2L

Laboratory Effects in Coastal Movable-Bed Models,
W76-10425 2L

Coastal Mobile Bed Model - Does it Work,
W76-10428 2L

Nearshore Water Circulation Induced by Wind and Waves,
W76-10433 2L

BEAS RIVER (INDIA)
Simulation of Delta Building Process,
W76-10426 2L

BENTHIC FAUNA
Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

Mineral Pathways in Small Appalachian Streams,
W76-10291 5B

BENTHIC ORGANISMS
Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

BENTHOS
Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

Effects of Kraft Mill Effluents on Benthic Macrophyte Assemblages in a Shallow-Bay System (Apalachee Bay, North Florida, U.S.A.),
W76-10077 5C

The Role of Benthic Communities in the Nitrogen and Phosphorus Cycles of an Estuary,
W76-10285 5C

Macrozoobenthos of Water Bodies of the Khazarasp Region of the Khorezm Oblast, (In Russian),
W76-10476 2H

BENZOPYRENE
Standardization of the Content of Benzo(a)-Pyrene in Water Bodies, (In Russian),
W76-10351 5C

BIBLIOGRAPHIES
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

A Review of the Literature on the Use of Simazine in Fisheries,
W76-10052 5C

Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

Pollution Effects on Surface Waters and Ground Waters, (Literature Review),
W76-10104 5C

A Review on Decision Models in Economics of Regional Water Quality Management,
W76-10195 5G

Information Booklet for Iceref, The Bibliography of Canadian Glaciers, Glacier Inventory Note No. 8,
W76-10494 2C

BICARBONATES
Sodium Bicarbonate Doses Upgrade Plant to '77 Standards.
W76-10233 5D

BIG CYPRESS SWAMP (FLA)
Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

BIG SANDY RIVER (KY)
Flood Plain Information: Big Sandy River, Lawrence County, Kentucky.
W76-10159 4A

BIOASSAY
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

The Effect of In Vivo Chromium Exposure on Na/K- and Mg-ATPase Activity in Several Tissues of the Rainbow Trout (Salmo Gairdneri),
W76-10337 5C

Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

The Need for More Intercomparable Field Data and Widely Applicable Short-Term Survey,
W76-10358 5G

Biological Consideration of a Bioassay System,
W76-10359 5C

A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

Byssal Thread Production as a Toxicity Test,
W76-10362 5A

The Activities of Enzymes as Pollution Indicators,
W76-10363 5A

Comparison of Toxicity Tests,
W76-10367 5C

Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

BIOASSAYS

Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

Chemical Problems Encountered in Toxicity Studies,
W76-10364 5B

BIOCHEMICAL OXYGEN DEMAND

Short-Term Regulation of BOD Upsets in an Estuary,
W76-10020 5G

Computer-Aided Analysis of Environmental Data, Part II: Biochemical Oxygen Demand Model,
W76-10023 5A

Designing Microscreens. Here's Some Help,
W76-10033 5D

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

Four-Mode Treatment Plant Will Generate Sodium Hypochlorite Onsite.
W76-10213 5D

Buffering Aids Digestion of Waste.
W76-10218 5D

Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

Biodegradability--An Important Criterion for the Environmental Compatibility of Surfactants and Other Product Compounds,
W76-10235 5A

Fluctuations of the Runoff of Two Activated Sludge Plants and Its Consequences for the Observance of Limit Values (Schwankungen der Ablaeufe Zweier Schlammbelebunsanlagen und Inre Konsequenzen Fuer die Einhaltbarkeit von Grenzwerten),
W76-10242 5D

BIOCIDES

A Review of the Literature on the Use of Simazine in Fisheries,
W76-10052 5C

BIOCONTROL

Nitrogen Removal Depends on Form Nutrient Takes,
W76-10174 5D

BIODEGRADATION

Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

Application of Activated Sludge Design and Operation,
W76-10221 5D

Biodegradability--An Important Criterion for the Environmental Compatibility of Surfactants and Other Product Compounds,
W76-10235 5A

Anionic and Non-Ionic Surfactant Biodegradation in a Purifying Plant using Activating Muds (Biodegradazione de Tensioattivi Anionici e Non-Ionici in un Impianto di Trattamento a Fanghi Attivati),
W76-10238 5A

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

Deep-Sea Bacteria: Growth and Utilization of Hydrocarbons at Ambient and in Situ Pressure,
W76-10349 5B

BIODEGRADION

Litter Production, Decomposition, and Nutrient Cycling in a Mixed Hardwood Watershed and a White Pine Watershed.
W76-10310 5B

BIOFILM MODELS

Verification Studies of the Biofilm Model for Bacterial Substrate Utilization,
W76-10247 5D

BIOGENIC HYDROCARBONS

Hydrocarbon Content and Chlorophyll Correlation in the Waters Between Nova Scotia and the Gulf Stream,
W76-10389 5B

Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

BIOINDICATORS

Bodily Distribution, Accumulation and Excretion of Mercury in a Fresh-Water Mussel,
W76-10081 5C

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

Delta-Amino Levulinic Acid Dehydratase Activity in Fish Blood as an Indicator of a Harmful Exposure to Lead,
W76-10338 5C

The Need for More Intercomparable Field Data and Widely Applicable Short-Term Survey,
W76-10358 5G

The Activities of Enzymes as Pollution Indicators,
W76-10363 5A

Comparison of Toxicity Tests,
W76-10367 5C

Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

Analytical Techniques for Isolating and Quantifying Petroleum Paraffin Hydrocarbons in Marine Organisms,
W76-10406 5A

BIOLOGICAL COMMUNITIES

A Comparison of Growth and Abundance for Tidal Pool Fishes in California and British Columbia,
W76-10064 2L

Mineral Cycling in Marine Ecosystems,
W76-10278 5C

Resource Partitioning in Leaf-Litter Faunas from Hardwood and Hardwood-Converted-To-Pine Forests,
W76-10308 5B

BIOLOGICAL HARVESTING

Harvest of Biological Production as a Means of Improving Effluents form Sewage Lagoons,
W76-10500 5G

BIOLOGICAL TREATMENT

Dynamic Modelling and Control Simulation of a Biological Wastewater Treatment Process,
W76-10018 5D

Treatment and Disposal of Sewage Sludge,
W76-10204 5D

Experiments on Rapid Sand Filtration of Biological Sewage Treatment-Plant Effluents (Untersuchungen Ueber Das Verhalten von Schnell-Sandfiltern Bei der Filtration Eines Biologisch Gereinigten Klaeranlagenablaufs),
W76-10215 5D

Buffering Aids Digestion of Waste.
W76-10218 5D

Application of Activated Sludge Design and Operation,
W76-10221 5D

Biological Treatment Process in Cold Climates,
W76-10222 5D

Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

Design Criteria for Microscreening Biological Wastewater Plant Effluents,
W76-10232 5D

Effect of Wastewater Composition and Cell Residence Time on Phosphorus Removal in Activated Sludge,
W76-10239 5D

Fluctuations of the Runoff of Two Activated Sludge Plants and Its Consequences for the Observance of Limit Values (Schwankungen der Ablaeufe Zweier Schlammbelebunsanlagen und Inre Konsequenzen Fuer die Einhaltbarkeit von Grenzwerten),
W76-10242 5D

Verification Studies of the Biofilm Model for Bacterial Substrate Utilization,
W76-10247 5D

The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

BIOMASS
Effects of Kraft Mill Effluents on Benthic Macrophyte Assemblages in a Shallow-Bay System (Apalachee Bay, North Florida, U.S.A.),
W76-10077 5C

Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

BIOMES
Nutrient Budgets for Undisturbed Ecosystems Along an Elevational Gradient in New Mexico,
W76-10325 5C

BIOTA
Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

Frequency Distributions of Radiocesium Concentrations in Soil and Biota,
W76-10273 5B

BISCAYNE BAY (FLA)
Numerical Simulation of Storm Surges in Bays,
W76-10457 2L

BLOW-OUT PREVENTER EQUIPMENT
Exxon Uses Hands-On Methods to Train Drilling Personnel,
W76-10098 8G

BOREHOLE DEVIATION
Heavy Collars Aid Hole Control,
W76-10102 8G

How to Drill Without Troublesome Dog-Legs,
W76-10111 8G

BOREHOLES
Run Drill Pipe Slower and Reduce Formation Damage,
W76-10097 8G

Heavy Collars Aid Hole Control,
W76-10102 8G

How to Drill Troublesome Shales,
W76-10108 8G

How to Perform a Through-Tubing Gravel Pack,
W76-10113 8G

How to Use a Systems Approach to Combat Lost Circulation,
W76-10115 8G

BORON
Boron and Arsenic Studies in Florida Waters,
W76-10265 5B

BOSTON INNER HARBOR (MASS)
Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

BOTANY BAY (AUSTRALIA)
Portable Breakwater with Ship Hulks,
W76-10459 8B

BOTTOM SEDIMENTS
Tube-Worm-Sediment Relationships in Populations of Pectinaria Gouldii (Polychaeta: Pectinariidae) from Barnegat Bay, New Jersey,
W76-10061 2L

BOTTOMLESS HARBORS
Wave Response of Offshore Bottomless Harbors,
W76-10417 8B

BRACKISH WATER FISH
Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

BREAKWATERS
Wave Induced Loads on Multi-Element Structures,
W76-10458 8B

Portable Breakwater with Ship Hulks,
W76-10459 8B

Analysis of Floating Breakwater Performance,
W76-10460 8B

Reliability of Rubble-Mound Breakwater Stability Models,
W76-10461 8B

BRIDGE BACKWATER
Finite Element Model for Backwater Computation,
W76-10452 8B

BRIDGES
Finite Element Model for Backwater Computation,
W76-10452 8B

BRINES
Selecting Packer Fluids: Here's What to Consider,
W76-10099 8G

BRITISH COLUMBIA
A Comparison of Growth and Abundance for Tidal Pool Fishes in California and British Columbia,
W76-10064 2L

BROOK TROUT
Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

BROWN SHRIMP
Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

BULLHEADS
Uptake and Elimination of Radiotungsten in Black Bullheads,
W76-10293 5C

BYPRODUCTS
Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

BYSSAL THREADS PRODUCTION TEST
Byssal Thread Production as a Toxicity Test,
W76-10362 5A

CABLE TOOL DRILLING
What Type of Rig Should You Buy,
W76-10094 8C

CADMIUM
Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

CADMIUM RADIOISOTIPES
The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

CALCIFICATION
Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

CALCIFICATION RATE
Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

CALCITE
Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

CALCIUM
Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

A Model of Mineral-Element Cycling for an Invertebrate Food Web in a Southeastern Hardwood Forest Litter Community,
W76-10272 5C

The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

CALCIUM CHLORIDE
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

CALIBRATION
Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage,
W76-10399 5A

CALIFORNIA
An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

A Comparison of Growth and Abundance for Tidal Pool Fishes in California and British Columbia,
W76-10064 2L

Flood Plain Information: Soquel Creek, Santa Cruz County, California.
W76-10157 4A

Disease Responses in Southern California Coastal Fishes,
W76-10366 5C

CANADA
Hydrocarbon Content and Chlorophyll Correlation in the Waters Between Nova Scotia and the Gulf Stream,
W76-10389 5B

Canadian Participation in the International Hydrological Decade, Final Report, (Volume 2), Research Reports.
W76-10489 2A

Phosphorus Removal Demonstration Studies at C.F.B. Trenton, Phase II,
W76-10490 5D

Information Booklet for Iceref, The Bibliography of Canadian Glaciers, Glacier Inventory Note No. 8,
W76-10494 2C

Exchange Flow Between Lake Ontario and Hamilton Harbour,
W76-10496 5B

Approach to Glacier Mass-Balance Analysis Utilizing Terrain Characterization,
W76-10499 2C

CARBOHYDRATES ENERGY
The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

CARBON DIOXIDE
Biodegradability--An Important Criterion for the Environmental Compatibility of Surfactants and Other Product Compounds,
W76-10235 5A

CARBON RADIOISOTOPES
Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

CARCINOGENS
Standardization of the Content of Benzo(a)-Pyrene in Water Bodies, (In Russian),
W76-10351 5C

CARIBBEAN SEA
Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

CARP
Distribution of Selected Metals in Tissue Samples of Carp, Cyprinus Carpio,
W76-10082 5C

The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

CATALASE ACTIVITY
Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

CATFISH
The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

CATIONS
The Effect of Nonremoval Clear-Cutting and Pine Reforestation of the Cation Composition of a Hardwood Forest Soil,
W76-10322 4C

Cation Flux in Hardwood and White Pine Watersheds,
W76-10329 5B

CATTLE
Comparison of Sheep and Cattle Grazing on Semiarid Grassland,
W76-10181 4C

CELL DIVISION
Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

CENTER-PIVOT IRRIGATION
Center-Pivot Irrigation,
W76-10173 3F

CENTRIFUGATION
Optimizing Centrifuge Decantation for Sludge Thickening (Optimisation Des Decanteuses Centrifuges Pour La Concentration Des Bous),
W76-10217 5D

CENTRIFUGE DECANTATION
Optimizing Centrifuge Decantation for Sludge Thickening (Optimisation Des Decanteuses Centrifuges Pour La Concentration Des Bous),
W76-10217 5D

CERIUM
Cerium and Cobalt Movement with Litter Leachate in a Forest Soil,
W76-10311 5B

CESIUM
Redistribution of Cesium-137 in Southeastern Watersheds,
W76-10295 5B

Radiocesium Cycling in Vegetation and Soil,
W76-10296 5B

Accumulation and Mobility of Cesium in Roots of Tulip Poplar Seedlings,
W76-10297 5B

Radiocesium Levels in Vegetation Colonizing a Contaminated Flood Plain,
W76-10298 5C

Seasonal Variation in Radiocesium Concentrations in Three Tree Species,
W76-10299 5C

Distribution of Radiocesium in Vegetation Along a Contaminated Stream,
W76-10300 5B

Radiocesium Concentrations in Whole-Body Homogenates and Several Body Compartments of Naturally Contaminated White-Tailed Deer,
W76-10304 5C

Relationship Between Potassium Intake and Radiocesium Retention in the Reindeer,
W76-10305 5C

Fallout Cesium-137 and Mineral-Element Distribution in Food Chains of Granitic-Outcrop Ecosystems,
W76-10307 5B

CHANNELS
Flood Plain Information: Portage Open Bay and Main Ditch, Vicinity of Portageville, Missouri.
W76-10156 4A

CHELATION
Organically Complexed Copper, Zinc, and Chelating Agents in Rivers of Western Puerto Rico,
W76-10292 5B

Mobilization of Nutrients in Soil by Acids of Sulfur and Chelating Agents,
W76-10316 5B

Chemical Problems Encountered in Toxicity Studies,
W76-10364 5B

CHEMICAL ANALYSIS
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

The Measurement of Adenosine Triphosphate in Pure Algal Cultures and Natural Aquatic Samples,
W76-10133 5A

The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

CHEMICAL HAZARDS
Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

CHEMICAL OXYGEN DEMAND
Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

Biodegradability--An Important Criterion for the Environmental Compatibility of Surfactants and Other Product Compounds,
W76-10235 5A

Determination of the Chemical Oxygen Demand (COD) by Potassium Dichromate at Very High Chloride Concentrations (Bestimmung des Chemischen Sauerstoffbedarfs (CSB) Gegen Kaliumdichromat Bei Sehr Hohen Chloridkonzentrationen),
W76-10236 5A

Effect of Wastewater Composition and Cell Residence Time on Phosphorus Removal in Activated Sludge,
W76-10239 5D

The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

CHEMICAL PRECIPITATION
Beneficial Effects of Baking Soda Added to Septic Tanks,
W76-10012 5D

Determination of the Chemical Oxygen Demand (COD) by Potassium Dichromate at Very High Chloride Concentrations (Bestimmung des Chemischen Sauerstoffbedarfs (CSB) Gegen Kaliumdichromat Bei Sehr Hohen Chloridkonzentrationen),
W76-10236 5A

Contribution to Optimizing Chemical Precipitation in Untreated Waste Water Through Control of the Added Flocculant Quantity (Beitrag Zur Optimierung Chemischer Faellung Im Rohabwasser Durch Die Steuerung Der Faellmittelzugabemenge),
W76-10246 5D

Assessment of Polyelectrolytes for Phosphorus Removal,
W76-10492 5D

CHEMICAL PROPERTIES
Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

Effects of Age, Sex, and Pelage Phenotype on the Elemental Composition of the Old-Field Mouse,
W76-10301 5A

Chemical Composition of White-Tailed Deer: Whole-Body Concentrations of Macro- and Micronutrients,
W76-10303 5C

Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

CHEMICAL REACTION
Corrosion,
W76-10095 8G

CHEMICAL REACTIONS
Waste Treatment Process,
W76-10207 5D

CHEMICAL WASTES
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

Preliminary Environmental Survey, Newport Army Ammunition Plant, Newport, Indiana, January, 1973,
W76-10056 5C

Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

Flocculation of Suspended Solids,
W76-10468 5D

Photooxidative Destruction of Organic Wastes,
W76-10472 5D

CHEMICALS
Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

CHEMISTRY
Microbiology and Chemistry Studies of Water Quality Factors in a Watershed Used for Municipal Supply and Waste Disposal,
W76-10263 5B

CHISELLING
Effect of Tillage on Soil Structure and Plant Growth Under Rain-Fed Conditions,
W76-10487 2G

CHLORIDES
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

Determination of the Chemical Oxygen Demand (COD) by Potassium Dichromate at Very High Chloride Concentrations (Bestimmung des Chemischen Sauerstoffbedarfs (CSB) Gegen Kaliumdichromat Bei Sehr Hohen Chloridkonzentrationen),
W76-10236 5A

CHLORINATED HYDROCARBON PESTICIDES
Evaluation of the Army Pesticide Monitoring Program, Evaluation of Data from Environmental Samples Collected Prior to 1 January 1974, Part I, Soil, Sediment, Water,
W76-10048 5A

An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

CHLORINATION
General Considerations in Wastewater Disinfection,
W76-10220 5D

CHLORINE
Chlorine Looks Secure as Water Reagent.
W76-10011 5D

An Instrument with Internal Calibration for Monitoring Chlorine Residuals in Natural Waters,
W76-10028 5A

CHLOROPHYLL
Hydrocarbon Content and Chlorophyll Correlation in the Waters Between Nova Scotia and the Gulf Stream,
W76-10389 5B

CHONDRUS CRISPUS
Photosynthetic Studies of Chondrus Crispus,
W76-10060 5C

CHROMATOGRAPHY
Microbial Petroleum Degradation: Use of Mixed Hydrocarbon Substrates,
W76-10350 5B

Determination of Aromatic and Total Hydrocarbon Content in Submicrogram and Microgram Quantities in Aqueous Systems by Means of High Performance Liquid Chromatography,
W76-10391 5A

Measurement and Characterization of Nonvolatile Hydrocarbons in Ocean Water,
W76-10394 5B

CHROMIUM
Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

The Effect of In Vivo Chromium Exposure on Na/K- and Mg-ATPase Activity in Several Tissues of the Rainbow Trout (Salmo Gairdneri),
W76-10337 5C

Byssal Thread Production as a Toxicity Test,
W76-10362 5A

Interlaboratory Quality Control Study No. 5, Chromium, Iron, Molybdenum and Vanadium,
W76-10493 5A

CLAMS
Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

CLAYS
Selecting Packer Fluids: Here's What to Consider,
W76-10099 8G

The Simulation of Sediment Transport,
W76-10244 2J

CLEAR-CUTTING
Effects of Clear-Cutting on Nutrient Losses in Aspen Forests on Three Soil Types in Michigan,
W76-10315 4C

The Effect of Nonremoval Clear-Cutting and Pine Reforestation of the Cation Composition of a Hardwood Forest Soil,
W76-10322 4C

CLINCH RIVER (VA)
Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

COAGULATION
Assessment of Polyelectrolytes for Phosphorus Removal,
W76-10492 5D

COAL GASIFICATION
Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

Cost Functions for Additional Ground Water Development,
W76-10194 4B

LIBRARY U. OF A. ENVIRONMENTAL SCIENCES

COAL MINE WASTES
An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

COAST GUARD REGULATION
Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

COASTS
Coastal Mobile Bed Model - Does it Work,
W76-10428 2L

Multilayer Hydrodynamical-Numerical Models,
W76-10429 2L

Numerical Simulation of Storm Surges in Bays,
W76-10457 2L

LCHF Coastal Sediment Modeling Techniques,
W76-10463 2L

COBALT
Cerium and Cobalt Movement with Litter Leachate in a Forest Soil,
W76-10311 5B

Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

COCCOLITHOPHORIDS
Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

COLIFORMS
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

Analytical Notes--Electrochemical Method for Early Detection and Monitoring of Coliforms,
W76-10237 5A

COLORADO
Salt-Load Computations--Colorado River; Cameo, Colorado, to Cisco, Utah: Part 2. Basic Data,
W76-10143 7C

Application of a Water Quality Model to the Denver Metropolitan Area,
W76-10438 5B

COLORADO RIVER
Salt-Load Computations--Colorado River; Cameo, Colorado to Cisco, Utah: Part 1. Data Summary,
W76-10142 7C

Salt-Load Computations--Colorado River; Cameo, Colorado, to Cisco, Utah: Part 2. Basic Data,
W76-10143 7C

COLORIMETRY
Important Aspects of Phosphorus Analysis,
W76-10241 5A

COLUMBIA RIVER
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

COMBINED SEWERS
The Influence of the Surface Runoff of Heavy Rains on the Calculation of Sewers (Uber Den Einfluss Des Flachenabflusses Der Starkregen Auf Die Berechung Von Kanalisationen),
W76-10197 5D

The Effect of Various Designs of Rain Catching Basins on the Pollution of the Receiving Water and the Economy of the Sewer System (Die Auswirkung Der Verschiedenen Bauarten Von Regenuberlaufbecken Auf Die Schmutzbelastung Des Vorfluters Und Die Wirtschaftlichkeit Des Kanalnetzes),
W76-10198 5D

COMPETITION
Competition and the Relative Abundances of Two Cladocerans,
W76-10125 2I

COMPREHENSIVE PLANNING
Obstacles to the Development of Arid and Semi-Arid Zones.
W76-10179 3F

An LP-10 Model for Coordinating Multi-Group Inputs in Resource Planning,
W76-10192 6A

COMPUTER MODELS
Computer-Aided Analysis of Environmental Data, Part I: Linear Regression, Precision and Accuracy,
W76-10022 5A

Computer-Aided Modelling of Stream Purification Capacity, Part I: Nonlinear DO Model,
W76-10024 5B

Computer-Aided Modelling of Stream Purification Capacity, Part II: Multiple Linear Correlation Method,
W76-10025 5B

Industrial Research Institute Studying Pollution Problems of Seto Inland Sea,
W76-10031 5B

Cost-Effective Goal,
W76-10032 5D

Minimization of Core Required in Routing Through a Channel Newtwork,
W76-10243 2E

COMPUTER PROGRAMS
Computer-Aided Analysis of Environmental Data, Part I: Linear Regression, Precision and Accuracy,
W76-10022 5A

Computer-Aided Analysis of Environmental Data, Part II: Biochemical Oxygen Demand Model,
W76-10023 5A

Evaluation and Adaptation of Selected Computer Programs to Water Resource Problems in Massachusetts,
W76-10129 7C

Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

Evaluation of the Ciria Prototype Model for the Design of Sewage-Treatment Works,
W76-10245 5D

Program Esoph - Extended Soph, Simulation of Time-Variant Piezometric Surface in a Confined, Leaky Aquifer Subjected to Pumping.
W76-10498 7C

COMPUTERS
Computer Based Control for Wastewater Systems,
W76-10019 5D

CONCORD RIVER (MASS)
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

CONCRETE STRUCTURES
Floating Structure Arrangement,
W76-10465 8A

CONFERENCES
Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop,
W76-10370 5B

CONNATE WATER
Physical Factors Controlling Abundance of Meiofauna on Tidal and Atidal Beaches,
W76-10069 5A

CONSUMPTIVE USE
Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

CONTROL SYSTEMS
Computer Based Control for Wastewater Systems,
W76-10019 5D

COOLING WATER
Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

Ohio River Cooling Water Study,
W76-10414 5C

COPPER
Organically Complexed Copper, Zinc, and Chelating Agents in Rivers of Western Puerto Rico,
W76-10292 5B

Byssal Thread Production as a Toxicity Test,
W76-10362 5A

CORAL FISH
Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

CORIXIDAE
Population Characteristics of a Species Ensemble of Waterboatmen (Corixidae),
W76-10123 2H

CORN (FIELD)
Effect of Tillage on Soil Structure and Plant Growth Under Rain-Fed Conditions,
W76-10487 2G

CORPUS CHRISTI BAY (TEX)
Large-Scale Estuarine Water Quality Matrix Model,
W76-10191 5B

CORRELATION ANALYSIS
Computer-Aided Modelling of Stream Purification Capacity, Part II: Multiple Linear Correlation Method,
W76-10025 5B

Factor Analysis: An Exploratory Technique Applied to Mineral Cycling,
W76-10274 5B

CORROSION
Corrosion,
W76-10095 8G

How to Make Your Drill String Last Longer,
W76-10109 8G

CORROSION CONTROL
Floating Structural Plastic Truss System Protects Waste Lagoon Lining,
W76-10007 5G

Corrosion,
W76-10095 8G

Selecting Packer Fluids: Here's What to Consider,
W76-10099 8G

How to Cope with Sulfide Corrosion,
W76-10116 8G

CORROSION DAMAGE
Corrosion,
W76-10095 8G

COSEISMIC WATER LEVEL CHANGES
Water Wells as Possible Indicators of Tectonic Strain,
W76-10105 8G

COST ANALYSIS
Cost-Effective Goal,
W76-10032 5D

Evaluation of the Ciria Prototype Model for the Design of Sewage-Treatment Works,
W76-10245 5D

Pollutant Analysis Cost Survey,
W76-10259 5A

COST COMPARISONS
Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

A Present Value-Unit Cost Methodology for Evaluating Wastewater Reclamation and Direct Reuse at a Military Base of Operations,
W76-10255 5D

COST FUNCTIONS
Cost Functions for Additional Ground Water Development,
W76-10194 4B

COSTS
Improving the Fuel Value of Sewage Sludge,
W76-10234 5E

COW BAYOU WATERSHED (TEX)
Hydrologic Data for Cow Bayou, Brazos River Basin, Texas, 1974,
W76-10146 7C

CRABS
On the Relationship Between Oxygen Consumption and Feeding Level in Decapods,
W76-10072 5C

A Computer Simulation of Competition Among Five Sympatric Congeneric Species of Xanthid Crabs,
W76-10124 2L

Sampling Marine Organisms and Sediments for High Precision Gas Chromatographic Analysis of Aromatic Hydrocarbons,
W76-10401 5A

CREOSOTE
Anomalous Diurnal Patterns of Stem Xylem Water Potentials in Larrea Tridentata,
W76-10172 2I

CRICOSPHAERA CARTERAE
Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

CRICOSPHAERA SP
Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

CROP PRODUCTION
Center-Pivot Irrigation,
W76-10173 3F

Effect of Cultural Practices on Grain Yield and Yield Components in Irrigated Wheat,
W76-10176 3F

Yield-Nutrient Absorption Relationships as Affected by Environmental Growth Factors,
W76-10184 2I

1975 Arizona Agricultural Statistics.
W76-10187 3F

Effect of Water Regime on Productivity of Cultivated Plants, (In Belorussian),
W76-10189 3F

CROP RESPONSE
Effects of Treated Municipal Wastewater on Oat Forage and Grain,
W76-10119 5D

Solution Phosphorus Concentration and Growth of Rice (Oryza Sativa L.) in Flooded Soils,
W76-10122 3F

Different Levels of Soil Organic Matter in Desert Soil and Nitrogen Fertilizer on Yields and Mineral Composition of Barley Grown in the Soil,
W76-10170 3F

Effect of Cultural Practices on Grain Yield and Yield Components in Irrigated Wheat,
W76-10176 3F

Fertilization, Nutrient Composition, and Yield Relationships in Irrigated Spring Wheat,
W76-10177 3F

Moisture use Efficiency of Dryland Crops as Influenced by Fertilizer Use II. Rabi Cereals,
W76-10186 3F

CROPS
Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

CRUSTACEAN
The Activities of Enzymes as Pollution Indicators,
W76-10363 5A

CRUSTACEANS
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

On the Relationship Between Oxygen Consumption and Feeding Level in Decapods,
W76-10072 5C

Competition and the Relative Abundances of Two Cladocerans,
W76-10125 2I

Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

The Role of Benthic Communities in the Nitrogen and Phosphorus Cycles of an Estuary,
W76-10285 5C

CTENOPHORES
Nitrogen Regeneration by the Ctenophore Mnemiopsis Leidyi,
W76-10284 5C

CULTIVATION
Effect of Tillage on Soil Structure and Plant Growth Under Rain-Fed Conditions,
W76-10487 2G

CUMBERLAND RIVER (KY)
Flood Plain Information: Cumberland River, Burkesville, Kentucky.
W76-10151 4A

CURRENTS (WATER)
Physical Factors Controlling Abundance of Meiofauna on Tidal and Atidal Beaches,
W76-10069 5A

CYANIDE
Process for Decontaminating Sewage Containing Cyanide,
W76-10203 5D

CYANIDES
Potentiometric Determination of Low Levels of Simple and Total Cyanides,
W76-10030 5A

CYANOPHYTA
Nitrogen Fixation by Lichens of the Northern Piedmont,
W76-10327 5C

CYCLING NUTRIENTS
Mineral Cycling in Southeastern Ecosystems.
W76-10266 5C

Nutrient Recycling and the Stability of Ecosystems,
W76-10267 5C

A Theoretical Basis for Ecosystem Analysis with Particular Reference to Element Cycling,
W76-10268 5C

LIBRARY U. OF I. WATER RESOURCES CENTER

A Preliminary Compartment Model of the Nitrogen Cycle in a Deciduous Forest Ecosystem,
W76-10269 5B

A Model of Mineral-Element Cycling for an Invertebrate Food Web in a Southeastern Hardwood Forest Litter Community,
W76-10272 5C

The Role of Physical Modeling in Marsh-Estuarine Mineral-Cycling Research,
W76-10276 5B

Mineral Cycling in Marine Ecosystems,
W76-10278 5C

Nitrogen Regeneration by the Ctenophore Mnemiopsis Leidyi,
W76-10284 5C

The Role of Benthic Communities in the Nitrogen and Phosphorus Cycles of an Estuary,
W76-10285 5C

Nutrient Flux and Cycling in Freshwater Ecosystems,
W76-10287 5C

The Role of Emergent Macrophytes in Mineral Cycling in a Freshwater Marsh,
W76-10289 5C

Mineral Pathways in Small Appalachian Streams,
W76-10291 5B

Resource Partitioning in Leaf-Litter Faunas from Hardwood and Hardwood-Converted-To-Pine Forests,
W76-10308 5B

Forest-Floor Nutrient Dynamics in Southern Appalachian Hardwood and White Pine Plantation Ecosystems,
W76-10309 5B

Litter Production, Decomposition, and Nutrient Cycling in a Mixed Hardwood Watershed and a White Pine Watershed.
W76-10310 5B

Leaching of Nutrients from Leaves of Selected Tree Species in New Hampshire,
W76-10312 5B

Phosphorus Cycling in a Maryland Deciduous Forest Subjected to Various Levels of Mineral-Nutrient Loading,
W76-10313 5B

Mobilization of Nutrients in Soil by Acids of Sulfur and Chelating Agents,
W76-10316 5B

Effects of Tree Species, Temperature, and Soil on Transfer of Manganese-54 from Litter to Roots in a Microcosm,
W76-10317 5C

Aspects of Mineral-Nutrient Cycling in a Southern Mixed-Hardwood Forest in North Central Florida,
W76-10318 5B

Mineral Cycling Strategies of Two Deciduous and Two Evergreen Tree Species on a Southern Appalachian Watershed,
W76-10321 5C

Some Effects of Fertilization on Mineral Cycling in Loblolly Pine,
W76-10323 5C

Influence of Nutrient Availability on Ecosystem Structure,
W76-10324 5C

Nutrient Budgets for Undisturbed Ecosystems Along an Elevational Gradient in New Mexico,
W76-10325 5C

Nutrient Return in the Stemflow and Throughfall of Individual Trees in the Piedmont Deciduous Forest,
W76-10326 5B

Effects of Forest Fires on Atmospheric Loads of Soluble Nutrients,
W76-10328 4C

Cation Flux in Hardwood and White Pine Watersheds,
W76-10329 5B

CYTOLOGICAL STUDIES

Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

Changes in Some Hematological Characteristics of Coho Salmon (Oncorhynchus Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

DANUBE RIVER

Distribution of Selected Metals in Tissue Samples of Carp, Cyprinus Carpio,
W76-10082 5C

DAPHNIA-PARVULA

Competition and the Relative Abundances of Two Cladocerans,
W76-10125 2I

DATA COLLECTION

The Need for More Intercomparable Field Data and Widely Applicable Short-Term Survey,
W76-10358 5G

Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop,
W76-10370 5B

DATA COLLECTIONS

Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

National Water Data Storage and Retrieval System: Instructions for Preparation and Submission of Ground-Water Data,
W76-10148 10D

Systematic Analysis of Field Survey Techniques and Operational Utility of Environmental Research to the Navy,
W76-10356 5G

Marine Pollution Data Archiving and Exchange,
W76-10376 5A

DATA PROCESSING

Evaluation and Adaptation of Selected Computer Programs to Water Resource Problems in Massachusetts,
W76-10129 7C

National Water Data Storage and Retrieval System: Instructions for Preparation and Submission of Ground-Water Data,
W76-10148 10D

DATA STORAGE AND RETRIEVAL

National Water Data Storage and Retrieval System: Instructions for Preparation and Submission of Ground-Water Data,
W76-10148 10D

Minimization of Core Required in Routing Through a Channel Newtwork,
W76-10243 2E

DATA TRANSMISSION

Marine Pollution Data Archiving and Exchange,
W76-10376 5A

DDD

An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

DDE

An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

DDT

An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

DECIDUOUS FORESTS

A Preliminary Compartment Model of the Nitrogen Cycle in a Deciduous Forest Ecosystem,
W76-10269 5B

Phosphorus Cycling in a Maryland Deciduous Forest Subjected to Various Levels of Mineral-Nutrient Loading,
W76-10313 5B

Effects of Clear-Cutting on Nutrient Losses in Aspen Forests on Three Soil Types in Michigan,
W76-10315 4C

Significance of Biological Nitrogen Fixation and Denitrification in a Deciduous Forest Ecosystem,
W76-10320 5B

Nutrient Return in the Stemflow and Throughfall of Individual Trees in the Piedmont Deciduous Forest,
W76-10326 5B

DECISION MAKING
Models for Evaluation of Hazardous Wastes,
W76-10190 5B

DECOMPOSING ORGANIC MATTER
Alfalfa Safeguards Ground Water.
W76-10093 5G

A Model of Mineral-Element Cycling for an Invertebrate Food Web in a Southeastern Hardwood Forest Litter Community,
W76-10272 5C

DEEP TILLAGE
Effect of Tillage on Soil Structure and Plant Growth Under Rain-Fed Conditions,
W76-10487 2G

DEER
Chemical Composition of White-Tailed Deer: Whole-Body Concentrations of Macro- and Micronutrients,
W76-10303 5C

Radiocesium Concentrations in Whole-Body Homogenates and Several Body Compartments of Naturally Contaminated White-Tailed Deer,
W76-10304 5C

DEGRADATION (DECOMPOSITION)
Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

Microbial Petroleum Degradation: Use of Mixed Hydrocarbon Substrates,
W76-10350 5B

DEGRADATION (STREAM)
Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

DEHYDROABIETIC ACID (DHAA)
Changes in Some Hematological Characteristics of Coho Salmon (Oncorhynchus Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

DELAWARE
Flood Plain Information: Pike Creek, New Castle County, Delaware.
W76-10165 4A

DELAWARE RIVER
A Discussion of the Effects of Certain Potential Toxicants on Fish and Shellfish in the Upper Delaware Estuary,
W76-10352 5C

DELAWARE RIVER ESTUARY SYSTEM
A Discussion of the Effects of Certain Potential Toxicants on Fish and Shellfish in the Upper Delaware Estuary,
W76-10352 5C

DELTAS
Simulation of Delta Building Process,
W76-10426 2L

DEMINERALIZATION
Water Softener,
W76-10475 5F

Water Conditioning Apparatus,
W76-10480 5F

DENITRIFICATION
Significance of Biological Nitrogen Fixation and Denitrification in a Deciduous Forest Ecosystem,
W76-10320 5B

DENMARK
Computations of Harbor Oscillations by Ray Methods,
W76-10421 8B

DENVER (COLO)
Application of a Water Quality Model to the Denver Metropolitan Area,
W76-10438 5B

DEPOSITION (SEDIMENTS)
Oil Pollution Along the Indian Coastline,
W76-10386 5B

Modeling Sediment Deposition in a Tidal River,
W76-10447 2L

Modelling of Suspension Currents,
W76-10449 5B

DESALINATION
Composite Semipermeable Membranes Made from Polyethylenimine,
W76-10485 3A

DESCALING AGENTS
Biological Consideration of a Bioassay System,
W76-10359 5C

DESERT PLANTS
Water Expenditure on Transpiration by Plants Communities Dominant in Eastern Kara Kum, (In Russian),
W76-10341 2D

DESIGN CRITERIA
Design of a Stormwater Sewer by Nonlinear Programming--1,
W76-10034 5D

Design A River Basin Sampling System,
W76-10131 5A

Design Criteria for Microscreening Biological Wastewater Plant Effluents,
W76-10232 5D

DETERGENTS
Effect of Surfactants on the Spectrophotometric Determination of Phosphate by Direct and Extraction Procedures,
W76-10027 5A

DEVELOPING COUNTRIES
Field Research and Testing of a Water Hand Pump for use in Developing Countries,
W76-10086 8G

DEWATERING
Mathematical Model Simplifies Design of Sludge Drying Beds,
W76-10035 5D

Hydrogen Peroxide Solves Sludge Odor Problem,
W76-10211 5D

DIATOMS
Savannah River Biological Survey, South Carolina and Georgia, August, 1954.
W76-10044 5C

Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

DIELDRIN
Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

DIFFUSION
Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

DINOFLAGELLATES
Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

DISINFECTION
Chlorine Looks Secure as Water Reagent.
W76-10011 5D

General Considerations in Wastewater Disinfection,
W76-10220 5D

DISPERSION
Scientific Problems of the Systems for Global Monitoring and Investigation of Oil Pollution in the World Ocean,
W76-10372 5B

Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

Two-Dimensional Finite Element Dispersion Model,
W76-10453 5B

DISSOLVED ORGANIC COMPOUNDS
The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

DISSOLVED OXYGEN
Computer-Aided Modelling of Stream Purification Capacity, Part I: Nonlinear DO Model,
W76-10024 5B

Computer-Aided Modelling of Stream Purification Capacity, Part II: Multiple Linear Correlation Method,
W76-10025 5B

Aspects of Physiological Condition in Mytilus Edulis L., with Special Reference to the Effects of Oxygen Tension and Salinity,
W76-10070 5C

Planning Implications of Dissolved Oxygen Depletion in the Willamette River, Oregon,
W76-10332 5G

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

DISTRIBUTION
Redistribution of Cesium-137 in Southeastern Watersheds,
W76-10295 5B

Radiocesium Concentrations in Whole-Body Homogenates and Several Body Compartments of Naturally Contaminated White-Tailed Deer,
W76-10304 5C

ISTRIBUTION PATTERNS
Effects of Kraft Mill Effluents on Benthic Macrophyte Assemblages in a Shallow-Bay System (Apalachee Bay, North Florida, U.S.A.),
W76-10077 5C

Frequency Distributions of Radiocesium Concentrations in Soil and Biota,
W76-10273 5B

OG-LEGS
How to Drill Without Troublesome Dog-Legs,
W76-10111 8G

OMESTIC WASTES
Beneficial Effects of Baking Soda Added to Septic Tanks,
W76-10012 5D

Virus Removal in an Activated Sludge Plant,
W76-10230 5D

OMINANT ORGANISMS
Effects of Kraft Mill Effluents on Benthic Macrophyte Assemblages in a Shallow-Bay System (Apalachee Bay, North Florida, U.S.A.),
W76-10077 5C

RAINAGE SYSTEMS
The Influence of the Surface Runoff of Heavy Rains on the Calculation of Sewers (Uber Den Einfluss Des Flachenabflusses Der Starkregen Auf Die Berechung Von Kanalisationen),
W76-10197 5D

RAWDOWN
Change in Drawdown Caused by Enlarging a Well in a Dolomite Aquifer,
W76-10088 4B

RILL MONITORS
Recording Equipment Booster.
W76-10091 8G

RILL PIPE
How to Avoid Downhole Failures and Maximize Pipe Use,
W76-10114 8G

RILL STRING WEAR
How to Make Your Drill String Last Longer,
W76-10109 8G

RILLING
Change in Drawdown Caused by Enlarging a Well in a Dolomite Aquifer,
W76-10088 4B

What Type of Rig Should You Buy,
W76-10094 8C

Exxon Uses Hands-On Methods to Train Drilling Personnel,
W76-10098 8G

Heavy Collars Aid Hole Control,
W76-10102 8G

How to Make Your Drill String Last Longer,
W76-10109 8G

How to Perform a Through-Tubing Gravel Pack,
W76-10113 8G

How to Use a Systems Approach to Combat Lost Circulation,
W76-10115 8G

Pollution-Free Well Cuttings Disposal Apparatus,
W76-10464 5G

DRILLING EQUIPMENT
Recording Equipment Booster.
W76-10091 8G

Run Drill Pipe Slower and Reduce Formation Damage,
W76-10097 8G

Tubing-Casing Reclamation Saved Shell Over $3 Million,
W76-10101 8G

Heavy Collars Aid Hole Control,
W76-10102 8G

How to Make Your Drill String Last Longer,
W76-10109 8G

How to Free a Stuck String,
W76-10110 8G

How to Drill Without Troublesome Dog-Legs,
W76-10111 8G

How to Get the Most from Mud Pump Parts,
W76-10112 8G

How to Perform a Through-Tubing Gravel Pack,
W76-10113 8G

How to Avoid Downhole Failures and Maximize Pipe Use,
W76-10114 8G

How to Sand Frac Multiple Zone Open Hole Sections,
W76-10117 8G

DRILLING FLUID ADDITIVES
How to Use a Systems Approach to Combat Lost Circulation,
W76-10115 8G

DRILLING FLUIDS
Selecting Packer Fluids: Here's What to Consider,
W76-10099 8G

How to Drill Troublesome Shales,
W76-10108 8G

DRILLING RATE
Recording Equipment Booster.
W76-10091 8G

DRILLING RECORDER
Recording Equipment Booster.
W76-10091 8G

DRY FARMING
Moisture use Efficiency of Dryland Crops as Influenced by Fertilizer Use II. Rabi Cereals,
W76-10186 3F

DUCT-FLOW FLUIDIZATION
Analytical Model of Duct-Flow Fluidization,
W76-10450 8B

DUNES
Time Growth of Tidal Dunes in a Physical Model,
W76-10424 2L

EARTH WATCH
United Nations Environment Program Earthwatch and Marine Pollution,
W76-10371 5B

EARTHQUAKES
Water Wells as Possible Indicators of Tectonic Strain,
W76-10105 8G

EAST ARM LITTLE CALUMET RIVER (IN)
Flood Plain Information: East Arm Little Calumet River, Salt Creek-Coffee Creek, Porter County, Indiana.
W76-10152 4A

ECOLOGY
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

Mineral Cycling in Southeastern Ecosystems.
W76-10266 5C

ECONOMIC ANALYSIS
Urban Service Pricing and Land Use: Some Preliminary Results,
W76-10193 6C

ECOSYSTEMS
Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

Mineral Cycling in Southeastern Ecosystems.
W76-10266 5C

Nutrient Recycling and the Stability of Ecosystems,
W76-10267 5C

A Theoretical Basis for Ecosystem Analysis with Particular Reference to Element Cycling,
W76-10268 5C

A Preliminary Compartment Model of the Nitrogen Cycle in a Deciduous Forest Ecosystem,
W76-10269 5B

Factor Analysis: An Exploratory Technique Applied to Mineral Cycling,
W76-10274 5B

Nutrient Budgets for Undisturbed Ecosystems Along an Elevational Gradient in New Mexico,
W76-10325 5C

EELGRASS
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

EFFICIENCIES
Diffused Air in Deep Tank Aeration,
W76-10226 5D

Techniques for Power Measurement for Surface Aerator,
W76-10251 5D

Effluent Polishing by Filtration Through Activated Alumina, Volume I.
W76-10491 5D

EFFLUENT POLISHING
Effluent Polishing by Filtration Through Activated Alumina, Volume I.
W76-10491 5D

EL PASO AREA (TEX)
Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

ELECTRICAL DESIGN
Techniques for Power Measurement for Surface Aerator,
W76-10251 5D

ELECTRICAL PROPERTIES
Techniques for Power Measurement for Surface Aerator,
W76-10251 5D

ELECTRICAL RESISTIVITY
Electrical Water Prospecting.
W76-10090 4B

ELECTROCHEMICAL METHODS
Analytical Notes--Electrochemical Method for Early Detection and Monitoring of Coliforms.
W76-10237 5A

ELECTROCHEMISTRY
Analytical Notes--Electrochemical Method for Early Detection and Monitoring of Coliforms.
W76-10237 5A

ELECTRODES
Potentiometric Determination of Low Levels of Simple and Total Cyanides,
W76-10030 5A

ELECTRON MICROSCOPY
Analyzing for Asbestos in Drinking Water,
W76-10240 5A

ELM CREEK (TEX)
Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1974,
W76-10144 7C

ELODEA
The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

EMULSIONS
Selecting Packer Fluids: Here's What to Consider,
W76-10099 8G

ENERGY
Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

ENERGY BUDGET
Mineral Pathways in Small Appalachian Streams,
W76-10291 5B

Nutrient Budgets for Undisturbed Ecosystems Along an Elevational Gradient in New Mexico,
W76-10325 5C

ENERGY CONVERSION
An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

ENGINEERING STRUCTURES
Floating Structure Arrangement,
W76-10465 8A

ENVIRONMENTAL CONTROL
Proceedings of the Conference on Marine Biology in Environmental Protection Held at San Clemente Island, California on 13-15 November, 1973.
W76-10353 5C

ENVIRONMENTAL EFFECTS
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

Mineral Cycling in Southeastern Ecosystems.
W76-10266 5C

Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

ENVIRONMENTAL ENGINEERING
Models for Evaluation of Hazardous Wastes,
W76-10190 5B

Large-Scale Estuarine Water Quality Matrix Model,
W76-10191 5B

LSW-500 Disposal of Air Force Liquid Wastes,
W76-10258 5E

Proceedings of the Conference on Marine Biology in Environmental Protection Held at San Clemente Island, California on 13-15 November, 1973.
W76-10353 5C

ENZYME ACTIVITY MEASUREMENTS
The Activities of Enzymes as Pollution Indicators,
W76-10363 5A

ENZYMES
A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

The Effect of In Vivo Chromium Exposure on Na/K- and Mg-ATPase Activity in Several Tissues of the Rainbow Trout (Salmo Gairdneri),
W76-10337 5C

Delta-Amino Levulinic Acid Dehydratase Activity in Fish Blood as an Indicator of a Harmful Exposure to Lead,
W76-10338 5C

Proceedings of the Conference on Marine Biology in Environmental Protection Held at San Clemente Island, California on 13-15 November, 1973.
W76-10353 5C

The Activities of Enzymes as Pollution Indicators,
W76-10363 5A

EQUATIONS
Assessment of the Maximum Concentration of Heavy Metals in Crude Sewage Which Will Not Inhibit the Anaerobic Digestion of Sludge,
W76-10040 5D

EQUILIBRIUM
A Theoretical Basis for Ecosystem Analysis with Particular Reference to Element Cycling,
W76-10268 5C

EROSION CONTROL
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

EROSION RATES
Nutrient Losses in Particulate Form as Weir Pond Sediments from Four Unit Watersheds in the Southern Appalachians,
W76-10330 5C

ESTUARIES
Ecosystems Analysis of the Big Cypress Swamp and Estuaries,
W76-10046 6G

Large-Scale Estuarine Water Quality Matrix Model,
W76-10191 5B

The Role of Physical Modeling in Marsh-Estuarine Mineral-Cycling Research,
W76-10276 5B

Distribution of Copper and Zinc in Oysters and Sediments from Three Coastal-Plain Estuaries,
W76-10279 5C

The Role of Spartina Alterniflora in the Flow of Lead, Cadmium, and Copper Through the Salt-Marsh Ecosystem,
W76-10281 5C

Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

Nitrogen Regeneration by the Ctenophore Mnemiopsis Leidyi,
W76-10284 5C

The Role of Benthic Communities in the Nitrogen and Phosphorus Cycles of an Estuary,
W76-10285 5C

A Discussion of the Effects of Certain Potential Toxicants on Fish and Shellfish in the Upper Delaware Estuary,
W76-10352 5C

Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

Measured Contributions of the Terms of the Vertically Integrated Hydrodynamic Equations,
W76-10442 2L

Simulation of the Salinity Distribution in the St. Lawrence Estuary by a Two-Dimensional Mathematical Model,
W76-10443 5B

Overview of Physical Estuary Practice,
W76-10444 2L

Modeling Sediment Deposition in a Tidal River,
W76-10447 2L

FLOW2D: A Two-Dimensional Flow Model for Flood Plains and Estuaries,
W76-10454 2L

ESTUARINE ENVIRONMENT
A Discussion of the Effects of Certain Potential Toxicants on Fish and Shellfish in the Upper Delaware Estuary,
W76-10352 5C

Problems and Techniques of Marine Biology in the Field: Modeling the Marine Ecosystem,
W76-10355 5C

ESTUARY
Heavy-Metal Concentrations in Selected Georgia Estuarine Organisms with Comparative Food-Habit Data,
W76-10282 5C

EUTROPHICATION
Selective Renovation of Eutrophic Wastes Phosphate Removal,
W76-10026 5D

Water Quality Data from Truckee and Carson Rivers. Pyramid Lake and Lahontan Reservoir, A Working Paper.
W76-10054 5C

EVAPORATION
A Model of Water Content and Evaporation for Hardwood Leaf Litter,
W76-10270 2D

EVAPOTRANSPIRATION
Water Expenditure on Transpiration by Plants Communities Dominant in Eastern Kara Kum, (In Russian),
W76-10341 2D

EVERGLADES (FLA)
Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

EVERGREEN TREES
Mineral Cycling Strategies of Two Deciduous and Two Evergreen Tree Species on a Southern Appalachian Watershed,
W76-10321 5C

EXCAVATION
Analytical Model of Duct-Flow Fluidization,
W76-10450 8B

EXCHANGE FLOW (LAKES)
Exchange Flow Between Lake Ontario and Hamilton Harbour,
W76-10496 5B

EXPERIMENTAL ANIMALS
Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

EXTRACTION METHOD
Effect of Surfactants on the Spectrophotometric Determination of Phosphate by Direct and Extraction Procedures,
W76-10027 5A

FACTOR ANALYSIS
Factor Analysis: An Exploratory Technique Applied to Mineral Cycling,
W76-10274 5B

FALLOUT
Fallout Cesium-137 and Mineral-Element Distribution in Food Chains of Granitic-Outcrop Ecosystems,
W76-10307 5B

FARM WASTES
Swine Waste Digestion Enhancement with Nutrient Separation,
W76-10128 5D

FATHEAD MINNOW
Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

FAULTS (GEOLOGY)
Predicting Productive Trends Related to Wrench Faults,
W76-10100 8E

FAUNA
Physical Factors Controlling Abundance of Meiofauna on Tidal and Atidal Beaches,
W76-10069 5A

FECAL POLLUTION
Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah,
W76-10171 5G

FEDERAL WATER POLLUTION CONTROL ACT
Operation and Impact of NPDES in Region II, Part I,
W76-10005 5G

FEEDING RATES
Aspects of Physiological Condition in Mytilus Edulis L., with Special Reference to the Effects of Oxygen Tension and Salinity,
W76-10070 5C

On the Relationship Between Oxygen Consumption and Feeding Level in Decapods,
W76-10072 5C

Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

FERROMAGNETIC POLYMERS
Filtration Process,
W76-10473 5D

FERTILIZATION
Effects of Treated Municipal Wastewater on Oat Forage and Grain,
W76-10119 5D

Fertilization, Nutrient Composition, and Yield Relationships in Irrigated Spring Wheat,
W76-10177 3F

Reclamation of A Burned Anthracite Refuse Bank with Municipal Sludge,
W76-10249 5E

Some Effects of Fertilization on Mineral Cycling in Loblolly Pine,
W76-10323 5C

FERTILIZERS
Moisture use Efficiency of Dryland Crops as Influenced by Fertilizer Use II. Rabi Cereals,
W76-10186 3F

FIELD RESEARCH AND TESTING
Field Research and Testing of a Water Hand Pump for use in Developing Countries,
W76-10086 8G

FILMS
Verification Studies of the Biofilm Model for Bacterial Substrate Utilization,
W76-10247 5D

FILTRATION
Waste Treatment Process,
W76-10207 5D

Experiments on Rapid Sand Filtration of Biological Sewage Treatment-Plant Effluents (Untersuchungen Ueber Das Verhalten von Schnell-Sandfiltern Bei der Filtration Eines Biologisch Gereinigten Klaeranlagenablaufs),
W76-10215 5D

Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

Effluent Polishing by Filtration Through Activated Alumina, Volume I.
W76-10491 5D

FIN EROSION
Disease Responses in Southern California Coastal Fishes,
W76-10366 5C

FINITE DIFFERENCE MODEL
Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

FINITE ELEMENT ANALYSIS
Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

Two-Dimensional Finite Element Dispersion Model,
W76-10453 5B

FISH
Heavy-Metal Concentrations in Selected Georgia Estuarine Organisms with Comparative Food-Habit Data,
W76-10282 5C

Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

FISH BEHAVIOR
Influence of Temperature and Salinity on Routine Metabolic Rate and Growth of Young Atlantic Menhaden,
W76-10063 5C

Asymmetry Analysis in Fishes: A Possible Statistical Indicator of Environmental Stress,
W76-10121 5C

Pikes (Esox Lucius L.) Shown to be Affected by Low pH Values During First Weeks After Hatching,
W76-10343 5C

Low Thermal Responsiveness in the Bluegill, Lepomis Macrochirus,
W76-10369 5C

FISH DISEASES
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

Disease Responses in Southern California Coastal Fishes,
W76-10366 5C

FISH EGGS
Some Effects of Acidified Water on the Early Development of Roach (Rutilus Rutilus L.) and Perch (Perca Fluviatilis L.),
W76-10076 5C

FISH GENETICS
Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

FISH PHYSIOLOGY
Effects of Hyperbaric Pressure on Oxygen Concentration in the Swim Bladder of Poecilia Latipinna,
W76-10066 5C

Changes in Some Hematological Characteristics of Coho Salmon (Oncorhynchus Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

The Effect of In Vivo Chromium Exposure on Na/K- and Mg-ATPase Activity in Several Tissues of the Rainbow Trout (Salmo Gairdneri),
W76-10337 5C

The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

FISH POPULATIONS
A Comparison of Growth and Abundance for Tidal Pool Fishes in California and British Columbia,
W76-10064 2L

FISH TOXINS
Asymmetry Analysis in Fishes: A Possible Statistical Indicator of Environmental Stress,
W76-10121 5C

FISHING OPERATIONS
How to Free a Stuck String,
W76-10110 8G

FISHKILL
Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

FJORDS
Comparison Between Physical and Mathematical Modelling of a Tidal Fjord System in Northern Norway,
W76-10445 2L

FLASH FLOODS
Flood Plain Information: Crooked Creek and Williams Creek, Marion County, Indiana.
W76-10154 4A

FLOATING BREAKWATERS
Analysis of Floating Breakwater Performance,
W76-10460 8B

FLOATING PLANTS
Quantitative Monitoring and Variability of Pelagic Tar in the North Atlantic,
W76-10378 5B

FLOCCULATION
Beneficial Effects of Baking Soda Added to Septic Tanks,
W76-10012 5D

Biochemical and Physical Properties of an Activated Sludge on Settling Characteristics,
W76-10037 5D

Contribution to Optimizing Chemical Precipitation in Untreated Waste Water Through Control of the Added Flocculant Quantity (Beitrag Zur Optimierung Chemischer Faellung Im Rohabwasser Durch Die Steuerung Der Faellmittelzugabemenge),
W76-10246 5D

FLOOD CONTROL
Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1974,
W76-10144 7C

Hydrologic Data for Cow Bayou, Brazos River Basin, Texas, 1974,
W76-10146 7C

Hydrologic Data for North Creek Trinity River Basin, Texas, 1974,
W76-10147 7C

FLOOD DATA
Flood Plain Information: Soquel Creek, Santa Cruz County, California.
W76-10157 4A

FLOOD FLOW
Flood Plain Information: Cumberland River, Burkesville, Kentucky.
W76-10151 4A

Flood Plain Information: Crooked Creek and Williams Creek, Marion County, Indiana.
W76-10154 4A

Flood Plain Information: Soquel Creek, Santa Cruz County, California.
W76-10157 4A

Flood Plain Information: Lynn Camp and East Fork Lynn Camp Creeks, Corbin, Kentucky.
W76-10163 4A

Flood Plain Information: Clear Creek-Mulberry Creek, Vicinity of Shelbyville, Kentucky.
W76-10164 4A

Flood Plain Information: Dry Turkey and Bull Creeks, McPherson, Kansas.
W76-10167 4A

FLOOD FORECASTING
Flood Plain Information: Big Sandy River, Lawrence County, Kentucky.
W76-10159 4A

Flood Plain Information: North Fork Kentucky River and Trace Fork, Vicinity of Hazard, Kentucky.
W76-10166 4A

FLOOD PEAK
Flood Plain Information: Soquel Creek, Santa Cruz County, California.
W76-10157 4A

Flood Plain Information: South Fork Salt River and Davis Creek, Mexico, Missouri.
W76-10158 4A

Flood Plain Information: Clear Creek-Mulberry Creek, Vicinity of Shelbyville, Kentucky.
W76-10164 4A

FLOOD PLAIN MANAGEMENT
Special Flood Hazard Information: Labette and Little Labette Creeks, Parsons, Kansas.
W76-10161 4A

FLOOD PLAIN ZONING
Flood Plain Information: East Arm Little Calumet River, Salt Creek-Coffee Creek, Porter County, Indiana.
W76-10152 4A

FLOOD PLAINS
Flood Plain Information: Cumberland River, Burkesville, Kentucky.
W76-10151 4A

Flood Plain Information: Little Eagle Creek and Tributaries, Marion County, Indiana.
W76-10153 4A

Flood Plain Information: Crooked Creek and Williams Creek, Marion County, Indiana.
W76-10154 4A

Flood Plain Information: Turkey and Joplin Creeks, Joplin, Missouri.
W76-10155 4A

Flood Plain Information: South Fork Salt River and Davis Creek, Mexico, Missouri.
W76-10158 4A

Flood Plain Information: Big Sandy River, Lawrence County, Kentucky.
W76-10159 4A

Special Flood Hazard Information: Arkansas River, Arkansas City, Kansas.
W76-10160 4A

Special Flood Hazard Information: Labette and Little Labette Creeks, Parsons, Kansas.
W76-10161 4A

Special Flood Hazard Information: Whiskey and Rock Creeks, Independence, Kansas.
W76-10162 4A

Flood Plain Information: Clear Creek-Mulberry Creek, Vicinity of Shelbyville, Kentucky.
W76-10164 4A

Flood Plain Information: Pike Creek, New Castle County, Delaware.
W76-10165 4A

Flood Plain Information: North Fork Kentucky River and Trace Fork, Vicinity of Hazard, Kentucky.
W76-10166 4A

Flood Plain Information: Dry Turkey and Bull Creeks, McPherson, Kansas.
W76-10167 4A

Finite Element Model for Backwater Computation,
W76-10452 8B

FLOW2D: A Two-Dimensional Flow Model for Flood Plains and Estuaries,
W76-10454 2L

Change of Water Regime and Content of Mobile Forms of N, K, Mn and Fe in Meadow-Peat Soil of the Ramensk Floodplain of the Moscow River in Connection with Agricultural Use, (In Russian),
W76-10477 2G

FLOOD PROFILES
Flood Plain Information: Cumberland River, Burkesville, Kentucky.
W76-10151 4A

Flood Plain Information: Turkey and Joplin Creeks, Joplin, Missouri.
W76-10155 4A

Flood Plain Information: Portage Open Bay and Main Ditch, Vicinity of Portageville, Missouri.
W76-10156 4A

Flood Plain Information: Soquel Creek, Santa Cruz County, California.
W76-10157 4A

Flood Plain Information: South Fork Salt River and Davis Creek, Mexico, Missouri.
W76-10158 4A

Flood Plain Information: Big Sandy River, Lawrence County, Kentucky.
W76-10159 4A

Special Flood Hazard Information: Arkansas River, Arkansas City, Kansas.
W76-10160 4A

Special Flood Hazard Information: Labette and Little Labette Creeks, Parsons, Kansas.
W76-10161 4A

Special Flood Hazard Information: Whiskey and Rock Creeks, Independence, Kansas.
W76-10162 4A

Flood Plain Information: Lynn Camp and East Fork Lynn Camp Creeks, Corbin, Kentucky.
W76-10163 4A

Flood Plain Information: Clear Creek-Mulberry Creek, Vicinity of Shelbyville, Kentucky.
W76-10164 4A

Flood Plain Information: Dry Turkey and Bull Creeks, McPherson, Kansas.
W76-10167 4A

FLOOD PROTECTION
Flood Plain Information: East Arm Little Calumet River, Salt Creek-Coffee Creek, Porter County, Indiana.
W76-10152 4A

Flood Plain Information: Little Eagle Creek and Tributaries, Marion County, Indiana.
W76-10153 4A

Special Flood Hazard Information: Whiskey and Rock Creeks, Independence, Kansas.
W76-10162 4A

FLOOD STAGES
Flood Plain Information: Little Eagle Creek and Tributaries, Marion County, Indiana.
W76-10153 4A

Flood Plain Information: Crooked Creek and Williams Creek, Marion County, Indiana.
W76-10154 4A

Flood Plain Information: Soquel Creek, Santa Cruz County, California.
W76-10157 4A

Flood Plain Information: Lynn Camp and East Fork Lynn Camp Creeks, Corbin, Kentucky.
W76-10163 4A

FLOODING
Flood Plain Information: East Arm Little Calumet River, Salt Creek-Coffee Creek, Porter County, Indiana.
W76-10152 4A

Flood Plain Information: Little Eagle Creek and Tributaries, Marion County, Indiana.
W76-10153 4A

Flood Plain Information: Big Sandy River, Lawrence County, Kentucky.
W76-10159 4A

Flood Plain Information: Pike Creek, New Castle County, Delaware.
W76-10165 4A

FLOODS
Flood Plain Information: Cumberland River, Burkesville, Kentucky.
W76-10151 4A

Flood Plain Information: East Arm Little Calumet River, Salt Creek-Coffee Creek, Porter County, Indiana.
W76-10152 4A

Flood Plain Information: Little Eagle Creek and Tributaries, Marion County, Indiana.
W76-10153 4A

Flood Plain Information: Turkey and Joplin Creeks, Joplin, Missouri.
W76-10155 4A

Flood Plain Information: Portage Open Bay and Main Ditch, Vicinity of Portageville, Missouri.
W76-10156 4A

Flood Plain Information: Big Sandy River, Lawrence County, Kentucky.
W76-10159 4A

Special Flood Hazard Information: Labette and Little Labette Creeks, Parsons, Kansas.
W76-10161 4A

Special Flood Hazard Information: Whiskey and Rock Creeks, Independence, Kansas.
W76-10162 4A

Flood Plain Information: Lynn Camp and East Fork Lynn Camp Creeks, Corbin, Kentucky.
W76-10163 4A

Flood Plain Information: Pike Creek, New Castle County, Delaware.
W76-10165 4A

Flood Plain Information: North Fork Kentucky River and Trace Fork, Vicinity of Hazard, Kentucky.
W76-10166 4A

FLOW2D: A Two-Dimensional Flow Model for Flood Plains and Estuaries,
W76-10454 2L

FLOODWATER
Special Flood Hazard Information: Arkansas River, Arkansas City, Kansas.
W76-10160 4A

FLORIDA
Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

Effects of a Landfill on Ground-water Quality,
W76-10137 5B

Boron and Arsenic Studies in Florida Waters,
W76-10265 5B

Systems Models for Phosphorus Management in Florida,
W76-10277 5C

Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

Tar Ball Loadings on Golden Beach, Florida,
W76-10379 5B

Numerical Simulation of Storm Surges in Bays,
W76-10457 2L

FLOTATION
Apparatus and Method for Removing Pollutants from Wastewater,
W76-10200 5D

FLOW CHARACTERISTICS
Interpretation of Internal Tracer Experiments and Local Sojourn Time Distributions,
W76-10039 5B

Selected Streamflow Experience Graphs for Southwestern Pennsylvania,
W76-10132 7C

Flood Plain Information: Turkey and Joplin Creeks, Joplin, Missouri.
W76-10155 4A

FLOW CONTROL
Sewer Pest Control Check Valve,
W76-10199 8C

FLOW DURATION
Flood Plain Information: South Fork Salt River and Davis Creek, Mexico, Missouri.
W76-10158 4A

Flood Plain Information: Clear Creek-Mulberry Creek, Vicinity of Shelbyville, Kentucky.
W76-10164 4A

Flood Plain Information: Dry Turkey and Bull Creeks, McPherson, Kansas.
W76-10167 4A

FLOW RATES
A Method for Assessing Friction Losses for a Non-Newtonian Fluid, Such as Sewage Sludge, under Laminar Flow Conditions,
W76-10009 5B

Selected Streamflow Experience Graphs for Southwestern Pennsylvania,
W76-10132 7C

Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1974,
W76-10144 7C

Hydrologic Data for North Creek Trinity River Basin, Texas, 1974,
W76-10147 7C

FLOW SYSTEM
Interpretation of Internal Tracer Experiments and Local Sojourn Time Distributions,
W76-10039 5B

FLUIDIZED BED INCINERATION
LSW-500 Disposal of Air Force Liquid Wastes,
W76-10258 5E

FLUORESCENCE
Hydrocarbon Concentrations in Seawater along the Halifax-Bermuda Section: Lessons Learned Regarding Sampling and some Results,
W76-10388 5A

FLUORESCENCE SPECTROSCOPY
Hydrocarbon Concentrations in Seawater along the Halifax-Bermuda Section: Lessons Learned Regarding Sampling and some Results,
W76-10388 5A

FLUORESCENSE
Identification, Estimation and Monitoring of Petroleum in Marine Waters by Luminescence Methods,
W76-10395 5B

FLUORINE
Fluoride Tolerance of Japanese Quail,
W76-10120 5C

FLY ASH
Process for Decontaminating Sewage Containing Cyanide,
W76-10203 5D

FOOD CHAINS
Fallout Cesium-137 and Mineral-Element Distribution in Food Chains of Granitic-Outcrop Ecosystems,
W76-10307 5B

FOOD WEBS
Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

A Model of Mineral-Element Cycling for an Invertebrate Food Web in a Southeastern Hardwood Forest Litter Community,
W76-10272 5C

FOODS
Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

FOREST FIRES
Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

Effects of Forest Fires on Atmospheric Loads of Soluble Nutrients,
W76-10328 4C

FOREST LITTER
A Model of Water Content and Evaporation for Hardwood Leaf Litter,
W76-10270 2D

FOREST SOILS
Cerium and Cobalt Movement with Litter Leachate in a Forest Soil,
W76-10311 5B

The Effect of Nonremoval Clear-Cutting and Pine Reforestation of the Cation Composition of a Hardwood Forest Soil,
W76-10322 4C

FORESTS
A Model of Mineral-Element Cycling for an Invertebrate Food Web in a Southeastern Hardwood Forest Litter Community,
W76-10272 5C

Seasonal and Annual Variations in the Quantities of Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, and Manganese Reaching the Forest Floor as Mast in Pennsylvania and Vermont Forests,
W76-10306 5B

Resource Partitioning in Leaf-Litter Faunas from Hardwood and Hardwood-Converted-To-Pine Forests,
W76-10308 5B

Forest-Floor Nutrient Dynamics in Southern Appalachian Hardwood and White Pine Plantation Ecosystems,
W76-10309 5B

FORMATION DAMAGE
Run Drill Pipe Slower and Reduce Formation Damage,
W76-10097 8G

FORT MYERS (FLA)
Effects of a Landfill on Ground-water Quality,
W76-10137 5B

FORT WORTH (TEX)
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1974,
W76-10141 7C

FOSSIL FUELS
Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

FOSSIL HYDROCARBON
Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

FOSSIL HYDROCARBONS
Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

FOULING
The Fouling Community as a Field Monitoring Technique,
W76-10354 5C

Antifouling Coatings and their Influence on the Marine Environment,
W76-10365 5G

FOULING PLATES
The Fouling Community as a Field Monitoring Technique,
W76-10354 5C

FOULING RACKS
The Fouling Community as a Field Monitoring Technique,
W76-10354 5C

FRACTURES (GEOLOGY)
Predicting Productive Trends Related to Wrench Faults,
W76-10100 8E

How to Sand Frac Multiple Zone Open Hole Sections,
W76-10117 8G

FREQUENCY
Design A River Basin Sampling System,
W76-10131 5A

FREQUENCY ANALYSIS
Frequency Distributions of Radiocesium Concentrations in Soil and Biota,
W76-10273 5B

FRESHWATER
Mobilization of Mercury from Freshwater Sediments by Humic Acid,
W76-10294 5C

FRESHWATER FISH
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

Savannah River Biological Survey, South Carolina and Georgia, August, 1954.
W76-10044 5C

FRESHWATER MARSHES
The Role of Emergent Macrophytes in Mineral Cycling in a Freshwater Marsh,
W76-10289 5C

Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

FRICTION
A Method for Assessing Friction Losses for a Non-Newtonian Fluid, Such as Sewage Sludge, under Laminar Flow Conditions,
W76-10009 5B

FUELS
Improving the Fuel Value of Sewage Sludge,
W76-10234 5E

GAME BIRDS
Fluoride Tolerance of Japanese Quail,
W76-10120 5C

GAMMA IRRADIATION
General Considerations in Wastewater Disinfection,
W76-10220 5D

GAMMA RAYS
General Considerations in Wastewater Disinfection,
W76-10220 5D

GAS BUBBLE DISEASE
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

GAS CHROMATOGRAPHY
Application of a Computer-Based Chromatograph for Automated Water Pollution Analyses,
W76-10038 5A

Determination of C1-C10 Hydrocarbons in Water,
W76-10392 5A

Suspensions of Crude Oils in Sea Water: Rapid Methods of Characterizing Light Hydrocarbon Solutes,
W76-10393 5A

Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage,
W76-10399 5A

LIBRARY U. OF T. UNIVERSITY OF TORONTO

Methods for Establishing Levels of Petroleum Contamination in Organisms and Sediment as Related to Marine Pollution Monitoring,
W76-10403 5B

Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

GASES
Determination of Aromatic Hydrocarbons in Sea Water using an Electrolytic Stripping Cell,
W76-10390 5A

GEO-ELECTRIC MODELS
Electrical Water Prospecting.
W76-10090 4B

GEO-ELECTRIC SOUNDINGS
Electrical Water Prospecting.
W76-10090 4B

GEORGIA
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

Savannah River Biological Survey, South Carolina and Georgia, August, 1954.
W76-10044 5C

GEOTHERMAL STUDIES
Geothermal Power Method,
W76-10470 3C

GERMANY
A Mathematical Model of Blooms of Plankton Diatoms, (In German),
W76-10127 5C

GERMINATION
Seed Germination and Early Seedling Growth of Wheat (Triticum Aestivum Linn.) CV. 1553 Under the Influence of Salinity and Plant-Growth Hormones,
W76-10169 3C

Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

Interaction of Water Potential and Temperature Effects on Germination of Three Semi-Arid Plant Species,
W76-10185 2I

GLACIER MASS-BALANCE ANALYSIS
Approach to Glacier Mass-Balance Analysis Utilizing Terrain Characterization,
W76-10499 2C

GLACIERS
Information Booklet for Iceref, The Bibliography of Canadian Glaciers, Glacier Inventory Note No. 8,
W76-10494 2C

Approach to Glacier Mass-Balance Analysis Utilizing Terrain Characterization,
W76-10499 2C

GOLDFISH
Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

GOVERNANCE
Basin Governance,
W76-10130 6E

GRANITE OUTCROPS
Influence of Nutrient Availability on Ecosystem Structure,
W76-10324 5C

GRANITES
Influence of Nutrient Availability on Ecosystem Structure,
W76-10324 5C

GRASSLANDS
Comparison of Sheep and Cattle Grazing on Semiarid Grassland,
W76-10181 4C

GRAZING
Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah,
W76-10171 5G

Comparison of Sheep and Cattle Grazing on Semiarid Grassland,
W76-10181 4C

GREAT LAKES
Great Lakes Pollution Cleanup Stagnates as Problems Mount,
W76-10250 5G

GREEN RIVER (WASH)
Tacoma's North Fork Wells.
W76-10089 4B

GROUNDWATER
Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part I: Sanitary Landfill Leachate...What It Is,
W76-10013 5B

Pollution of Groundwater by Landfills (Pollution de L'eau Souterraine par les Decharges),
W76-10016 5B

Ground-Water Pollution Problems in the Northwestern United States,
W76-10083 5B

Tacoma's North Fork Wells.
W76-10089 4B

Guardians of Ground Water Quality,
W76-10096 5G

Well Field Maintenance Avoids Crises,
W76-10103 8G

Pollution Effects on Surface Waters and Ground Waters, (Literature Review),
W76-10104 5C

Effects of a Landfill on Ground-water Quality,
W76-10137 5B

Cost Functions for Additional Ground Water Development,
W76-10194 4B

The Fate of Pollutants in Subsurface Environments,
W76-10253 5B

GROUNDWATER RECHARGE
International Survey on Existing Water Recharge Facilities.
W76-10085 4B

GROUNDWATER RESOURCES
Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

National Water Data Storage and Retrieval System: Instructions for Preparation and Submission of Ground-Water Data,
W76-10148 10D

Maps Showing Ground-Water Conditions in the Ranegras Plain and Butler Valley Areas, Yuma County, Arizona--1975,
W76-10149 7C

GROWTH RATES
Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

Influence of Temperature and Salinity on Routine Metabolic Rate and Growth of Young Atlantic Menhaden,
W76-10063 5C

A Comparison of Growth and Abundance for Tidal Pool Fishes in California and British Columbia,
W76-10064 2L

Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

Population Characteristics of a Species Ensemble of Waterboatmen (Corixidae),
W76-10123 2H

Effect of Cultural Practices on Grain Yield and Yield Components in Irrigated Wheat,
W76-10176 3F

GULF OF MEXICO
Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

GUTHION (R)
Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

HAMILTON HARBOUR (ONTARIO)
Exchange Flow Between Lake Ontario and Hamilton Harbour,
W76-10496 5B

HAND PUMPS
Field Research and Testing of a Water Hand Pump for use in Developing Countries,
W76-10086 8G

HANDS-ON TRAINING
Exxon Uses Hands-On Methods to Train Drilling Personnel,
W76-10098 8G

HARBOR MODELS
Problems of Physical Model Tests with Harbours,
W76-10451 8B

HARBOR RESONANCES
Resonances in Harbors with Variable Depths,
W76-10416 8B

HARBORS
Resonances in Harbors with Variable Depths,
W76-10416 8B

Wave Response of Offshore Bottomless Harbors,
W76-10417 8B

Nonlinear Lateral Oscillation in a Harbour Model,
W76-10418 8B

Numerical Prediction of Harbor Responses,
W76-10419 8B

Free Oscillations in Bays and Harbors,
W76-10420 8B

Computations of Harbor Oscillations by Ray Methods,
W76-10421 8B

Movable-Bed Model Investigation of Taichung Harbor, Taiwan, Rep. of China,
W76-10427 2L

Problems of Physical Model Tests with Harbours,
W76-10451 8B

HARDNESS (WATER)
The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

Water Softener,
W76-10475 5F

HARDWOOD
Mineral Cycling Strategies of Two Deciduous and Two Evergreen Tree Species on a Southern Appalachian Watershed,
W76-10321 5C

Cation Flux in Hardwood and White Pine Watersheds,
W76-10329 5B

HARVESTING OF ALGAE
Algae Harvester,
W76-10478 5G

Harvest of Biological Production as a Means of Improving Effluents form Sewage Lagoons,
W76-10500 5G

HAWAII
Compilation and Analysis of Water Quality Rights and Responsibilities in Hawaii,
W76-10001 5G

A Computer Simulation of Competition Among Five Sympatric Congeneric Species of Xanthid Crabs,
W76-10124 2L

Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

Numerical Prediction of Harbor Responses,
W76-10419 8B

HAWAIIAN LATOSOLS
Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

HAZARDOUS MATERIALS
Models for Evaluation of Hazardous Wastes,
W76-10190 5B

HAZARDOUS WASTES
Models for Evaluation of Hazardous Wastes,
W76-10190 5B

HAZARDS
Maritime Consideration of Oil Transportation,
W76-10375 5G

HEAT EXCHANGERS
Geothermal Power Method,
W76-10470 3C

HEAT TREATMENT
Treatment and Disposal of Sewage Sludge,
W76-10204 5D

HEATED WATER
Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

Low Thermal Responsiveness in the Bluegill, Lepomis Macrochirus,
W76-10369 5C

Ohio River Cooling Water Study,
W76-10414 5C

HEAVY DRILL COLLARS
Heavy Collars Aid Hole Control,
W76-10102 8G

HEAVY METALS
Potentiometric Determination of Low Levels of Simple and Total Cyanides,
W76-10030 5A

Assessment of the Maximum Concentration of Heavy Metals in Crude Sewage Which Will Not Inhibit the Anaerobic Digestion of Sludge,
W76-10040 5D

Effects of Environmental Levels of Mercury and Cadmium on Rates of Metal Uptake and Growth Physiology of Selected Genera of Marine Phytoplankton,
W76-10280 5C

The Role of Spartina Alterniflora in the Flow of Lead, Cadmium, and Copper Through the Salt-Marsh Ecosystem,
W76-10281 5C

Heavy-Metal Concentrations in Selected Georgia Estuarine Organisms with Comparative Food-Habit Data,
W76-10282 5C

Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

Antifouling Coatings and their Influence on the Marine Environment,
W76-10365 5G

Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

Interlaboratory Quality Control Study No. 5, Chromium, Iron, Molybdenum and Vanadium,
W76-10493 5A

HEMATOLOGY
Changes in Some Hematological Characteristics of Coho Salmon (Oncorhynchus Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

HEPATOPANCREAS
On the Relationship Between Oxygen Consumption and Feeding Level in Decapods,
W76-10072 5C

HERBICIDES
A Review of the Literature on the Use of Simazine in Fisheries,
W76-10052 5C

HIGH VOLUME SUBMERSIBLE PUMPS
Tacoma's North Fork Wells.
W76-10089 4B

HIGH VOLUME WATER WELLS
Tacoma's North Fork Wells.
W76-10089 4B

HIGHWAY DEICING
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

HIGHWAY EFFECTS
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

HINCHI-NADA SEA (JAPAN)
Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

HISTORIC FLOODS
Flood Plain Information: Crooked Creek and Williams Creek, Marion County, Indiana.
W76-10154 4A

Flood Plain Information: Lynn Camp and East Fork Lynn Camp Creeks, Corbin, Kentucky.
W76-10163 4A

HOLOPEDIUM-GIBBERUM
Competition and the Relative Abundances of Two Cladocerans,
W76-10125 2I

HONOLULU (HAWAII)
Numerical Prediction of Harbor Responses,
W76-10419 8B

HOT-FILM ANEMOMETRY
Principles and Measuring Techniques of Turbulence Characteristics in Open-Channel Flows,
W76-10134 8B

HUECO BOLSON (TEX)
Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

HUMIC ACIDS
Mobilization of Mercury from Freshwater Sediments by Humic Acid,
W76-10294 5C

HURRICANE BETSY
Numerical Simulation of Storm Surges in Bays,
W76-10457 2L

HYDRAULIC DESIGN
Designing Microscreens. Here's Some Help,
W76-10033 5D

HYDRAULIC MODELS
Symposium on Modeling Techniques, Volume II.
W76-10415 8B

Tests on the Equilibrium Probiles of Model Beaches and the Effects of Grain Shape and Size Distribution,
W76-10422 2L

Physical Modeling of Scour Initiation and Sediment Transport in Distorted Tidal Models,
W76-10423 2L

Laboratory Effects in Coastal Movable-Bed Models,
W76-10425 2L

Simulation of Delta Building Process,
W76-10426 2L

Coastal Mobile Bed Model - Does it Work,
W76-10428 2L

Scale Effects on Physical/Mathematical Modeling,
W76-10435 8B

Combined Use of Physical and Mathematical Models for Analysis of Reservoir Water Quality,
W76-10439 5B

Overview of Physical Estuary Practice,
W76-10444 2L

HYDRO PROGRAMMING SYSTEM
Evaluation and Adaptation of Selected Computer Programs to Water Resource Problems in Massachusetts,
W76-10129 7C

HYDROCARBON EXCHANGE
Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

HYDROCARBON SNIFFER
Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

HYDRODYNAMICS
Scientific Problems of the Systems for Global Monitoring and Investigation of Oil Pollution in the World Ocean,
W76-10372 5B

Multilayer Hydrodynamical-Numerical Models,
W76-10429 2L

HYDROGEN
Analytical Notes--Electrochemical Method for Early Detection and Monitoring of Coliforms,
W76-10237 5A

HYDROGEN ION CONCENTRATION
Effects of Hyperbaric Pressure on Oxygen Concentration in the Swim Bladder of Poecilia Latipinna,
W76-10066 5C

Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

Some Effects of Acidified Water on the Early Development of Roach (Rutilus Rutilus L.) and Perch (Perca Fluviatilis L.),
W76-10076 5C

Pikes (Esox Lucius L.) Shown to be Affected by Low pH Values During First Weeks After Hatching,
W76-10343 5C

A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

HYDROGEN SULFIDE
How to Cope with Sulfide Corrosion,
W76-10116 8G

HYDROLOGIC ASPECTS
A Model of Water Content and Evaporation for Hardwood Leaf Litter,
W76-10270 2D

HYDROLOGIC BOUNDARIES
Hydrologic Unit Map--1974, State of Washington.
W76-10150 7C

HYDROLOGIC DATA
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1974,
W76-10141 7C

Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1974,
W76-10144 7C

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1974,
W76-10145 7C

Hydrologic Data for Cow Bayou, Brazos River Basin, Texas, 1974,
W76-10146 7C

Hydrologic Data for North Creek Trinity River Basin, Texas, 1974,
W76-10147 7C

National Water Data Storage and Retrieval System: Instructions for Preparation and Submission of Ground-Water Data,
W76-10148 10D

HYDROLOGIC UNIT MAPS (WASH)
Hydrologic Unit Map--1974, State of Washington.
W76-10150 7C

HYDROLOGY
Hydrologic Unit Map--1974, State of Washington.
W76-10150 7C

HYDROSTATIC PRESSURE
Effects of Hyperbaric Pressure on Oxygen Concentration in the Swim Bladder of Poecilia Latipinna,
W76-10066 5C

Deep-Sea Bacteria: Growth and Utilization of Hydrocarbons at Ambient and in Situ Pressure,
W76-10349 5B

HYDROXYL RADICALS
The Role of Hydroxyl Radical Reactions in Ozonation Processes in Aqueous Solutions,
W76-10036 5D

IMMATURE GROWTH STAGE
Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

Some Effects of Acidified Water on the Early Development of Roach (Rutilus Rutilus L.) and Perch (Perca Fluviatilis L.),
W76-10076 5C

A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

IMPAIRED WATER QUALITY
Method for Controlling Scale,
W76-10469 5G

IMPOUNDMENTS
Changes in Water Chemistry and Primary Productivity of a Reactor Cooling Reservoir (Par Pond),
W76-10290 5C

INCINERATION
Improving the Fuel Value of Sewage Sludge,
W76-10234 5E

LSW-500 Disposal of Air Force Liquid Wastes,
W76-10258 5E

INCLINOMETER
Recording Equipment Booster.
W76-10091 8G

INDIA
Simulation of Delta Building Process,
W76-10426 2L

INDIAN OCEAN
Oil Pollution Along the Indian Coastline,
W76-10386 5B

INDIANA
Preliminary Environmental Survey, Newport Army Ammunition Plant, Newport, Indiana, January, 1973,
W76-10056 5C

Flood Plain Information: East Arm Little Calumet River, Salt Creek-Coffee Creek, Porter County, Indiana.
W76-10152 4A

Flood Plain Information: Little Eagle Creek and Tributaries, Marion County, Indiana.
W76-10153 4A

Flood Plain Information: Crooked Creek and Williams Creek, Marion County, Indiana.
W76-10154 4A

INDUSTRIAL WASTES
Waste Treatment Process,
W76-10207 5D

Optimizing Centrifuge Decantation for Sludge Thickening (Optimisation Des Decanteuses Centrifuges Pour La Concentration Des Bous),
W76-10217 5D

Great Lakes Pollution Cleanup Stagnates as Problems Mount,
W76-10250 5G

Pollutant Analysis Cost Survey,
W76-10259 5A

Changes in Some Hematological Characteristics of Coho Salmon (Oncorhynchus Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

Flocculation of Suspended Solids,
W76-10468 5D

Photooxidative Destruction of Organic Wastes,
W76-10472 5D

Clarification Tank,
W76-10486 5D

INFILTRATION
Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

INFILTRATION RATES
Results of Infiltration Tests Near Scott City, Western Kansas,
W76-10136 2G

INFILTROMETERS
Results of Infiltration Tests Near Scott City, Western Kansas,
W76-10136 2G

INFLATABLE PACKER SYSTEM (WELLS)
How to Sand Frac Multiple Zone Open Hole Sections,
W76-10117 8G

INFORMATION EXCHANGE
Strengthening Lake-Shoreland Management in Massachusetts,
W76-10264 6E

INFORMATION RETRIEVAL
Systematic Analysis of Field Survey Techniques and Operational Utility of Environmental Research to the Navy,
W76-10356 5G

INHIBITORS
Delta-Amino Levulinic Acid Dehydratase Activity in Fish Blood as an Indicator of a Harmful Exposure to Lead,
W76-10338 5C

Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

INLETS (WATERWAYS)
Modeling of Inlet-Bay Systems in Relation to Sand Trapping,
W76-10462 2L

INPUT-OUTPUT ANALYSIS
Nutrient Flux and Cycling in Freshwater Ecosystems,
W76-10287 5C

INSPECTION
How to Avoid Downhole Failures and Maximize Pipe Use,
W76-10114 8G

INSTITUTIONS
Compilation and Analysis of Water Quality Rights and Responsibilities in Hawaii,
W76-10001 5G

INSTRUMENTATION
Recording Equipment Booster,
W76-10091 8G

Water Pollution Sampler Evaluation,
W76-10261 5A

INTERNATIONAL ARTIFICIAL RECHARGE INSTALLATION SURVEY
International Survey on Existing Water Recharge Facilities,
W76-10085 4B

INTERNATIONAL HYDROLOGICAL DECADE
Canadian Participation in the International Hydrological Decade, Final Report, (Volume 2), Research Reports,
W76-10489 2A

INTERNATIONAL WATERS
United Nations Environment Program Earthwatch and Marine Pollution,
W76-10371 5B

Methods for Establishing Levels of Petroleum Contamination in Organisms and Sediment as Related to Marine Pollution Monitoring,
W76-10403 5B

INTERTIDAL AREAS
Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

INTERTIDAL AREAS, *ADAPTATION
Photosynthetic Studies of Chondrus Crispus,
W76-10060 5C

INVERTEBRATES
Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

IODINE
An Instrument with Internal Calibration for Monitoring Chlorine Residuals in Natural Waters,
W76-10028 5A

ION EXCHANGE
Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

IONIZING RADIATION
Use of High Level Radiation in Waste Treatment--Status and Prospects,
W76-10010 5D

IRANIAN CRUDE OIL
Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

IRON
Interlaboratory Quality Control Study No. 5, Chromium, Iron, Molybdenum and Vanadium,
W76-10493 5A

IRRADIANCE
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

IRRADIATION
Use of High Level Radiation in Waste Treatment--Status and Prospects,
W76-10010 5D

Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

IRRIGATION
Maps Showing Ground-Water Conditions in the Ranegras Plain and Butler Valley Areas, Yuma County, Arizona--1975,
W76-10149 7C

Center-Pivot Irrigation,
W76-10173 3F

IRRIGATION DESIGN
Water Quality Data from Truckee and Carson Rivers, Pyramid Lake and Lahontan Reservoir, A Working Paper,
W76-10054 5C

IRRIGATION EFFICIENCY
Center-Pivot Irrigation,
W76-10173 3F

IRRIGATION PRACTICES
Use of Saline Water in Agriculture. I. Description of the System,
W76-10168 3C

LIBRARY U. OF I. URBANA-CHAMPAIGN

IRRIGATION WELLS
Use of Saline Water in Agriculture. I. Description of the System,
W76-10168 3C

IZU-HANTO-OKI EARTHQUAKE
Water Wells as Possible Indicators of Tectonic Strain,
W76-10105 8G

JAPAN
Survey Analyses for Petroleum Derived Hydrocarbons in the Ocean,
W76-10374 5B

Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

JAPAN (INLAND SEA)
Industrial Research Institute Studying Pollution Problems of Seto Inland Sea,
W76-10031 5B

JAPANESE QUAIL
Fluoride Tolerance of Japanese Quail,
W76-10120 5C

JUNIPER TREES
Techniques for Improving Tree Survival and Growth in Semiarid Areas,
W76-10175 2I

JUVENILE FISH
Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

Influence of Temperature and Salinity on Routine Metabolic Rate and Growth of Young Atlantic Menhaden,
W76-10063 5C

Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

JUVENILE GROWTH STAGE
Pikes (Esox Lucius L.) Shown to be Affected by Low pH Values During First Weeks After Hatching,
W76-10343 5C

KANSAS
Results of Infiltration Tests Near Scott City, Western Kansas,
W76-10136 2G

Special Flood Hazard Information: Arkansas River, Arkansas City, Kansas.
W76-10160 4A

Special Flood Hazard Information: Labette and Little Labette Creeks, Parsons, Kansas.
W76-10161 4A

Special Flood Hazard Information: Whiskey and Rock Creeks, Independence, Kansas.
W76-10162 4A

Flood Plain Information: Dry Turkey and Bull Creeks, McPherson, Kansas.
W76-10167 4A

KENTUCKY
Flood Plain Information: Cumberland River, Burkesville, Kentucky.
W76-10151 4A

Flood Plain Information: Big Sandy River, Lawrence County, Kentucky.
W76-10159 4A

Flood Plain Information: Lynn Camp and East Fork Lynn Camp Creeks, Corbin, Kentucky.
W76-10163 4A

Flood Plain Information: Clear Creek-Mulberry Creek, Vicinity of Shelbyville, Kentucky.
W76-10164 4A

Flood Plain Information: North Fork Kentucky River and Trace Fork, Vicinity of Hazard, Kentucky.
W76-10166 4A

KENTUCKY RIVER (KY)
Flood Plain Information: North Fork Kentucky River and Trace Fork, Vicinity of Hazard, Kentucky.
W76-10166 4A

KINETICS
The Role of Hydroxyl Radical Reactions in Ozonation Processes in Aqueous Solutions,
W76-10036 5D

Biological Treatment Process in Cold Climates,
W76-10222 5D

Verification Studies of the Biofilm Model for Bacterial Substrate Utilization,
W76-10247 5D

Cerium and Cobalt Movement with Litter Leachate in a Forest Soil,
W76-10311 5B

Phosphorus Cycling in a Maryland Deciduous Forest Subjected to Various Levels of Mineral-Nutrient Loading,
W76-10313 5B

LABORATORY ANIMALS
Biological Consideration of a Bioassay System,
W76-10359 5C

LABORATORY TESTS
An Instrument with Internal Calibration for Monitoring Chlorine Residuals in Natural Waters,
W76-10028 5A

Effects of Hyperbaric Pressure on Oxygen Concentration in the Swim Bladder of Poecilia Latipinna,
W76-10066 5C

Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage,
W76-10399 5A

Effects of Oils on Baltic Littoral Community, as Studied in an Outdoor Model Test System,
W76-10411 5C

LAGOONS
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

LAKE HURON
Applicability of the Technicon Autoanalyzer I and II Systems for Shipboard Analysis of Great Lakes Water Samples,
W76-10497 5A

LAKE MORPHOLOGY
Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

LAKE MORPHOMETRY
Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

LAKE ONTARIO
Exchange Flow Between Lake Ontario and Hamilton Harbour,
W76-10496 5B

Applicability of the Technicon Autoanalyzer I and II Systems for Shipboard Analysis of Great Lakes Water Samples,
W76-10497 5A

LAKE REHABILITATION
Strengthening Lake-Shoreland Management in Massachusetts,
W76-10264 6E

LAKE SHORES
Strengthening Lake-Shoreland Management in Massachusetts,
W76-10264 6E

LAKES
Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

Nutrient Flux and Cycling in Freshwater Ecosystems,
W76-10287 5C

LAMINAR FLOW
A Method for Assessing Friction Losses for a Non-Newtonian Fluid, Such as Sewage Sludge, under Laminar Flow Conditions,
W76-10009 5B

LAND DEVELOPMENT
Obstacles to the Development of Arid and Semi-Arid Zones.
W76-10179 3F

LAND RECLAMATION
Reclamation of A Burned Anthracite Refuse Bank with Municipal Sludge,
W76-10249 5E

LAND USE
Obstacles to the Development of Arid and Semi-Arid Zones.
W76-10179 3F

Urban Service Pricing and Land Use: Some Preliminary Results,
W76-10193 6C

What to Do with Sewage Sludge.
W76-10210 5D

Microbiology and Chemistry Studies of Water Quality Factors in a Watershed Used for Municipal Supply and Waste Disposal,
W76-10263 5B

The Effect of urban Land Use on Nutrient and Suspended-Solids Export from North Florida Watersheds,
W76-10331 4C

LANDFILLS
Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part I: Sanitary Landfill Leachate...What It Is,
W76-10013 5B

Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part II: An Index of the Water Pollution Potential of Sanitary Landfills,
W76-10014 5B

Pollution of Groundwater by Landfills (Pollution de L'eau Souterraine par les Decharges),
W76-10016 5B

Hydrogeologic and Other Considerations Related to the Selection of Sanitary-Landfill Sites in Ohio,
W76-10084 5D

Effects of a Landfill on Ground-water Quality,
W76-10137 5B

Treatment and Disposal of Sewage Sludge,
W76-10204 5D

LARVAL GROWTH STAGE
Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

LEACHATE
Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part I: Sanitary Landfill Leachate...What It Is,
W76-10013 5B

Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part II: An Index of the Water Pollution Potential of Sanitary Landfills,
W76-10014 5B

Hydrogeologic and Other Considerations Related to the Selection of Sanitary-Landfill Sites in Ohio,
W76-10084 5D

LEACHING
Hydrogeologic and Other Considerations Related to the Selection of Sanitary-Landfill Sites in Ohio,
W76-10084 5D

Leaching of Nutrients from Leaves of Selected Tree Species in New Hampshire,
W76-10312 5B

Effects of Clear-Cutting on Nutrient Losses in Aspen Forests on Three Soil Types in Michigan,
W76-10315 4C

LEAD
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

Delta-Amino Levulinic Acid Dehydratase Activity in Fish Blood as an Indicator of a Harmful Exposure to Lead,
W76-10338 5C

LEAKAGE
Program Esoph - Extended Soph, Simulation of Time-Variant Piezometric Surface in a Confined, Leaky Aquifer Subjected to Pumping.
W76-10498 7C

LEAVES
Resource Partitioning in Leaf-Litter Faunas from Hardwood and Hardwood-Converted-To-Pine Forests,
W76-10308 5B

Leaching of Nutrients from Leaves of Selected Tree Species in New Hampshire,
W76-10312 5B

LEGISLATION
Operation and Impact of NPDES in Region II, Part I,
W76-10005 5G

PL92-500: Mid-Course Correction Grants Options; Next Move up to Congress,
W76-10106 5G

LETHAL LIMIT
Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

Fluoride Tolerance of Japanese Quail,
W76-10120 5C

Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

LICHENS
Nitrogen Fixation by Lichens of the Northern Piedmont,
W76-10327 5C

LIGHT
Photosynthetic Studies of Chondrus Crispus,
W76-10060 5C

LIGHT INTENSITY
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

LIGHT PENETRATION
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

LINEAR PROGRAMMING
An LP-10 Model for Coordinating Multi-Group Inputs in Resource Planning,
W76-10192 6A

LIPIDS
Process and Apparatus for Treating Fatty Waste Water,
W76-10471 5D

LIQUID WASTES
Treatment of Waste with Oxygen or Ozone.
W76-10212 5D

Use of the Earth's Crust for Treatment or Storage of Sewage Effluent and Other Waste Fluids,
W76-10216 5D

LITTER
Resource Partitioning in Leaf-Litter Faunas from Hardwood and Hardwood-Converted-To-Pine Forests,
W76-10308 5B

Litter Production, Decomposition, and Nutrient Cycling in a Mixed Hardwood Watershed and a White Pine Watershed.
W76-10310 5B

LITTORAL DRIFT
Movable-Bed Model Investigation of Taichung Harbor, Taiwan, Rep. of China,
W76-10427 2L

LIVESTOCK
1975 Arizona Agricultural Statistics.
W76-10187 3F

LOADS (FORCES)
Wave Induced Loads on Multi-Element Structures,
W76-10458 8B

LOBLOLLY PINE TREES
Simulation of Nitrogen Distribution and Its Effect on Productivity in Even-Aged Loblolly Pine Plantations,
W76-10271 5B

Some Effects of Fertilization on Mineral Cycling in Loblolly Pine,
W76-10323 5C

LOESS
Results of Infiltration Tests Near Scott City, Western Kansas,
W76-10136 2G

LOGGING (RECORDING)
Electrical Water Prospecting.
W76-10090 4B

LOW-FLOW AUGMENTATION
Planning Implications of Dissolved Oxygen Depletion in the Willamette River, Oregon,
W76-10332 5G

LOW-MOLECULAR-WEIGHT HYDROCARBONS
Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

MACOMA BALTHICA
Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

LIBRARY U. OF I. UNIVERSITY OF

AGNESIUM
Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

ANAGEMENT
Basin Governance,
W76-10130 6E

A Review on Decision Models in Economics of Regional Water Quality Management,
W76-10195 5G

Strengthening Lake-Shoreland Management in Massachusetts,
W76-10264 6E

Systematic Analysis of Field Survey Techniques and Operational Utility of Environmental Research to the Navy,
W76-10356 5G

ANGANESE
Effects of Tree Species, Temperature, and Soil on Transfer of Manganese-54 from Litter to Roots in a Microcosm,
W76-10317 5C

APPING
Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

APS
Maps Showing Ground-Water Conditions in the Ranegras Plain and Butler Valley Areas, Yuma County, Arizona--1975,
W76-10149 7C

Hydrologic Unit Map--1974, State of Washington.
W76-10150 7C

ARINE ALGAE
Effects of Environmental Levels of Mercury and Cadmium on Rates of Metal Uptake and Growth Physiology of Selected Genera of Marine Phytoplankton,
W76-10280 5C

Effects of Oils on Baltic Littoral Community, as Studied in an Outdoor Model Test System,
W76-10411 5C

ARINE ANIMALS
Biological Consideration of a Bioassay System,
W76-10359 5C

The Activities of Enzymes as Pollution Indicators,
W76-10363 5A

Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

Marine Pollution by Carcinogenic Hydrocarbons,
W76-10413 5C

MARINE BIOLOGY
Proceedings of the Conference on Marine Biology in Environmental Protection Held at San Clemente Island, California on 13-15 November, 1973.
W76-10353 5C

Problems and Techniques of Marine Biology in the Field: Modeling the Marine Ecosystem,
W76-10355 5C

MARINE ECOSYSTEMS
Mineral Cycling in Marine Ecosystems,
W76-10278 5C

MARINE FISH
Disease Responses in Southern California Coastal Fishes,
W76-10366 5C

Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage,
W76-10399 5A

MARINE FISHERIES
Disease Responses in Southern California Coastal Fishes,
W76-10366 5C

MARINE ORGANISMS
Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

MARINE PLANTS
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

MARINE POLLUTION
Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop,
W76-10370 5B

United Nations Environment Program Earthwatch and Marine Pollution,
W76-10371 5B

Pilot Project on Marine Pollution Monitoring Under the Framework of Igoss,
W76-10373 5B

Survey Analyses for Petroleum Derived Hydrocarbons in the Ocean,
W76-10374 5B

Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

MARKING TECHNIQUES
Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

MARSH MANAGEMENT
A Review of the Literature on the Use of Simazine in Fisheries,
W76-10052 5C

MARSH PLANTS
Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

MASS
Approach to Glacier Mass-Balance Analysis Utilizing Terrain Characterization,
W76-10499 2C

MASS SPECTROMETRY
Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

MASSACHUSETTS
Evaluation and Adaptation of Selected Computer Programs to Water Resource Problems in Massachusetts,
W76-10129 7C

Strengthening Lake-Shoreland Management in Massachusetts,
W76-10264 6E

Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

MASSACHUSETTS BAY (MASS)
Two-Dimensional Finite Element Dispersion Model,
W76-10453 5B

MATHEMATICAL MODELS
A Method for Assessing Friction Losses for a Non-Newtonian Fluid, Such as Sewage Sludge, under Laminar Flow Conditions,
W76-10009 5B

Short-Term Regulation of BOD Upsets in an Estuary,
W76-10020 5G

Computer-Aided Analysis of Environmental Data, Part II: Biochemical Oxygen Demand Model,
W76-10023 5A

Industrial Research Institute Studying Pollution Problems of Seto Inland Sea,
W76-10031 5B

Designing Microscreens. Here's Some Help,
W76-10033 5D

Design of a Stormwater Sewer by Nonlinear Programming--1,
W76-10034 5D

Mathematical Model Simplifies Design of Sludge Drying Beds,
W76-10035 5D

Large-Scale Estuarine Water Quality Matrix Model,
W76-10191 5B

A Review on Decision Models in Economics of Regional Water Quality Management,
W76-10195 5G

Network Models and the Impact of Modeling Assumptions,
W76-10196 4A

The Fate of Pollutants in Subsurface Environments,
W76-10253 5B

Frequency Distributions of Radiocesium Concentrations in Soil and Biota,
W76-10273 5B

A Specific-Activity and Concentration Model Applied to Cesium Movement in an Oligotrophic Lake,
W76-10275 5C

Problems and Techniques of Marine Biology in the Field: Modeling the Marine Ecosystem,
W76-10355 5C

Symposium on Modeling Techniques, Volume II.
W76-10415 8B

Scale Effects on Physical/Mathematical Modeling.
W76-10435 8B

Combined Use of Physical and Mathematical Models for Analysis of Reservoir Water Quality,
W76-10439 5B

Application of a Dynamic Network Model to Hydraulic and Water Quality Studies of the St. Lawrence River,
W76-10440 5B

Overview of Physical Estuary Practice,
W76-10444 2L

MATRIC POTENTIAL
Interaction of Water Potential and Temperature Effects on Germination of Three Semi-Arid Plant Species,
W76-10185 2I

MATRICES (MATHEMATICS)
Large-Scale Estuarine Water Quality Matrix Model,
W76-10191 5B

MATURE GROWTH STAGE
Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

MAYFLIES
Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

MEASUREMENT
Principles and Measuring Techniques of Turbulence Characteristics in Open-Channel Flows,
W76-10134 8B

Approach to Glacier Mass-Balance Analysis Utilizing Terrain Characterization,
W76-10499 2C

MEDITERANEAN
Physical Factors Controlling Abundance of Meiofauna on Tidal and Atidal Beaches,
W76-10069 5A

MEIOFAUNA
Physical Factors Controlling Abundance of Meiofauna on Tidal and Atidal Beaches,
W76-10069 5A

MELT WATER
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

MENHADEN
Influence of Temperature and Salinity on Routine Metabolic Rate and Growth of Young Atlantic Menhaden,
W76-10063 5C

MERCURY
Bodily Distribution, Accumulation and Excretion of Mercury in a Fresh-Water Mussel,
W76-10081 5C

Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

Mobilization of Mercury from Freshwater Sediments by Humic Acid,
W76-10294 5C

Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

Byssal Thread Production as a Toxicity Test,
W76-10362 5A

Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

METABOLISM
Influence of Temperature and Salinity on Routine Metabolic Rate and Growth of Young Atlantic Menhaden,
W76-10063 5C

On the Relationship Between Oxygen Consumption and Feeding Level in Decapods,
W76-10072 5C

Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

METALS
Retention of Metals in Sewage Sludge II: Incorporated Radioisotopes,
W76-10006 5A

Distribution of Selected Metals in Tissue Samples of Carp, Cyprinus Carpio,
W76-10082 5C

Distribution of Copper and Zinc in Oysters and Sediments from Three Coastal-Plain Estuaries,
W76-10279 5C

A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

A Discussion of the Effects of Certain Potential Toxicants on Fish and Shellfish in the Upper Delaware Estuary,
W76-10352 5C

Chemical Problems Encountered in Toxicity Studies,
W76-10364 5B

METHODOLOGY
Principles and Measuring Techniques of Turbulence Characteristics in Open-Channel Flows,
W76-10134 8B

Systematic Analysis of Field Survey Techniques and Operational Utility of Environmental Research to the Navy,
W76-10356 5G

The Need for More Intercomparable Field Data and Widely Applicable Short-Term Survey,
W76-10358 5G

Evaluation of Thin Film Oil Samplers,
W76-10381 5A

Recent Developments in the Identification of Asphalts and Other Petroleum Products,
W76-10396 5A

Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage,
W76-10399 5A

METHYL MERCURY
Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

METHYLMERCURY
Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

MICROBIAL DEGRADATION
Microbial Petroleum Degradation: Use of Mixed Hydrocarbon Substrates,
W76-10350 5B

MICROBIOLOGY
Microbiology and Chemistry Studies of Water Quality Factors in a Watershed Used for Municipal Supply and Waste Disposal,
W76-10263 5B

MICROSCREENS
Designing Microscreens. Here's Some Help,
W76-10033 5D

MIGRATION PATTERNS
Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

MINERAL CYCLING
Mineral Cycling in Southeastern Ecosystems.
W76-10266 5C

MINNOWS
Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

MISSOURI
Flood Plain Information: Turkey and Joplin Creeks, Joplin, Missouri.
W76-10155 4A

Flood Plain Information: Portage Open Bay and Main Ditch, Vicinity of Portageville, Missouri.
W76-10156 4A

Flood Plain Information: South Fork Salt River and Davis Creek, Mexico, Missouri.
W76-10158 4A

MIXED FORESTS
Aspects of Mineral-Nutrient Cycling in a Southern Mixed-Hardwood Forest in North Central Florida,
W76-10318 5B

MIXING
Exchange Flow Between Lake Ontario and Hamilton Harbour,
W76-10496 5B

MODEL SCALING
Scaling and Sizing Criteria for Thermal-Hydraulic Models,
W76-10437 5B

MODEL STUDIES
Optimal Allocation of Measurement and Control Resources with Application to River Depollution,
W76-10017 5A

Dynamic Modelling and Control Simulation of a Biological Wastewater Treatment Process,
W76-10018 5D

Computer Based Control for Wastewater Systems,
W76-10019 5D

A Simulation of Water Pollution Model Parameter Estimation,
W76-10021 5B

Computer-Aided Analysis of Environmental Data, Part II: Biochemical Oxygen Demand Model,
W76-10023 5A

Industrial Research Institute Studying Pollution Problems of Seto Inland Sea,
W76-10031 5B

Cost-Effective Goal,
W76-10032 5D

Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

Evaluation of the Ciria Prototype Model for the Design of Sewage-Treatment Works,
W76-10245 5D

Verification Studies of the Biofilm Model for Bacterial Substrate Utilization,
W76-10247 5D

A Model of Water Content and Evaporation for Hardwood Leaf Litter,
W76-10270 2D

Simulation of Nitrogen Distribution and Its Effect on Productivity in Even-Aged Loblolly Pine Plantations,
W76-10271 5B

A Model of Mineral-Element Cycling for an Invertebrate Food Web in a Southeastern Hardwood Forest Litter Community,
W76-10272 5C

The Role of Physical Modeling in Marsh-Estuarine Mineral-Cycling Research,
W76-10276 5B

Systems Models for Phosphorus Management in Florida,
W76-10277 5C

Problems and Techniques of Marine Biology in the Field: Modeling the Marine Ecosystem,
W76-10355 5C

Effects of Oils on Baltic Littoral Community, as Studied in an Outdoor Model Test System,
W76-10411 5C

Symposium on Modeling Techniques, Volume II.
W76-10415 8B

Resonances in Harbors with Variable Depths,
W76-10416 8B

Wave Response of Offshore Bottomless Harbors,
W76-10417 8B

Nonlinear Lateral Oscillation in a Harbour Model,
W76-10418 8B

Numerical Prediction of Harbor Responses,
W76-10419 8B

Free Oscillations in Bays and Harbors,
W76-10420 8B

Computations of Harbor Oscillations by Ray Methods,
W76-10421 8B

Tests on the Equilibrium Probiles of Model Beaches and the Effects of Grain Shape and Size Distribution,
W76-10422 2L

Physical Modeling of Scour Initiation and Sediment Transport in Distorted Tidal Models,
W76-10423 2L

Time Growth of Tidal Dunes in a Physical Model,
W76-10424 2L

Laboratory Effects in Coastal Movable-Bed Models,
W76-10425 2L

Simulation of Delta Building Process,
W76-10426 2L

Movable-Bed Model Investigation of Taichung Harbor, Taiwan, Rep. of China,
W76-10427 2L

Coastal Mobile Bed Model - Does it Work,
W76-10428 2L

Multilayer Hydrodynamical-Numerical Models,
W76-10429 2L

Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

Modeling of Turbulence in the Surf Zone,
W76-10432 2L

Nearshore Water Circulation Induced by Wind and Waves,
W76-10433 2L

Numerical Model for Wave Refraction by Finite Amplitude Wave Theories,
W76-10434 2L

Scale Effects on Physical/Mathematical Modeling,
W76-10435 8B

Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

Scaling and Sizing Criteria for Thermal-Hydraulic Models,
W76-10437 5B

Application of a Water Quality Model to the Denver Metropolitan Area,
W76-10438 5B

Combined Use of Physical and Mathematical Models for Analysis of Reservoir Water Quality,
W76-10439 5B

Application of a Dynamic Network Model to Hydraulic and Water Quality Studies of the St. Lawrence River,
W76-10440 5B

Finite Difference Approximation to the Convective Transport Equation,
W76-10441 5B

Measured Contributions of the Terms of the Vertically Integrated Hydrodynamic Equations,
W76-10442 2L

Simulation of the Salinity Distribution in the St. Lawrence Estuary by a Two-Dimensional Mathematical Model,
W76-10443 5B

Overview of Physical Estuary Practice,
W76-10444 2L

Comparison Between Physical and Mathematical Modelling of a Tidal Fjord System in Northern Norway,
W76-10445 2L

Comparison of Hydraulic and Numerical Tidal Models,
W76-10446 2L

Modeling Sediment Deposition in a Tidal River,
W76-10447 2L

Computer Simulation of Beach Erosion and Profile Modification Due to Waves,
W76-10448 2L

Modelling of Suspension Currents,
W76-10449 5B

Analytical Model of Duct-Flow Fluidization,
W76-10450 8B

Problems of Physical Model Tests with Harbours,
W76-10451 8B

LIBRARY U. OF T. INSTITUTE...

MODEL STUDIES

Finite Element Model for Backwater Computation,
W76-10452 8B

Two-Dimensional Finite Element Dispersion Model,
W76-10453 5B

FLOW2D: A Two-Dimensional Flow Model for Flood Plains and Estuaries,
W76-10454 2L

Analogous Modelling of Aquiferous Systems in Coastal Zones,
W76-10455 2L

Numerical Model for Storm Surge and Tidal Run-Up Studies,
W76-10456 2L

Numerical Simulation of Storm Surges in Bays,
W76-10457 2L

Wave Induced Loads on Multi-Element Structures,
W76-10458 8B

Portable Breakwater with Ship Hulks,
W76-10459 8B

Analysis of Floating Breakwater Performance,
W76-10460 8B

Reliability of Rubble-Mound Breakwater Stability Models,
W76-10461 8B

Modeling of Inlet-Bay Systems in Relation to Sand Trapping,
W76-10462 2L

LCHF Coastal Sediment Modeling Techniques,
W76-10463 2L

MOHAWK RIVER (NY)
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

MOISTURE CONTENT
Effect of Water Regime on Productivity of Cultivated Plants, (In Belorussian),
W76-10189 3F

MOISTURE DIFFUSIVITY (SOILS)
Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

MOISTURE PROFILES (SOILS)
Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

MOISTURE STRESS
Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

MOLLUSCS
A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

MOLLUSKS
Byssal Thread Production as a Toxicity Test,
W76-10362 5A

Sampling Marine Organisms and Sediments for High Precision Gas Chromatographic Analysis of Aromatic Hydrocarbons,
W76-10401 5A

Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

MOLYBDENUM
Interlaboratory Quality Control Study No. 5, Chromium, Iron, Molybdenum and Vanadium,
W76-10493 5A

MONITORING
Phosphorus Distribution from Septic Tank Effluent in Coastal Plain Soils,
W76-10015 5B

An Instrument with Internal Calibration for Monitoring Chlorine Residuals in Natural Waters,
W76-10028 5A

Pollution Monitoring Doesn't Have to be Costly,
W76-10029 5A

Evaluation of the Army Pesticide Monitoring Program, Evaluation of Data from Environmental Samples Collected Prior to 1 January 1974, Part I, Soil, Sediment, Water,
W76-10048 5A

Continuous Respirometer Apparatus for Monitoring Sewage Oxygen Content.
W76-10201 5A

Problems and Techniques of Marine Biology in the Field: Modeling the Marine Ecosystem,
W76-10355 5C

Systematic Analysis of Field Survey Techniques and Operational Utility of Environmental Research to the Navy,
W76-10356 5G

The Systems Concept and Pollution Control,
W76-10357 5G

The Need for More Intercomparable Field Data and Widely Applicable Short-Term Survey,
W76-10358 5G

Comparison of Toxicity Tests,
W76-10367 5C

Pilot Project on Marine Pollution Monitoring Under the Framework of Igoss,
W76-10373 5B

Quantitative Monitoring and Variability of Pelagic Tar in the North Atlantic,
W76-10378 5B

Oil Spillage Monitoring, Sampling and Recovery Systems,
W76-10382 5B

Sampling of Oil Spills and Fingerprinting by Infrared Spectroscopy,
W76-10383 5B

Identification, Estimation and Monitoring of Petroleum in Marine Waters by Luminescence Methods,
W76-10395 5B

Sampling Marine Organisms and Sediments for High Precision Gas Chromatographic Analysis of Aromatic Hydrocarbons,
W76-10401 5A

Field Sampling Methods and Techniques for Marine Organisms and Sediments,
W76-10402 5A

Methods for Establishing Levels of Petroleum Contamination in Organisms and Sediment as Related to Marine Pollution Monitoring,
W76-10403 5B

MONTANA
Microbiology and Chemistry Studies of Water Quality Factors in a Watershed Used for Municipal Supply and Waste Disposal,
W76-10263 5B

MONTEREY BAY (CALIF)
An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

MORTALITY
Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

Pikes (Esox Lucius L.) Shown to be Affected by Low pH Values During First Weeks After Hatching,
W76-10343 5C

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

Low Thermal Responsiveness in the Bluegill, Lepomis Macrochirus,
W76-10369 5C

MOSCOW RIVER (USSR)
Change of Water Regime and Content of Mobile Forms of N, K, Mn and Fe in Meadow-Peat Soil of the Ramensk Floodplain of the Moscow River in Connection with Agricultural Use, (In Russian),
W76-10477 2G

OUNTAIN FORESTS
The Quantity and Distribution of Four Nutrient Elements in High-Elevation Forest Ecosystems, Balsam Mountains, North Carolina,
W76-10319 5B

OVABLE-BED MODELS
Tests on the Equilibrium Probiles of Model Beaches and the Effects of Grain Shape and Size Distribution,
W76-10422 2L

Physical Modeling of Scour Initiation and Sediment Transport in Distorted Tidal Models,
W76-10423 2L

Laboratory Effects in Coastal Movable-Bed Models,
W76-10425 2L

Simulation of Delta Building Process,
W76-10426 2L

Movable-Bed Model Investigation of Taichung Harbor, Taiwan, Rep. of China,
W76-10427 2L

Coastal Mobile Bed Model - Does it Work,
W76-10428 2L

OVEMENT
Salt-Load Computations--Colorado River; Cameo, Colorado to Cisco, Utah: Part 1. Data Summary,
W76-10142 7C

UD PUMPS
How to Get the Most from Mud Pump Parts,
W76-10112 8G

ULTIPLE-INPUT PLANNING
An LP-10 Model for Coordinating Multi-Group Inputs in Resource Planning,
W76-10192 6A

UNICIPAL WASTES
Thames Water Opens Stanford Rivers Sewage Treatment Works,
W76-10229 5D

Virus Removal in an Activated Sludge Plant,
W76-10230 5D

Reclamation of A Burned Anthracite Refuse Bank with Municipal Sludge,
W76-10249 5E

Great Lakes Pollution Cleanup Stagnates as Problems Mount,
W76-10250 5G

USSELS
Aspects of Physiological Condition in Mytilus Edulis L., with Special Reference to the Effects of Oxygen Tension and Salinity,
W76-10070 5C

Bodily Distribution, Accumulation and Excretion of Mercury in a Fresh-Water Mussel,
W76-10081 5C

A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

Sampling Marine Organisms and Sediments for High Precision Gas Chromatographic Analysis of Aromatic Hydrocarbons,
W76-10401 5A

Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

MYA ARENARIA
Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

NATIONAL COMMISSION ON WATER QUALITY
PL92-500: Mid-Course Correction Grants Options; Next Move up to Congress,
W76-10106 5G

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
Operation and Impact of NPDES in Region II, Part I,
W76-10005 5G

NATIONAL WATER DATA STORAGE AND RETRIEVAL SYSTEM (WATSTORE)
National Water Data Storage and Retrieval System: Instructions for Preparation and Submission of Ground-Water Data,
W76-10148 10D

NATURAL GAS
Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

NAVADA
Water Quality Data from Truckee and Carson Rivers. Pyramid Lake and Lahontan Reservoir, A Working Paper.
W76-10054 5C

NETWORKS
Network Models and the Impact of Modeling Assumptions,
W76-10196 4A

NEUSTON
Quantitative Monitoring and Variability of Pelagic Tar in the North Atlantic,
W76-10378 5B

Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

NEUTRALIZATION
Sodium Bicarbonate Doses Upgrade Plant to '77 Standards.
W76-10233 5D

NEW SOUTH WALES
Comparison of Sheep and Cattle Grazing on Semiarid Grassland,
W76-10181 4C

NICKEL
Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

NITRATE-NITROGEN
Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

NITRATES
Alfalfa Safeguards Ground Water.
W76-10093 5G

Fertilization, Nutrient Composition, and Yield Relationships in Irrigated Spring Wheat,
W76-10177 3F

Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

NITRITES
Nitrogen Removal Depends on Form Nutrient Takes,
W76-10174 5D

NITROGEN
Alfalfa Safeguards Ground Water.
W76-10093 5G

Nitrogen Removal Depends on Form Nutrient Takes,
W76-10174 5D

Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

Nitrogen Regeneration by the Ctenophore Mnemiopsis Leidyi,
W76-10284 5C

River Input of Inorganic Phosphorus and Nitrogen to the Southeastern Salt-Marsh Estuarine Environment,
W76-10286 5C

Harvest of Biological Production as a Means of Improving Effluents form Sewage Lagoons,
W76-10500 5G

NITROGEN CYCLE
A Preliminary Compartment Model of the Nitrogen Cycle in a Deciduous Forest Ecosystem,
W76-10269 5B

Simulation of Nitrogen Distribution and Its Effect on Productivity in Even-Aged Loblolly Pine Plantations,
W76-10271 5B

The Role of Benthic Communities in the Nitrogen and Phosphorus Cycles of an Estuary,
W76-10285 5C

Significance of Biological Nitrogen Fixation and Denitrification in a Deciduous Forest Ecosystem,
W76-10320 5B

Effects of Forest Fires on Atmospheric Loads of Soluble Nutrients,
W76-10328 4C

NITROGEN FIXATION
Significance of Biological Nitrogen Fixation and Denitrification in a Deciduous Forest Ecosystem,
W76-10320 5B

Nitrogen Fixation by Lichens of the Northern Piedmont,
W76-10327 5C

NON-STRUCTURAL ALTERNATIVES
Flood Plain Information: East Arm Little Calumet River, Salt Creek-Coffee Creek, Porter County, Indiana.
W76-10152 4A

Flood Plain Information: Little Eagle Creek and Tributaries, Marion County, Indiana.
W76-10153 4A

Flood Plain Information: Crooked Creek and Williams Creek, Marion County, Indiana.
W76-10154 4A

Special Flood Hazard Information: Arkansas River, Arkansas City, Kansas.
W76-10160 4A

Special Flood Hazard Information: Labette and Little Labette Creeks, Parsons, Kansas.
W76-10161 4A

Flood Plain Information: Pike Creek, New Castle County, Delaware.
W76-10165 4A

Flood Plain Information: Dry Turkey and Bull Creeks, McPherson, Kansas.
W76-10167 4A

NORTH FORK (WASH)
Tacoma's North Fork Wells.
W76-10089 4B

NORTH SEA
Measured Contributions of the Terms of the Vertically Integrated Hydrodynamic Equations,
W76-10442 2L

NORWAY
Comparison Between Physical and Mathematical Modelling of a Tidal Fjord System in Northern Norway,
W76-10445 2L

NUCLEAR POWER PLANTS
Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

NUMERICAL ANALYSIS
Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

NUTRIENT BUDGET
Nutrient Flux and Cycling in Freshwater Ecosystems,
W76-10287 5C

NUTRIENT FLUX
Nutrient Flux and Cycling in Freshwater Ecosystems,
W76-10287 5C

NUTRIENT REMOVAL
Selective Renovation of Eutrophic Wastes Phosphate Removal,
W76-10026 5D

Aquiculture - New Broom Cleans up Wastewater,
W76-10180 5G

The Santee Swamp as a Nutrient Sink,
W76-10288 5C

The Role of Emergent Macrophytes in Mineral Cycling in a Freshwater Marsh,
W76-10289 5C

NUTRIENT REQUIREMENTS
Fertilization, Nutrient Composition, and Yield Relationships in Irrigated Spring Wheat,
W76-10177 3F

NUTRIENTS
The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

Yield-Nutrient Absorption Relationships as Affected by Environmental Growth Factors,
W76-10184 2I

Mineral Cycling in Southeastern Ecosystems.
W76-10266 5C

Seasonal and Annual Variations in the Quantities of Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, and Manganese Reaching the Forest Floor as Mast in Pennsylvania and Vermont Forests,
W76-10306 5B

Fallout Cesium-137 and Mineral-Element Distribution in Food Chains of Granitic-Outcrop Ecosystems,
W76-10307 5B

Effects of Clear-Cutting on Nutrient Losses in Aspen Forests on Three Soil Types in Michigan,
W76-10315 4C

The Quantity and Distribution of Four Nutrient Elements in High-Elevation Forest Ecosystems, Balsam Mountains, North Carolina,
W76-10319 5B

Nutrient Losses in Particulate Form as Weir Pond Sediments from Four Unit Watersheds in the Southern Appalachians,
W76-10330 5C

The Effect of urban Land Use on Nutrient and Suspended-Solids Export from North Florida Watersheds,
W76-10331 4C

NUTRITION
The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

OATS
Effects of Treated Municipal Wastewater on Oat Forage and Grain,
W76-10119 5D

OBSERVATION WELLS
Water Wells as Possible Indicators of Tectonic Strain,
W76-10105 8G

OCEAN CURRENTS
Measured Contributions of the Terms of the Vertically Integrated Hydrodynamic Equations,
W76-10442 2L

OCEAN WAVES
Modeling of Turbulence in the Surf Zone,
W76-10432 2L

OCEANS
Disposal of Sewage from Coastal Towns: The Case for Sea Outfalls,
W76-10224 5E

The Disposal of Sewage from Coastal Towns: The Case for Treatment,
W76-10225 5D

Mineral Cycling in Marine Ecosystems,
W76-10278 5C

ODOR CONTROL
Hydrogen Peroxide Solves Sludge Odor Problem,
W76-10211 5D

OFFSHORE HARBORS
Wave Response of Offshore Bottomless Ha
bors,
W76-10417 8

OFFSHORE PLATFORMS
Pollution-Free Well Cuttings Disposal Ap
paratus,
W76-10464 5

OHIO
Coal Gasification in Southeastern Ohio: Wat
Supply and Demand,
W76-10002 3

Hydrogeologic and Other Considerations Re
lated to the Selection of Sanitary-Landfill Site
in Ohio,
W76-10084 5

OHIO RIVER
Ohio River Cooling Water Study,
W76-10414 5

OIL ABSORPTION
Long Term Weathering Characteristics of Iran
an Crude Oil: The Wreck of the 'Norther
Gulf',
W76-10405 5

OIL INDUSTRY
Marine Pollution Monitoring (Petroleum
Proceedings of a Symposium and Workshop,
W76-10370 5

Maritime Consideration of Oil Transportation,
W76-10375 5

Pollution-Free Well Cuttings Disposal Ap
paratus,
W76-10464 5

OIL POLLUTION
Petroleum Hydrocarbons: Degradation an
Growth Potential for Atlantic Ocean Sedimen
Bacteria,
W76-10068 5

Microbial Petroleum Degradation: Use o
Mixed Hydrocarbon Substrates,
W76-10350 5

Pilot Project on Marine Pollution Monitorin
Under the Framework of Igoss,
W76-10373 5

Tar Ball Loadings on Golden Beach, Florida,
W76-10379 5

Oil Spillage Monitoring, Sampling an
Recovery Systems,
W76-10382 5

Mapping and Identification of Oil on Water b
the Use of an Airborne Laser System,
W76-10384 5

Movement of Spilled Oil in San Francisco Ba
as Predicted by Estuarine Nontidal Drift,
W76-10385 5

Oil Pollution Along the Indian Coastline,
W76-10386 5

Hydrocarbon Concentrations in Seawater alon
the Halifax-Bermuda Section: Lessons Learne
Regarding Sampling and some Results,
W76-10388 5

Suspensions of Crude Oils in Sea Water: Rapi
Methods of Characterizing Light Hydrocarbo
Solutes,
W76-10393 5

LIBRARY U. OF I. URBANA-CHAMP

Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

Field Sampling Methods and Techniques for Marine Organisms and Sediments,
W76-10402 5A

Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

Effects of Oils on Baltic Littoral Community, as Studied in an Outdoor Model Test System,
W76-10411 5C

Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

Marine Pollution by Carcinogenic Hydrocarbons,
W76-10413 5C

Filtration Process,
W76-10473 5D

Oil Skimmer Module with Free Floating Weir Trough,
W76-10482 5G

Coalescing Unit for Gravity Separator,
W76-10484 5G

Clarification Tank,
W76-10486 5D

OIL POLLUTION *OIL SPILLS

Analytical Techniques for Isolating and Quantifying Petroleum Paraffin Hydrocarbons in Marine Organisms,
W76-10406 5A

OIL SAMPLING

Evaluation of Thin Film Oil Samplers,
W76-10381 5A

OIL SPILL

Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

OIL SPILLS

Deep-Sea Bacteria: Growth and Utilization of Hydrocarbons at Ambient and in Situ Pressure,
W76-10349 5B

Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop,
W76-10370 5B

Pilot Project on Marine Pollution Monitoring Under the Framework of Igoss,
W76-10373 5B

Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

Movement of Spilled Oil in San Francisco Bay as Predicted by Estuarine Nontidal Drift,
W76-10385 5B

Oil Pollution Along the Indian Coastline,
W76-10386 5B

Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

Oil Skimmer Module with Free Floating Weir Trough,
W76-10482 5G

Coalescing Unit for Gravity Separator,
W76-10484 5G

OIL WASTES

Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

OIL-WATER INTERFACES

Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

OILY WATER

Evaluation of Thin Film Oil Samplers,
W76-10381 5A

Oil Spillage Monitoring, Sampling and Recovery Systems,
W76-10382 5B

Sampling of Oil Spills and Fingerprinting by Infrared Spectroscopy,
W76-10383 5B

Movement of Spilled Oil in San Francisco Bay as Predicted by Estuarine Nontidal Drift,
W76-10385 5B

Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

Determination of Aromatic Hydrocarbons in Sea Water using an Electrolytic Stripping Cell,
W76-10390 5A

Determination of Aromatic and Total Hydrocarbon Content in Submicrogram and Microgram Quantities in Aqueous Systems by Means of High Performance Liquid Chromatography,
W76-10391 5A

Suspensions of Crude Oils in Sea Water: Rapid Methods of Characterizing Light Hydrocarbon Solutes,
W76-10393 5A

Measurement and Characterization of Nonvolatile Hydrocarbons in Ocean Water,
W76-10394 5B

Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

Field Sampling Methods and Techniques for Marine Organisms and Sediments,
W76-10402 5A

OILY WATER SEPARATORS

Maritime Considerations,
W76-10377 5G

OILY WATERS

Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

OLIGOCOTTUS SP.

A Comparison of Growth and Abundance for Tidal Pool Fishes in California and British Columbia,
W76-10064 2L

OLIGOTROPHY

A Specific-Activity and Concentration Model Applied to Cesium Movement in an Oligotrophic Lake,
W76-10275 5C

ON-SITE INVESTIGATIONS

An Instrument with Internal Calibration for Monitoring Chlorine Residuals in Natural Waters,
W76-10028 5A

Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

ON-SITE TESTS

Percolation Tests for Septic Tank Suitability in Southern Arizona Soils,
W76-10248 5D

OPEN CHANNEL FLOW

Principles and Measuring Techniques of Turbulence Characteristics in Open-Channel Flows,
W76-10134 8B

OPEN-HOLE FRACTURING (WELLS)

How to Sand Frac Multiple Zone Open Hole Sections,
W76-10117 8G

OPTIMIZATION

Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

A Review on Decision Models in Economics of Regional Water Quality Management,
W76-10195 5G

Evaluation of the Ciria Prototype Model for the Design of Sewage-Treatment Works,
W76-10245 5D

Contribution to Optimizing Chemical Precipitation in Untreated Waste Water Through Control of the Added Flocculant Quantity (Beitrag Zur Optimierung Chemischer Faellung Im Rohabwasser Durch Die Steuerung Der Faellmittelzugabemenge),
W76-10246 5D

OREGON
Planning Implications of Dissolved Oxygen Depletion in the Willamette River, Oregon,
W76-10332 5G

ORGANIC CHELATORS
Organically Complexed Copper, Zinc, and Chelating Agents in Rivers of Western Puerto Rico,
W76-10292 5B

ORGANIC COMPOUNDS
Application of a Computer-Based Chromatograph for Automated Water Pollution Analyses,
W76-10038 5A

The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

Standardization of the Content of Benzo(a)-Pyrene in Water Bodies, (In Russian),
W76-10351 5C

Hydrocarbon Content and Chlorophyll Correlation in the Waters Between Nova Scotia and the Gulf Stream,
W76-10389 5B

Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

Marine Pollution by Carcinogenic Hydrocarbons,
W76-10413 5C

ORGANIC MATTER
Different Levels of Soil Organic Matter in Desert Soil and Nitrogen Fertilizer on Yields and Mineral Composition of Barley Grown in the Soil,
W76-10170 3F

Harvest of Biological Production as a Means of Improving Effluents form Sewage Lagoons,
W76-10500 5G

OSMOTIC POTENTIAL
Interaction of Water Potential and Temperature Effects on Germination of Three Semi-Arid Plant Species,
W76-10185 2I

OSMOTIC PRESSURE
Interaction of Water Potential and Temperature Effects on Germination of Three Semi-Arid Plant Species,
W76-10185 2I

OUTER CONTINENTAL SHELF
Pollution-Free Well Cuttings Disposal Apparatus,
W76-10464 5G

Floating Structure Arrangement,
W76-10465 8A

OUTFALL SEWERS
Disposal of Sewage from Coastal Towns: The Case for Sea Outfalls,
W76-10224 5E

The Disposal of Sewage from Coastal Towns: The Case for Treatment,
W76-10225 5D

OUTLETS
Disposal of Sewage from Coastal Towns: The Case for Sea Outfalls,
W76-10224 5E

OXIDATION
Photooxidative Destruction of Organic Wastes,
W76-10472 5D

OXYGEN
Effects of Hyperbaric Pressure on Oxygen Concentration in the Swim Bladder of Poecilia Latipinna,
W76-10066 5C

Continuous Respirometer Apparatus for Monitoring Sewage Oxygen Content.
W76-10201 5A

Treatment of Waste with Oxygen or Ozone.
W76-10212 5D

Vertical Static Tube Aerators: Evaluating Their Performance,
W76-10223 5D

OXYGEN REQUIREMENTS
On the Relationship Between Oxygen Consumption and Feeding Level in Decapods,
W76-10072 5C

OXYGEN TRANSFER
Diffused Air in Deep Tank Aeration,
W76-10226 5D

OXYGENATION
What's New in Ozonation, Oxygenation, Reverse Osmosis and Ultrafiltration.
W76-10214 5D

Diffused Air in Deep Tank Aeration,
W76-10226 5D

OYSTERS
A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

OZONE
The Role of Hydroxyl Radical Reactions in Ozonation Processes in Aqueous Solutions,
W76-10036 5D

Treatment of Waste with Oxygen or Ozone.
W76-10212 5D

What's New in Ozonation, Oxygenation, Reverse Osmosis and Ultrafiltration.
W76-10214 5D

PACIFIC NORTHWEST U. S
Ground-Water Pollution Problems in the Northwestern United States,
W76-10083 5B

PAGLIA RIVER (ITALY)
Bodily Distribution, Accumulation and Excretion of Mercury in a Fresh-Water Mussel,
W76-10081 5C

PALAEMONETES SP.
Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

PANDOH DAM (INDIA)
Simulation of Delta Building Process,
W76-10426 2L

PAR POND (SC)
Changes in Water Chemistry and Primary Productivity of a Reactor Cooling Reservoir (Par Pond),
W76-10290 5C

PASTURE MANAGEMENT
Center-Pivot Irrigation,
W76-10173 3F

Comparison of Sheep and Cattle Grazing on Semiarid Grassland,
W76-10181 4C

PATENTS
Sewer Pest Control Check Valve,
W76-10199 8C

Apparatus and Method for Removing Pollutants from Wastewater,
W76-10200 5D

Continuous Respirometer Apparatus for Monitoring Sewage Oxygen Content.
W76-10201 5A

Waste Water Treatment.
W76-10202 5D

Process for Decontaminating Sewage Containing Cyanide,
W76-10203 5D

Treatment and Disposal of Sewage Sludge,
W76-10204 5D

Sewage Handling and Disposal Process for Chloride (NACL) Contaminated Sludges,
W76-10205 5D

Traction-Driven Composite Sludge Raking Mechanism for Sedimentation Tanks,
W76-10206 5D

Waste Treatment Process,
W76-10207 5D

Method and Apparatus for the Activated Sludge Treatment of Wastewater,
W76-10208 5D

Recirculating Sewerage System,
W76-10209 5D

Treatment of Waste with Oxygen or Ozone.
W76-10212 5D

Pollution-Free Well Cuttings Disposal Apparatus,
W76-10464 5G

Floating Structure Arrangement,
W76-10465 8A

Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

Method for Treating Fouled Water,
W76-10467 5D

Flocculation of Suspended Solids,
W76-10468 5D

Method for Controlling Scale,
W76-10469 5G

Geothermal Power Method,
W76-10470 3C

Process and Apparatus for Treating Fatty Waste Water,
W76-10471 5D

Photooxidative Destruction of Organic Wastes,
W76-10472 5D

LIBRARY U. OF I. DRAINAGE SERIES

Filtration Process,
W76-10473 5D

Method of Storing Sludge Recovered from the Hot Water Extraction of Bitumen from Tar Sands,
W76-10474 5D

Water Softener,
W76-10475 5F

Algae Harvester,
W76-10478 5G

Clarifier Apparatus,
W76-10479 5F

Water Conditioning Apparatus,
W76-10480 5F

Filter Press,
W76-10481 5D

Oil Skimmer Module with Free Floating Weir Trough,
W76-10482 5G

Modular Container,
W76-10483 5D

Coalescing Unit for Gravity Separator,
W76-10484 5G

Composite Semipermeable Membranes Made from Polyethylenimine,
W76-10485 3A

Clarification Tank,
W76-10486 5D

Chevron Clarifier,
W76-10488 5D

PATH OF POLLUTANTS
A Method for Assessing Friction Losses for a Non-Newtonian Fluid, Such as Sewage Sludge, under Laminar Flow Conditions,
W76-10009 5B

Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part I: Sanitary Landfill Leachate...What It Is,
W76-10013 5B

Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part II: An Index of the Water Pollution Potential of Sanitary Landfills,
W76-10014 5B

Phosphorus Distribution from Septic Tank Effluent in Coastal Plain Soils,
W76-10015 5B

A Simulation of Water Pollution Model Parameter Estimation,
W76-10021 5B

Computer-Aided Modelling of Stream Purification Capacity, Part I: Nonlinear DO Model,
W76-10024 5B

Computer-Aided Modelling of Stream Purification Capacity, Part II: Multiple Linear Correlation Method,
W76-10025 5B

Effects of a Landfill on Ground-water Quality,
W76-10137 5B

Mineral Pathways in Small Appalachian Streams,
W76-10291 5B

Cerium and Cobalt Movement with Litter Leachate in a Forest Soil,
W76-10311 5B

Movement of Spilled Oil in San Francisco Bay as Predicted by Estuarine Nontidal Drift,
W76-10385 5B

Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

Finite Difference Approximation to the Convective Transport Equation,
W76-10441 5B

Modelling of Suspension Currents,
W76-10449 5B

Exchange Flow Between Lake Ontario and Hamilton Harbour,
W76-10496 5B

PATHOGENIC BACTERIA
General Considerations in Wastewater Disinfection,
W76-10220 5D

PEAK DISCHARGE
Flood Plain Information: South Fork Salt River and Davis Creek, Mexico, Missouri.
W76-10158 4A

Flood Plain Information: Pike Creek, New Castle County, Delaware.
W76-10165 4A

PECTINARIA SP.
Tube-Worm-Sediment Relationships in Populations of Pectinaria Gouldii (Polychaeta: Pectinariidae) from Barnegat Bay, New Jersey,
W76-10061 2L

PELAGE PHENOTYPE
Effects of Age, Sex, and Pelage Phenotype on the Elemental Composition of the Old-Field Mouse,
W76-10301 5A

PELAGIC TAR
Quantitative Monitoring and Variability of Pelagic Tar in the North Atlantic,
W76-10378 5B

Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

PENETRATION RATES
Heavy Collars Aid Hole Control,
W76-10102 8G

PENNSYLVANIA
Selected Streamflow Experience Graphs for Southwestern Pennsylvania,
W76-10132 7C

PENOBSCOT BAY (MAINE)
Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

PERCHES
Some Effects of Acidified Water on the Early Development of Roach (Rutilus Rutilus L.) and Perch (Perca Fluviatilis L.),
W76-10076 5C

PERCOLATION
Percolation Tests for Septic Tank Suitability in Southern Arizona Soils,
W76-10248 5D

PERIPHYTON
The Fouling Community as a Field Monitoring Technique,
W76-10354 5C

Antifouling Coatings and their Influence on the Marine Environment,
W76-10365 5G

PERMITS
Operation and Impact of NPDES in Region II, Part I,
W76-10005 5G

PESTICIDE KINETICS
An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

PESTICIDE RESIDUES
Evaluation of the Army Pesticide Monitoring Program, Evaluation of Data from Environmental Samples Collected Prior to 1 January 1974, Part I, Soil, Sediment, Water,
W76-10048 5A

Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

PESTICIDES
Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

PETROLEUM HYDROCARBONS
Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

PH CHANGES
A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

PHASE SEPARATION
Filtration Process,
W76-10473 5D

PHENOLS
Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

PHOSPHATE
Effect of Surfactants on the Spectrophotometric Determination of Phosphate by Direct and Extraction Procedures,
W76-10027 5A

PHOSPHATE REMOVAL
Selective Renovation of Eutrophic Wastes Phosphate Removal,
W76-10026 5D

PHOSPHATES

PHOSPHATES
Selective Renovation of Eutrophic Wastes Phosphate Removal,
W76-10026 5D

Water Quality Data from Truckee and Carson Rivers. Pyramid Lake and Lahontan Reservoir, A Working Paper.
W76-10054 5C

Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

Important Aspects of Phosphorus Analysis,
W76-10241 5A

PHOSPHORUS
Phosphorus Distribution from Septic Tank Effluent in Coastal Plain Soils,
W76-10015 5B

Solution Phosphorus Concentration and Growth of Rice (Oryza Sativa L.) in Flooded Soils,
W76-10122 3F

Effect of Wastewater Composition and Cell Residence Time on Phosphorus Removal in Activated Sludge,
W76-10239 5D

Important Aspects of Phosphorus Analysis,
W76-10241 5A

Contribution to Optimizing Chemical Precipitation in Untreated Waste Water Through Control of the Added Flocculant Quantity (Beitrag Zur Optimierung Chemischer Faellung Im Rohabwasser Durch Die Steuerung Der Faellmittelzugabemenge),
W76-10246 5D

Systems Models for Phosphorus Management in Florida,
W76-10277 5C

River Input of Inorganic Phosphorus and Nitrogen to the Southeastern Salt-Marsh Estuarine Environment,
W76-10286 5C

Phosphorus Cycling in a Maryland Deciduous Forest Subjected to Various Levels of Mineral-Nutrient Loading,
W76-10313 5B

Harvest of Biological Production as a Means of Improving Effluents form Sewage Lagoons,
W76-10500 5G

PHOSPHORUS REMOVAL
Phosphorus Removal Demonstration Studies at C.F.B. Trenton, Phase II,
W76-10490 5D

Effluent Polishing by Filtration Through Activated Alumina, Volume I.
W76-10491 5D

Assessment of Polyelectrolytes for Phosphorus Removal,
W76-10492 5D

PHOTOGRAPHIC PROCESSING WASTES
Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

PHOTOMETRY
Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

PHOTOOXIDATION
Photooxidative Destruction of Organic Wastes,
W76-10472 5D

PHOTOSYNTHESIS
Photosynthetic Studies of Chondrus Crispus,
W76-10060 5C

PHYSICOCHEMICAL PROPERTIES
Prediction of Elemental Content in the Old-Field Mouse,
W76-10302 5A

Oil Spillage Monitoring, Sampling and Recovery Systems,
W76-10382 5B

PHYTOPLANKTON
Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

PIKES
Pikes (Esox Lucius L.) Shown to be Affected by Low pH Values During First Weeks After Hatching,
W76-10343 5C

PINE TREES
Effects of Forest Fires on Atmospheric Loads of Soluble Nutrients,
W76-10328 4C

PINFISH
Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

PIPES
Design of a Stormwater Sewer by Nonlinear Programming--1,
W76-10034 5D

PITLESS ADAPTERS
Pitless Unit and Adapter Update.
W76-10092 8G

PLANKTON
Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

PLANNING
Basin Governance,
W76-10130 6E

Systematic Analysis of Field Survey Techniques and Operational Utility of Environmental Research to the Navy,
W76-10356 5G

PLANT GROWTH
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

Puddling Tropical Rice Soils: 2. Effects of Water Losses,
W76-10118 3F

Solution Phosphorus Concentration and Growth of Rice (Oryza Sativa L.) in Flooded Soils,
W76-10122 3F

Techniques for Improving Tree Survival and Growth in Semiarid Areas,
W76-10175 2I

Yield-Nutrient Absorption Relationships as Affected by Environmental Growth Factors,
W76-10184 2I

Effect of Tillage on Soil Structure and Plant Growth Under Rain-Fed Conditions,
W76-10487 2G

PLANT GROWTH REGULATORS
Seed Germination and Early Seedling Growth of Wheat (Triticum Aestivum Linn.) CV. 1553 Under the Influence of Salinity and Plant-Growth Hormones,
W76-10169 3C

PLANT POPULATIONS
Influence of Nutrient Availability on Ecosystem Structure,
W76-10324 5C

PLANT TISSUES
Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

PLANTING MANAGEMENT
Effect of Cultural Practices on Grain Yield and Yield Components in Irrigated Wheat,
W76-10176 3F

PLASTICS
Floating Structural Plastic Truss System Protects Waste Lagoon Lining,
W76-10007 5G

The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

POCILLOPORA SP.
Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

POECILIA LATIPINNA
Effects of Hyperbaric Pressure on Oxygen Concentration in the Swim Bladder of Poecilia Latipinna,
W76-10066 5C

POISONS
Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

POLLUTANT IDENTIFICA TION
Effects of Age, Sex, and Pelage Phenotype on the Elemental Composition of the Old-Field Mouse,
W76-10301 5A

POLLUTANT IDENTIFICATION
Retention of Metals in Sewage Sludge II: Incorporated Radioisotopes,
W76-10006 5A

Optimal Allocation of Measurement and Control Resources with Application to River Depollution,
W76-10017 5A

A Simulation of Water Pollution Model Parameter Estimation,
W76-10021 5B

LIBRARY U. S. OFF. L. DRAWN-Colorado, Fort

Computer-Aided Analysis of Environmental Data, Part I: Linear Regression, Precision and Accuracy,
W76-10022 5A

Computer-Aided Analysis of Environmental Data, Part II: Biochemical Oxygen Demand Model,
W76-10023 5A

Effect of Surfactants on the Spectrophotometric Determination of Phosphate by Direct and Extraction Procedures,
W76-10027 5A

An Instrument with Internal Calibration for Monitoring Chlorine Residuals in Natural Waters,
W76-10028 5A

Pollution Monitoring Doesn't Have to be Costly,
W76-10029 5A

Potentiometric Determination of Low Levels of Simple and Total Cyanides,
W76-10030 5A

Application of a Computer-Based Chromatograph for Automated Water Pollution Analyses,
W76-10038 5A

Evaluation of the Army Pesticide Monitoring Program, Evaluation of Data from Environmental Samples Collected Prior to 1 January 1974, Part I, Soil, Sediment, Water,
W76-10048 5A

Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

Bodily Distribution, Accumulation and Excretion of Mercury in a Fresh-Water Mussel,
W76-10081 5C

Distribution of Selected Metals in Tissue Samples of Carp, Cyprinus Carpio,
W76-10082 5C

Asymmetry Analysis in Fishes: A Possible Statistical Indicator of Environmental Stress,
W76-10121 5C

Design A River Basin Sampling System,
W76-10131 5A

The Measurement of Adenosine Triphosphate in Pure Algal Cultures and Natural Aquatic Samples,
W76-10133 5A

Continuous Respirometer Apparatus for Monitoring Sewage Oxygen Content.
W76-10201 5A

Biodegradability--An Important Criterion for the Environmental Compatibility of Surfactants and Other Product Compounds,
W76-10235 5A

Determination of the Chemical Oxygen Demand (COD) by Potassium Dichromate at Very High Chloride Concentrations (Bestimmung des Chemischen Sauerstoffbedarfs (CSB) Gegen Kaliumdichromat Bei Sehr Hohen Chloridkonzentrationen),
W76-10236 5A

Analytical Notes--Electrochemical Method for Early Detection and Monitoring of Coliforms,
W76-10237 5A

Anionic and Non-Ionic Surfactant Biodegradation in a Purifying Plant using Activating Muds (Biodegradazione de Tensioattivi Anionici e Non-Ionici in un Impianto di Trattamento a Fanghi Attivati),
W76-10238 5A

Analyzing for Asbestos in Drinking Water,
W76-10240 5A

Important Aspects of Phosphorus Analysis,
W76-10241 5A

Pollutant Analysis Cost Survey,
W76-10259 5A

Water Pollution Sampler Evaluation,
W76-10261 5A

Prediction of Elemental Content in the Old-Field Mouse,
W76-10302 5A

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

Delta-Amino Levulinic Acid Dehydratase Activity in Fish Blood as an Indicator of a Harmful Exposure to Lead,
W76-10338 5C

The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

Microbial Petroleum Degradation: Use of Mixed Hydrocarbon Substrates,
W76-10350 5B

The Fouling Community as a Field Monitoring Technique,
W76-10354 5C

Byssal Thread Production as a Toxicity Test,
W76-10362 5A

Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

Determination of Aromatic Hydrocarbons in Sea Water using an Electrolytic Stripping Cell,
W76-10390 5A

Determination of Aromatic and Total Hydrocarbon Content in Submicrogram and Microgram Quantities in Aqueous Systems by Means of High Performance Liquid Chromatography,
W76-10391 5A

Determination of C1-C10 Hydrocarbons in Water,
W76-10392 5A

Suspensions of Crude Oils in Sea Water: Rapid Methods of Characterizing Light Hydrocarbon Solutes,
W76-10393 5A

Measurement and Characterization of Non-volatile Hydrocarbons in Ocean Water,
W76-10394 5B

Identification, Estimation and Monitoring of Petroleum in Marine Waters by Luminescence Methods,
W76-10395 5B

Recent Developments in the Identification of Asphalts and Other Petroleum Products,
W76-10396 5A

Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage,
W76-10399 5A

Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

Interlaboratory Quality Control Study No. 5, Chromium, Iron, Molybdenum and Vanadium,
W76-10493 5A

Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

Applicability of the Technicon Autoanalyzer I and II Systems for Shipboard Analysis of Great Lakes Water Samples,
W76-10497 5A

POLLUTION ABATEMENT
The Systems Concept and Pollution Control,
W76-10357 5G

POLLUTION INDICATORS
Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

POLLUTION SOURCES
Boron and Arsenic Studies in Florida Waters,
W76-10265 5B

POLLUTION TRANSPORT MODELS
A Simulation of Water Pollution Model Parameter Estimation,
W76-10021 5B

POLYCHAETES
Tube-Worm-Sediment Relationships in Populations of Pectinaria Gouldii (Polychaeta: Pectinariidae) from Barnegat Bay, New Jersey,
W76-10061 2L

POLYCHLORINATED BIPHENYLS
Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

POLYCHLORINATED BIPHENYLS

Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

POLYDIMETHYLSILOXANES
Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

POLYELECTROLYTES
Assessment of Polyelectrolytes for Phosphorus Removal,
W76-10492 5D

PONDS
Population Characteristics of a Species Ensemble of Waterboatmen (Corixidae),
W76-10123 2H

PORTAGE OPEN BAY (MO)
Flood Plain Information: Portage Open Bay and Main Ditch, Vicinity of Portageville, Missouri.
W76-10156 4A

POTABLE WATER
Fluoride Tolerance of Japanese Quail,
W76-10120 5C

Analyzing for Asbestos in Drinking Water,
W76-10240 5A

POTASSIUM
A Model of Mineral-Element Cycling for an Invertebrate Food Web in a Southeastern Hardwood Forest Litter Community,
W76-10272 5C

Relationship Between Potassium Intake and Radiocesium Retention in the Reindeer,
W76-10305 5C

POTASSIUM COMPOUNDS
How to Drill Troublesome Shales,
W76-10108 8G

Determination of the Chemical Oxygen Demand (COD) by Potassium Dichromate at Very High Chloride Concentrations (Bestimmung des Chemischen Sauerstoffbedarfs (CSB) Gegen Kaliumdichromat Bei Sehr Hohen Chloridkonzentrationen),
W76-10236 5A

POTENTIOMETERS
Potentiometric Determination of Low Levels of Simple and Total Cyanides,
W76-10030 5A

PREDATION
Competition and the Relative Abundances of Two Cladocerans,
W76-10125 2I

PRESSURE
Effects of Hyperbaric Pressure on Oxygen Concentration in the Swim Bladder of Poecilia Latipinna,
W76-10066 5C

PREVENTATIVE METHODS
How to Drill Without Troublesome Dog-Legs,
W76-10111 8G

PREVENTIVE MAINTENANCE
How to Get the Most from Mud Pump Parts,
W76-10112 8G

PRICING
Urban Service Pricing and Land Use: Some Preliminary Results,
W76-10193 6C

PRIMARY PRODUCTIVITY
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

Changes in Water Chemistry and Primary Productivity of a Reactor Cooling Reservoir (Par Pond),
W76-10290 5C

Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

PRINCE WILLIAM SOUND (ALAS)
Sampling Marine Organisms and Sediments for High Precision Gas Chromatographic Analysis of Aromatic Hydrocarbons,
W76-10401 5A

PRODUCTIVITY
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

PROGRAMS
Canadian Participation in the International Hydrological Decade, Final Report, (Volume 2), Research Reports.
W76-10489 2A

PROJECT PLANNING
Small Sewage Works that Function Satisfactorily,
W76-10228 5D

PROJECTIONS
Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

PROPERTY RIGHTS
Compilation and Analysis of Water Quality Rights and Responsibilities in Hawaii,
W76-10001 5G

PSEUDOMONAS
Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

PUBLIC HEALTH
Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah,
W76-10171 5G

Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

Marine Pollution by Carcinogenic Hydrocarbons,
W76-10413 5C

PUBLIC LAW 92-500
PL92-500: Mid-Course Correction Grants Options; Next Move up to Congress,
W76-10106 5G

PUBLIC POLICY
Urban Service Pricing and Land Use: Some Preliminary Results,
W76-10193 6C

PUDDLING
Puddling Tropical Rice Soils: 2. Effects of Water Losses,
W76-10118 3F

PUERTO RICO
Organically Complexed Copper, Zinc, and Chelating Agents in Rivers of Western Puerto Rico,
W76-10292 5B

FLOW2D: A Two-Dimensional Flow Model for Flood Plains and Estuaries,
W76-10454 2L

PULP WASTES
Effects of Kraft Mill Effluents on Benthic Macrophyte Assemblages in a Shallow-Bay System (Apalachee Bay, North Florida, U.S.A.),
W76-10077 5C

Changes in Some Hematological Characteristics of Coho Salmon (Oncorhynchus Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

PUMP TESTING
Field Research and Testing of a Water Hand Pump for use in Developing Countries,
W76-10086 8G

PUMPING
Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

Program Esoph - Extended Soph, Simulation of Time-Variant Piezometric Surface in a Confined, Leaky Aquifer Subjected to Pumping.
W76-10498 7C

PUMPS
Field Research and Testing of a Water Hand Pump for use in Developing Countries,
W76-10086 8G

Program Esoph - Extended Soph, Simulation of Time-Variant Piezometric Surface in a Confined, Leaky Aquifer Subjected to Pumping.
W76-10498 7C

QUALITY CONTROL
Tubing-Casing Reclamation Saved Shell Over $3 Million,
W76-10101 8G

How to Avoid Downhole Failures and Maximize Pipe Use,
W76-10114 8G

RADIOISOTOPES
Retention of Metals in Sewage Sludge II: Incorporated Radioisotopes,
W76-10006 5A

Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

Frequency Distributions of Radiocesium Concentrations in Soil and Biota,
W76-10273 5B

A Specific-Activity and Concentration Model Applied to Cesium Movement in an Oligotrophic Lake,
W76-10275 5C

Uptake and Elimination of Radiotungsten in Black Bullheads,
W76-10293 5C

Redistribution of Cesium-137 in Southeastern Watersheds,
W76-10295 5B

Radiocesium Cycling in Vegetation and Soil,
W76-10296 5B

Accumulation and Mobility of Cesium in Roots of Tulip Poplar Seedlings,
W76-10297 5B

Radiocesium Levels in Vegetation Colonizing a Contaminated Flood Plain,
W76-10298 5C

Seasonal Variation in Radiocesium Concentrations in Three Tree Species,
W76-10299 5C

Distribution of Radiocesium in Vegetation Along a Contaminated Stream,
W76-10300 5B

Radiocesium Concentrations in Whole-Body Homogenates and Several Body Compartments of Naturally Contaminated White-Tailed Deer,
W76-10304 5C

Relationship Between Potassium Intake and Radiocesium Retention in the Reindeer,
W76-10305 5C

Fallout Cesium-137 and Mineral-Element Distribution in Food Chains of Granitic-Outcrop Ecosystems,
W76-10307 5B

Cerium and Cobalt Movement with Litter Leachate in a Forest Soil,
W76-10311 5B

RAIN WATER

The Effect of Various Designs of Rain Catching Basins on the Pollution of the Receiving Water and the Economy of the Sewer System (Die Auswirkung Der Verschiedenen Bauarten Von Regenuberlaufbecken Auf Die Schmutzbelastung Des Vorfluters Und Die Wirtschaftlichkeit Des Kanalnetzes),
W76-10198 5D

RAINBOW TROUT

The Effect of In Vivo Chromium Exposure on Na/K- and Mg-ATPase Activity in Several Tissues of the Rainbow Trout (Salmo Gairdneri),
W76-10337 5C

Delta-Amino Levulinic Acid Dehydratase Activity in Fish Blood as an Indicator of a Harmful Exposure to Lead,
W76-10338 5C

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

RAINFALL

Nutrient Return in the Stemflow and Throughfall of Individual Trees in the Piedmont Deciduous Forest,
W76-10326 5B

RAINFALL-RUNOFF RELATIONSHIPS

Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1974,
W76-10141 7C

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1974,
W76-10145 7C

RAJASTHAN

Use of Saline Water in Agriculture. I. Description of the System,
W76-10168 3C

RANGE MANAGEMENT

Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah,
W76-10171 5G

RATES

Vertical Static Tube Aerators: Evaluating Their Performance,
W76-10223 5D

REAERATION

Important Considerations in Designing Activated Sludge Processes,
W76-10227 5D

RECIRCULATED WATER

Effects of Treated Municipal Wastewater on Oat Forage and Grain,
W76-10119 5D

RECLAIMED WATER

Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

RECLAMATION

A Present Value-Unit Cost Methodology for Evaluating Wastewater Reclamation and Direct Reuse at a Military Base of Operations,
W76-10255 5D

RECLAMATION PROGRAM (WELLS)

Tubing-Casing Reclamation Saved Shell Over $3 Million,
W76-10101 8G

RECYCLING

Recirculating Sewerage System,
W76-10209 5D

What's New in Ozonation, Oxygenation, Reverse Osmosis and Ultrafiltration.
W76-10214 5D

System for Total Direct Recycle of Secondary Municipal Wastewater, Vol I -- Design Concepts,
W76-10257 5D

Water Reuse in the United States,
W76-10260 5D

RED SEA

Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

REDCEDAR TREES (JUNIPERUS VIRGINIA)

Techniques for Improving Tree Survival and Growth in Semiarid Areas,
W76-10175 2I

REFERENCE TOXICANTS

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

REFORESTATION

The Effect of Nonremoval Clear-Cutting and Pine Reforestation of the Cation Composition of a Hardwood Forest Soil,
W76-10322 4C

REFRACTION (WATER WAVES)

Numerical Model for Wave Refraction by Finite Amplitude Wave Theories,
W76-10434 2L

REGIONAL ANALYSIS

Basin Governance,
W76-10130 6E

A Review on Decision Models in Economics of Regional Water Quality Management,
W76-10195 5G

REGRESSION ANALYSIS

Physical Factors Controlling Abundance of Meiofauna on Tidal and Atidal Beaches,
W76-10069 5A

REGULATION

Compilation and Analysis of Water Quality Rights and Responsibilities in Hawaii,
W76-10001 5G

Short-Term Regulation of BOD Upsets in an Estuary,
W76-10020 5G

REINDEER

Relationship Between Potassium Intake and Radiocesium Retention in the Reindeer,
W76-10305 5C

REMOTE SENSING

Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

REPRODUCTION

Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

RESEARCH AND DEVELOPMENT

Canadian Participation in the International Hydrological Decade, Final Report, (Volume 2), Research Reports.
W76-10489 2A

RESEARCH PRIORITIES

Strengthening Lake-Shoreland Management in Massachusetts,
W76-10264 6E

RESEARCH PROJECTS

Canadian Participation in the International Hydrological Decade, Final Report, (Volume 2), Research Reports.
W76-10489 2A

RESERVOIR YIELD
1975 Arizona Agricultural Statistics.
W76-10187 3F

RESERVOIRS
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

RESONANCE
Resonances in Harbors with Variable Depths,
W76-10416 8B

RESOURCES DEVELOPMENT
Floating Structure Arrangement,
W76-10465 8A

RESPIRATION
Photosynthetic Studies of Chondrus Crispus,
W76-10060 5C

On the Relationship Between Oxygen Consumption and Feeding Level in Decapods,
W76-10072 5C

RESPIROMETERS
Continuous Respirometer Apparatus for Monitoring Sewage Oxygen Content.
W76-10201 5A

REVERSE OSMOSIS
What's New in Ozonation, Oxygenation, Reverse Osmosis and Ultrafiltration.
W76-10214 5D

Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

Composite Semipermeable Membranes Made from Polyethylenimine,
W76-10485 3A

REVIEW
Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

REVIEWS
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

A Review of the Literature on the Use of Simazine in Fisheries,
W76-10052 5C

Aspects of Physiological Condition in Mytilus Edulis L., with Special Reference to the Effects of Oxygen Tension and Salinity,
W76-10070 5C

Pollution Effects on Surface Waters and Ground Waters, (Literature Review),
W76-10104 5C

A Review on Decision Models in Economics of Regional Water Quality Management,
W76-10195 5G

RICE
Puddling Tropical Rice Soils: 2. Effects of Water Losses,
W76-10118 3F

Solution Phosphorus Concentration and Growth of Rice (Oryza Sativa L.) in Flooded Soils,
W76-10122 3F

RIGHT-OF-WAY
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

RIVER BASINS
Basin Governance,
W76-10130 6E

Design A River Basin Sampling System,
W76-10131 5A

RIVER FLOW
Flood Plain Information: Cumberland River, Burkesville, Kentucky.
W76-10151 4A

Flood Plain Information: Big Sandy River, Lawrence County, Kentucky.
W76-10159 4A

RIVERS
River Input of Inorganic Phosphorus and Nitrogen to the Southeastern Salt-Marsh Estuarine Environment,
W76-10286 5C

Organically Complexed Copper, Zinc, and Chelating Agents in Rivers of Western Puerto Rico,
W76-10292 5B

Planning Implications of Dissolved Oxygen Depletion in the Willamette River, Oregon,
W76-10332 5G

Isolation of the Runoff-Dependent Salinity in a Shallow River-Mouth Offshore Zone Under Conditions of Wind-Induced Rise and Fall of the Water Level, (In Russian),
W76-10361 2L

ROACH
Some Effects of Acidified Water on the Early Development of Roach (Rutilus Rutilus L.) and Perch (Perca Fluviatilis L.),
W76-10076 5C

ROAD CONSTRUCTION
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

ROCK MECHANICS
Predicting Productive Trends Related to Wrench Faults,
W76-10100 8E

RODENTS
Effects of Age, Sex, and Pelage Phenotype on the Elemental Composition of the Old-Field Mouse,
W76-10301 5A

Prediction of Elemental Content in the Old-Field Mouse,
W76-10302 5A

ROOT SYSTEMS
Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

Accumulation and Mobility of Cesium in Roots of Tulip Poplar Seedlings,
W76-10297 5B

ROOTED AQUATIC PLANTS
The Role of Spartina Alterniflora in the Flow of Lead, Cadmium, and Copper Through the Salt-Marsh Ecosystem,
W76-10281 5C

Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

The Role of Emergent Macrophytes in Mineral Cycling in a Freshwater Marsh,
W76-10289 5C

ROTARY DRILLING
What Type of Rig Should You Buy,
W76-10094 8C

How to Drill Without Troublesome Dog-Legs,
W76-10111 8G

RUBBLE-MOUND BREAKWATERS
Reliability of Rubble-Mound Breakwater Stability Models,
W76-10461 8B

RUNOFF
The Effect of Various Designs of Rain Catching Basins on the Pollution of the Receiving Water and the Economy of the Sewer System (Die Auswirkung Der Verschiedenen Bauarten Von Regenuberlaufbecken Auf Die Schmutzbelastung Des Vorfluters Und Die Wirtschaftlichkeit Des Kanalnetzes),
W76-10198 5D

RURAL AREAS
Small Sewage Works that Function Satisfactorily,
W76-10228 5D

SACRAMENTO RIVER (CALIF)
Modeling Sediment Deposition in a Tidal River,
W76-10447 2L

SAFETY
Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

Maritime Consideration of Oil Transportation,
W76-10375 5G

Marine Pollution by Carcinogenic Hydrocarbons,
W76-10413 5C

SALINE AQUIFERS
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

SALINE WATER
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

Use of Saline Water in Agriculture. I. Description of the System,
W76-10168 3C

SALINE WATER-FRESH WATER INTERFACES
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

SALINE WATER-FRESHWATER INTERFACES
Analogous Modelling of Aquiferous Systems in Coastal Zones,
W76-10455 2L

SALINE WATER INTRUSION
Analogous Modelling of Aquiferous Systems in Coastal Zones,
W76-10455 2L

LIBRARY U. OF I. URBANA-CHAMP.

NE WATER SYSTEMS
e of Saline Water in Agriculture. I. Descrip-
n of the System,
76-10168 3C

NITY
luence of Temperature and Salinity on Rou-
e Metabolic Rate and Growth of Young At-
tic Menhaden,
76-10063 5C

pects of Physiological Condition in Mytilus
ulis L., with Special Reference to the Ef-
cts of Oxygen Tension and Salinity,
76-10070 5C

tumn Migration and Vertical Distribution of
e Brown Shrimp Crangon Crangon L. in Rela-
n to Environmental Conditions,
76-10073 5C

lation of the Runoff-Dependent Salinity in a
allow River-Mouth Offshore Zone Under
nditions of Wind-Induced Rise and Fall of
e Water Level, (In Russian),
76-10361 2L

mulation of the Salinity Distribution in the St.
wrence Estuary by a Two-Dimensional
athematical Model,
76-10443 5B

MON
anges in Some Hematological Charac-
ristics of Coho Salmon (Oncorhynchus
isutch) in Response to Acute Exposure to
ehydroabietic Acid (DHAA) at Different Ex-
cise Levels,
76-10333 5C

MONIDS
ffects of Thermal and Chemical Discharges
om Nuclear Power Plants,
76-10051 5C

T-LOAD COMPUTATIONS
alt-Load Computations--Colorado River;
ameo, Colorado to Cisco, Utah: Part 1. Data
ummary,
76-10142 7C

alt-Load Computations--Colorado River;
ameo, Colorado, to Cisco, Utah: Part 2. Basic
ata,
76-10143 7C

T MARSHES
he Role of Spartina Alterniflora in the Flow
Lead, Cadmium, and Copper Through the
alt-Marsh Ecosystem,
76-10281 5C

iver Input of Inorganic Phosphorus and
itrogen to the Southeastern Salt-Marsh
stuarine Environment,
76-10286 5C

T RIVER-SOUTH FORK (MO)
lood Plain Information: South Fork Salt River
nd Davis Creek, Mexico, Missouri.
76-10158 4A

T TOLERANCE
se of Saline Water in Agriculture. I. Descrip-
on of the System,
76-10168 3C

eed Germination and Early Seedling Growth
f Wheat (Triticum Aestivum Linn.) CV. 1553
nder the Influence of Salinity and Plant-
rowth Hormones,
76-10169 3C

SALTS
Salt-Load Computations--Colorado River; Cameo, Colorado to Cisco, Utah: Part 1. Data Summary,
W76-10142 7C

Salt-Load Computations--Colorado River; Cameo, Colorado, to Cisco, Utah: Part 2. Basic Data,
W76-10143 7C

Mobilization of Nutrients in Soil by Acids of Sulfur and Chelating Agents,
W76-10316 5B

SAMPLER EVALUATION
Water Pollution Sampler Evaluation,
W76-10261 5A

SAMPLING
Design A River Basin Sampling System,
W76-10131 5A

Quantitative Monitoring and Variability of Pelagic Tar in the North Atlantic,
W76-10378 5B

Tar Ball Sampling in the Western North Atlantic,
W76-10380 5B

Evaluation of Thin Film Oil Samplers,
W76-10381 5A

Oil Spillage Monitoring, Sampling and Recovery Systems,
W76-10382 5B

Hydrocarbon Concentrations in Seawater along the Halifax-Bermuda Section: Lessons Learned Regarding Sampling and some Results,
W76-10388 5A

Sampling Marine Organisms and Sediments for High Precision Gas Chromatographic Analysis of Aromatic Hydrocarbons,
W76-10401 5A

Field Sampling Methods and Techniques for Marine Organisms and Sediments,
W76-10402 5A

Methods for Establishing Levels of Petroleum Contamination in Organisms and Sediment as Related to Marine Pollution Monitoring,
W76-10403 5B

Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

SAMPLING ERRORS
Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

SAN DIEGO BAY (CALIF)
Comparison of Hydraulic and Numerical Tidal Models,
W76-10446 2L

SAN FRANCISCO BAY
Movement of Spilled Oil in San Francisco Bay as Predicted by Estuarine Nontidal Drift,
W76-10385 5B

Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

SAND CONTROL METHODS (WELLS)
How to Perform a Through-Tubing Gravel Pack,
W76-10113 8G

SAND FILTRATION
Experiments on Rapid Sand Filtration of Biological Sewage Treatment-Plant Effluents (Untersuchungen Ueber Das Verhalten von Schnell-Sandfiltern Bei der Filtration Eines Biologisch Gereinigten Klaeranlagenablaufs),
W76-10215 5D

SANDS
The Simulation of Sediment Transport,
W76-10244 2J

Tar Ball Loadings on Golden Beach, Florida,
W76-10379 5B

Analytical Model of Duct-Flow Fluidization,
W76-10450 8B

SANTEE SWAMP (SC)
The Santee Swamp as a Nutrient Sink,
W76-10288 5C

SARGASSUM
Quantitative Monitoring and Variability of Pelagic Tar in the North Atlantic,
W76-10378 5B

SAVANNAH RIVER (SC-GEO)
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

SCALE EFFECTS
Scale Effects on Physical/Mathematical Modeling,
W76-10435 8B

SCALING
Method for Controlling Scale,
W76-10469 5G

Geothermal Power Method,
W76-10470 3C

SCHEDULING
Small Sewage Works that Function Satisfactorily,
W76-10228 5D

SCOT COLUMNS
Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

SCOTCH PINE TREES
Techniques for Improving Tree Survival and Growth in Semiarid Areas,
W76-10175 2I

SCOUR
Physical Modeling of Scour Initiation and Sediment Transport in Distorted Tidal Models,
W76-10423 2L

SCREENS
Designing Microscreens. Here's Some Help,
W76-10033 5D

Method and Apparatus for the Activated Sludge Treatment of Wastewater,
W76-10208 5D

Design Criteria for Microscreening Biological Wastewater Plant Effluents,
W76-10232 5D

SCULPINS
A Comparison of Growth and Abundance for Tidal Pool Fishes in California and British Columbia,
W76-10064 2L

SEA WATER
Proceedings of the Conference on Marine Biology in Environmental Protection Held at San Clemente Island, California on 13-15 November, 1973.
W76-10353 5C

Marine Pollution by Carcinogenic Hydrocarbons,
W76-10413 5C

SEASONAL
Photosynthetic Studies of Chondrus Crispus,
W76-10060 5C

Seasonal and Annual Variations in the Quantities of Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, and Manganese Reaching the Forest Floor as Mast in Pennsylvania and Vermont Forests,
W76-10306 5B

SECONDARY RECOVERY (OIL)
Sampling of Oil Spills and Fingerprinting by Infrared Spectroscopy,
W76-10383 5B

SEDIMENT CONTROL
Traction-Driven Composite Sludge Raking Mechanism for Sedimentation Tanks,
W76-10206 5D

SEDIMENT DISCHARGE
Traction-Driven Composite Sludge Raking Mechanism for Sedimentation Tanks,
W76-10206 5D

SEDIMENT MODELING
Problems and Techniques of Marine Biology in the Field: Modeling the Marine Ecosystem,
W76-10355 5C

SEDIMENT TRANSPORT
The Simulation of Sediment Transport,
W76-10244 2J

Physical Modeling of Scour Initiation and Sediment Transport in Distorted Tidal Models,
W76-10423 2L

Time Growth of Tidal Dunes in a Physical Model,
W76-10424 2L

Laboratory Effects in Coastal Movable-Bed Models,
W76-10425 2L

Modelling of Suspension Currents,
W76-10449 5B

LCHF Coastal Sediment Modeling Techniques,
W76-10463 2L

SEDIMENTATION
Simulation of Delta Building Process,
W76-10426 2L

Modeling of Inlet-Bay Systems in Relation to Sand Trapping,
W76-10462 2L

SEDIMENTS
Savannah River Biological Survey, South Carolina and Georgia, August, 1954.
W76-10044 5C

Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

Mobilization of Mercury from Freshwater Sediments by Humic Acid,
W76-10294 5C

Nutrient Losses in Particulate Form as Weir Pond Sediments from Four Unit Watersheds in the Southern Appalachians,
W76-10330 5C

Methods for Establishing Levels of Petroleum Contamination in Organisms and Sediment as Related to Marine Pollution Monitoring,
W76-10403 5B

Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

SEED TREATMENT
Seed Germination and Early Seedling Growth of Wheat (Triticum Aestivum Linn.) CV. 1553 Under the Influence of Salinity and Plant-Growth Hormones,
W76-10169 3C

SEGREGATED BALLAST
Maritime Considerations,
W76-10377 5G

SELF-PURIFICATION
Computer-Aided Modelling of Stream Purification Capacity, Part I: Nonlinear DO Model,
W76-10024 5B

Computer-Aided Modelling of Stream Purification Capacity, Part II: Multiple Linear Correlation Method,
W76-10025 5B

SEMIARID CLIMATES
Techniques for Improving Tree Survival and Growth in Semiarid Areas,
W76-10175 2I

Obstacles to the Development of Arid and Semi-Arid Zones.
W76-10179 3F

SEPARATION TECHNIQUES
The Measurement of Adenosine Triphosphate in Pure Algal Cultures and Natural Aquatic Samples,
W76-10133 5A

Filtration Process,
W76-10473 5D

Oil Skimmer Module with Free Floating Weir Trough,
W76-10482 5G

Coalescing Unit for Gravity Separator,
W76-10484 5G

Chevron Clarifier,
W76-10488 5D

SEPTIC TANKS
Beneficial Effects of Baking Soda Added to Septic Tanks,
W76-10012 5D

Phosphorus Distribution from Septic Tank Effluent in Coastal Plain Soils,
W76-10015 5B

Percolation Tests for Septic Tank Suitability in Southern Arizona Soils,
W76-10248 5D

SETO INLAND SEA (JAPAN)
Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

SETTLING BASINS
Traction-Driven Composite Sludge Raking Mechanism for Sedimentation Tanks,
W76-10206 5D

SETTLING VELOCITY
Biochemical and Physical Properties of an Activated Sludge on Settling Characteristics,
W76-10037 5D

SEWAGE
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

Disposal of Sewage from Coastal Towns: The Case for Sea Outfalls,
W76-10224 5E

The Disposal of Sewage from Coastal Towns: The Case for Treatment,
W76-10225 5D

Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

Byssal Thread Production as a Toxicity Test,
W76-10362 5A

SEWAGE DISPOSAL
What to Do with Sewage Sludge.
W76-10210 5D

LIBRARY U. OF I. URBANA-CHAMP.

Disposal of Sewage from Coastal Towns: The Case for Sea Outfalls,
W76-10224 5E

The Disposal of Sewage from Coastal Towns: The Case for Treatment,
W76-10225 5D

SEWAGE EFFLUENTS
Selective Renovation of Eutrophic Wastes Phosphate Removal,
W76-10026 5D

Use of the Earth's Crust for Treatment or Storage of Sewage Effluent and Other Waste Fluids,
W76-10216 5D

Disposal of Sewage from Coastal Towns: The Case for Sea Outfalls,
W76-10224 5E

The Disposal of Sewage from Coastal Towns: The Case for Treatment,
W76-10225 5D

Reclamation of A Burned Anthracite Refuse Bank with Municipal Sludge,
W76-10249 5E

SEWAGE LAGOONS
Harvest of Biological Production as a Means of Improving Effluents form Sewage Lagoons,
W76-10500 5G

SEWAGE SLUDGE
Retention of Metals in Sewage Sludge II: Incorporated Radioisotopes,
W76-10006 5A

Muds, Slimes and Sludges,
W76-10008 5D

A Method for Assessing Friction Losses for a Non-Newtonian Fluid, Such as Sewage Sludge, under Laminar Flow Conditions,
W76-10009 5B

Treatment and Disposal of Sewage Sludge,
W76-10204 5D

Sewage Handling and Disposal Process for Chloride (NACL) Contaminated Sludges,
W76-10205 5D

What to Do with Sewage Sludge.
W76-10210 5D

Improving the Fuel Value of Sewage Sludge,
W76-10234 5E

LSW-500 Disposal of Air Force Liquid Wastes,
W76-10258 5E

SEWAGE TREATMENT
Use of High Level Radiation in Waste Treatment--Status and Prospects,
W76-10010 5D

Cost-Effective Goal,
W76-10032 5D

Designing Microscreens. Here's Some Help,
W76-10033 5D

Biochemical and Physical Properties of an Activated Sludge on Settling Characteristics,
W76-10037 5D

Waste Water Treatment.
W76-10202 5D

Process for Decontaminating Sewage Containing Cyanide,
W76-10203 5D

Sewage Handling and Disposal Process for Chloride (NACL) Contaminated Sludges,
W76-10205 5D

Recirculating Sewerage System,
W76-10209 5D

What's New in Ozonation, Oxygenation, Reverse Osmosis and Ultrafiltration.
W76-10214 5D

Experiments on Rapid Sand Filtration of Biological Sewage Treatment-Plant Effluents (Untersuchungen Ueber Das Verhalten von Schnell-Sandfiltern Bei der Filtration Eines Biologisch Gereinigten Klaeranlagenablaufs),
W76-10215 5D

Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

The Disposal of Sewage from Coastal Towns: The Case for Treatment,
W76-10225 5D

Small Sewage Works that Function Satisfactorily,
W76-10228 5D

Thames Water Opens Stanford Rivers Sewage Treatment Works,
W76-10229 5D

Sodium Bicarbonate Doses Upgrade Plant to '77 Standards.
W76-10233 5D

Anionic and Non-Ionic Surfactant Biodegradation in a Purifying Plant using Activating Muds (Biodegradazione de Tensioattivi Anionici e Non-Ionici in un Impianto di Trattamento a Fanghi Attivati),
W76-10238 5A

Evaluation of the Ciria Prototype Model for the Design of Sewage-Treatment Works,
W76-10245 5D

Great Lakes Pollution Cleanup Stagnates as Problems Mount,
W76-10250 5G

Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

System for Total Direct Recycle of Secondary Municipal Wastewater, Vol I -- Design Concepts,
W76-10257 5D

Water Reuse in the United States,
W76-10260 5D

Flocculation of Suspended Solids,
W76-10468 5D

Filter Press,
W76-10481 5D

SEWERAGE
Continuous Respirometer Apparatus for Monitoring Sewage Oxygen Content.
W76-10201 5A

Waste Water Treatment.
W76-10202 5D

Process for Decontaminating Sewage Containing Cyanide,
W76-10203 5D

Sewage Handling and Disposal Process for Chloride (NACL) Contaminated Sludges,
W76-10205 5D

Recirculating Sewerage System,
W76-10209 5D

Anionic and Non-Ionic Surfactant Biodegradation in a Purifying Plant using Activating Muds (Biodegradazione de Tensioattivi Anionici e Non-Ionici in un Impianto di Trattamento a Fanghi Attivati),
W76-10238 5A

Water Reuse in the United States,
W76-10260 5D

SEWERS
Design of a Stormwater Sewer by Nonlinear Programming--1,
W76-10034 5D

The Influence of the Surface Runoff of Heavy Rains on the Calculation of Sewers (Uber Den Einfluss Des Flachenabflusses Der Starkregen Auf Die Berechung Von Kanalisationen),
W76-10197 5D

Sewer Pest Control Check Valve,
W76-10199 8C

SHADE
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

SHALES
How to Drill Troublesome Shales,
W76-10108 8G

SHEEP
Comparison of Sheep and Cattle Grazing on Semiarid Grassland,
W76-10181 4C

SHELLFISH
Distribution of Copper and Zinc in Oysters and Sediments from Three Coastal-Plain Estuaries,
W76-10279 5C

SHIPS
Maritime Consideration of Oil Transportation,
W76-10375 5G

Maritime Considerations,
W76-10377 5G

SHRIMP
Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

SHRUBS
Water Expenditure on Transpiration by Plants Communities Dominant in Eastern Kara Kum, (In Russian),
W76-10341 2D

SIEROZEMS
Different Levels of Soil Organic Matter in Desert Soil and Nitrogen Fertilizer on Yields

and Mineral Composition of Barley Grown in the Soil,
W76-10170 3F

Characteristics of the Accumulation of Free Amino Acids by Some Nonsporulating Bacteria from Typical Irrigated Sierozem, (In Russian),
W76-10188 5B

SILICONES
Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

SILTS
The Simulation of Sediment Transport,
W76-10244 2J

SILVER
Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

SIMAZINE
A Review of the Literature on the Use of Simazine in Fisheries,
W76-10052 5C

SIMULATION ANALYSIS
Dynamic Modelling and Control Simulation of a Biological Wastewater Treatment Process,
W76-10018 5D

A Simulation of Water Pollution Model Parameter Estimation,
W76-10021 5B

A Computer Simulation of Competition Among Five Sympatric Congeneric Species of Xanthid Crabs,
W76-10124 2L

Network Models and the Impact of Modeling Assumptions,
W76-10196 4A

Minimization of Core Required in Routing Through a Channel Newtwork,
W76-10243 2E

The Simulation of Sediment Transport,
W76-10244 2J

Problems and Techniques of Marine Biology in the Field: Modeling the Marine Ecosystem,
W76-10355 5C

SITES
Hydrogeologic and Other Considerations Related to the Selection of Sanitary-Landfill Sites in Ohio,
W76-10084 5D

SKIMMING
Oil Skimmer Module with Free Floating Weir Trough,
W76-10482 5G

SLUDGE ANALYSIS
Muds, Slimes and Sludges,
W76-10008 5D

SLUDGE DIGESTION
Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

SLUDGE DISPOSAL
Improving the Fuel Value of Sewage Sludge,
W76-10234 5E

Reclamation of A Burned Anthracite Refuse Bank with Municipal Sludge,
W76-10249 5E

Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

Method of Storing Sludge Recovered from the Hot Water Extraction of Bitumen from Tar Sands,
W76-10474 5D

SLUDGE DRYING BEDS
Mathematical Model Simplifies Design of Sludge Drying Beds,
W76-10035 5D

SLUDGE TREATMENT
Muds, Slimes and Sludges,
W76-10008 5D

Mathematical Model Simplifies Design of Sludge Drying Beds,
W76-10035 5D

Treatment and Disposal of Sewage Sludge,
W76-10204 5D

Traction-Driven Composite Sludge Raking Mechanism for Sedimentation Tanks,
W76-10206 5D

Method and Apparatus for the Activated Sludge Treatment of Wastewater,
W76-10208 5D

Hydrogen Peroxide Solves Sludge Odor Problem,
W76-10211 5D

Optimizing Centrifuge Decantation for Sludge Thickening (Optimisation Des Decanteuses Centrifuges Pour La Concentration Des Bous),
W76-10217 5D

Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

Method of Storing Sludge Recovered from the Hot Water Extraction of Bitumen from Tar Sands,
W76-10474 5D

Phosphorus Removal Demonstration Studies at C.F.B. Trenton, Phase II,
W76-10490 5D

SLUDGE WORMS
Tube-Worm-Sediment Relationships in Populations of Pectinaria Gouldii (Polychaeta: Pectinariidae) from Barnegat Bay, New Jersey,
W76-10061 2L

SLURRIES
Selecting Packer Fluids: Here's What to Consider,
W76-10099 8G

SMALL ANIMALS (MAMMALS)
Effects of Age, Sex, and Pelage Phenotype on the Elemental Composition of the Old-Field Mouse,
W76-10301 5A

Prediction of Elemental Content in the Old-Field Mouse,
W76-10302 5A

SMALL-BOAT HARBORS
Numerical Prediction of Harbor Responses,
W76-10419 8B

SMALL WATERSHEDS
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1974,
W76-10141 7C

Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1974,
W76-10144 7C

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1974,
W76-10145 7C

Hydrologic Data for Cow Bayou, Brazos River Basin, Texas, 1974,
W76-10146 7C

Hydrologic Data for North Creek Trinity River Basin, Texas, 1974,
W76-10147 7C

SNAILS
The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

SNOW REMOVAL
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

SODIUM ARSENATE
Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

SODIUM BICARBONATE
Buffering Aids Digestion of Waste.
W76-10218 5D

Sodium Bicarbonate Doses Upgrade Plant to '77 Standards.
W76-10233 5D

SODIUM CHLORIDE
Sewage Handling and Disposal Process for Chloride (NACL) Contaminated Sludges,
W76-10205 5D

Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

SODIUM COMPOUNDS
Four-Mode Treatment Plant Will Generate Sodium Hypochlorite Onsite.
W76-10213 5D

Buffering Aids Digestion of Waste.
W76-10218 5D

Sodium Bicarbonate Doses Upgrade Plant to '77 Standards.
W76-10233 5D

SODIUM HYPOCHLORITE
Four-Mode Treatment Plant Will Generate Sodium Hypochlorite Onsite.
W76-10213 5D

SOIL COMPACTION
Effect of Tillage on Soil Structure and Plant Growth Under Rain-Fed Conditions,
W76-10487 2G

LIBRARY U. OF F. ENVIRONMENTAL ENGR.

SOIL ENVIRONMENT
Different Levels of Soil Organic Matter in Desert Soil and Nitrogen Fertilizer on Yields and Mineral Composition of Barley Grown in the Soil,
W76-10170 3F

Yield-Nutrient Absorption Relationships as Affected by Environmental Growth Factors,
W76-10184 2I

SOIL FILTRATION
Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

SOIL MECHANICS
Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part II: An Index of the Water Pollution Potential of Sanitary Landfills,
W76-10014 5B

SOIL MICROORGANISMS
Effects of Tree Species, Temperature, and Soil on Transfer of Manganese-54 from Litter to Roots in a Microcosm,
W76-10317 5C

SOIL MOISTURE
Anomalous Diurnal Patterns of Stem Xylem Water Potentials in Larrea Tridentata,
W76-10172 2I

Interaction of Water Potential and Temperature Effects on Germination of Three Semi-Arid Plant Species,
W76-10185 2I

Effect of Water Regime on Productivity of Cultivated Plants, (In Belorussian),
W76-10189 3F

Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

Change of Water Regime and Content of Mobile Forms of N, K, Mn and Fe in Meadow-Peat Soil of the Ramensk Floodplain of the Moscow River in Connection with Agricultural Use, (In Russian),
W76-10477 2G

SOIL TEMPERATURE
Yield-Nutrient Absorption Relationships as Affected by Environmental Growth Factors,
W76-10184 2I

SOIL TESTS
Percolation Tests for Septic Tank Suitability in Southern Arizona Soils,
W76-10248 5D

SOIL TYPES
Effects of Clear-Cutting on Nutrient Losses in Aspen Forests on Three Soil Types in Michigan,
W76-10315 4C

SOIL WATER MOVEMENT
Anomalous Diurnal Patterns of Stem Xylem Water Potentials in Larrea Tridentata,
W76-10172 2I

Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

SOIL-WATER-PLANT RELATIONSHIPS
Puddling Tropical Rice Soils: 2. Effects of Water Losses,
W76-10118 3F

Seed Germination and Early Seedling Growth of Wheat (Triticum Aestivum Linn.) CV. 1553 Under the Influence of Salinity and Plant-Growth Hormones,
W76-10169 3C

Anomalous Diurnal Patterns of Stem Xylem Water Potentials in Larrea Tridentata,
W76-10172 2I

Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

Change of Water Regime and Content of Mobile Forms of N, K, Mn and Fe in Meadow-Peat Soil of the Ramensk Floodplain of the Moscow River in Connection with Agricultural Use, (In Russian),
W76-10477 2G

Effect of Tillage on Soil Structure and Plant Growth Under Rain-Fed Conditions,
W76-10487 2G

SOILS
Results of Infiltration Tests Near Scott City, Western Kansas,
W76-10136 2G

Frequency Distributions of Radiocesium Concentrations in Soil and Biota,
W76-10273 5B

Radiocesium Cycling in Vegetation and Soil,
W76-10296 5B

SOLID WASTES
Hydrogeologic and Other Considerations Related to the Selection of Sanitary-Landfill Sites in Ohio,
W76-10084 5D

SOLUBILITY
Waste Treatment Process,
W76-10207 5D

SORPTION
Effects of Tree Species, Temperature, and Soil on Transfer of Manganese-54 from Litter to Roots in a Microcosm,
W76-10317 5C

SOUTH CAROLINA
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

Savannah River Biological Survey, South Carolina and Georgia, August, 1954.
W76-10044 5C

SOUTHEAST U. S.
Redistribution of Cesium-137 in Southeastern Watersheds,
W76-10295 5B

SOUTHEAST US
Mineral Cycling in Southeastern Ecosystems.
W76-10266 5C

SPARTINA ALTERNIFLORA
The Role of Spartina Alterniflora in the Flow of Lead, Cadmium, and Copper Through the Salt-Marsh Ecosystem,
W76-10281 5C

SPATIAL DISTRIBUTION
Photosynthetic Studies of Chondrus Crispus,
W76-10060 5C

Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

Population Characteristics of a Species Ensemble of Waterboatmen (Corixidae),
W76-10123 2H

SPECIES DIVERSITY
Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

SPECIFIC ACTIVITY
A Specific-Activity and Concentration Model Applied to Cesium Movement in an Oligotrophic Lake,
W76-10275 5C

SPECTROMETRY
Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

SPECTROPHOTOMETRY
Effect of Surfactants on the Spectrophotometric Determination of Phosphate by Direct and Extraction Procedures,
W76-10027 5A

SPECTROSCOPY
Sampling of Oil Spills and Fingerprinting by Infrared Spectroscopy,
W76-10383 5B

Hydrocarbon Concentrations in Seawater along the Halifax-Bermuda Section: Lessons Learned Regarding Sampling and some Results,
W76-10388 5A

Identification, Estimation and Monitoring of Petroleum in Marine Waters by Luminescence Methods,
W76-10395 5B

SPRINKLER IRRIGATION
Center-Pivot Irrigation,
W76-10173 3F

ST. LAWRENCE ESTUARY
Simulation of the Salinity Distribution in the St. Lawrence Estuary by a Two-Dimensional Mathematical Model,
W76-10443 5B

ST LAWRENCE RIVER
Application of a Dynamic Network Model to Hydraulic and Water Quality Studies of the St. Lawrence River,
W76-10440 5B

STABILITY
Nutrient Recycling and the Stability of Ecosystems,
W76-10267 5C

Mineral Cycling in Marine Ecosystems,
W76-10278 5C

STATISTICAL ANALYSIS
Recent Developments in the Identification of Asphalts and Other Petroleum Products,
W76-10396 5A

Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

STATISTICAL METHODS
Asymmetry Analysis in Fishes: A Possible Statistical Indicator of Environmental Stress,
W76-10121 5C

Selected Streamflow Experience Graphs for Southwestern Pennsylvania,
W76-10132 7C

Factor Analysis: An Exploratory Technique Applied to Mineral Cycling,
W76-10274 5B

Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

STATISTICS
1975 Arizona Agricultural Statistics.
W76-10187 3F

STEEL CREEK (SC)
Radiocesium Levels in Vegetation Colonizing a Contaminated Flood Plain,
W76-10298 5C

Seasonal Variation in Radiocesium Concentrations in Three Tree Species,
W76-10299 5C

Distribution of Radiocesium in Vegetation Along a Contaminated Stream,
W76-10300 5B

STEMFLOW
Nutrient Return in the Stemflow and Throughfall of Individual Trees in the Piedmont Deciduous Forest,
W76-10326 5B

STONEFLIES
Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

STORAGE CAPACITY
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

STORM RUNOFF
The Influence of the Surface Runoff of Heavy Rains on the Calculation of Sewers (Uber Den Einfluss Des Flachenabflusses Der Starkregen Auf Die Berechung Von Kanalisationen),
W76-10197 5D

The Effect of urban Land Use on Nutrient and Suspended-Solids Export from North Florida Watersheds,
W76-10331 4C

STORM SURGE
Numerical Model for Storm Surge and Tidal Run-Up Studies,
W76-10456 2L

Numerical Simulation of Storm Surges in Bays,
W76-10457 2L

STORMS
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1974,
W76-10141 7C

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1974,
W76-10145 7C

STREAM
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

STREAMFLOW
Salt-Load Computations--Colorado River; Cameo, Colorado to Cisco, Utah: Part 1. Data Summary,
W76-10142 7C

Salt-Load Computations--Colorado River; Cameo, Colorado, to Cisco, Utah: Part 2. Basic Data,
W76-10143 7C

Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1974,
W76-10144 7C

Hydrologic Data for Cow Bayou, Brazos River Basin, Texas, 1974,
W76-10146 7C

Hydrologic Data for North Creek Trinity River Basin, Texas, 1974,
W76-10147 7C

STREAMFLOW EXPERIENCE GRAPHS (PA)
Selected Streamflow Experience Graphs for Southwestern Pennsylvania,
W76-10132 7C

STREAMFLOW FORECASTING
Selected Streamflow Experience Graphs for Southwestern Pennsylvania,
W76-10132 7C

Special Flood Hazard Information: Arkansas River, Arkansas City, Kansas.
W76-10160 4A

STREAMS
Models for Evaluation of Hazardous Wastes,
W76-10190 5B

Nutrient Flux and Cycling in Freshwater Ecosystems,
W76-10287 5C

Mineral Pathways in Small Appalachian Streams,
W76-10291 5B

Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

STRONTIUM
Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

STRUCTURE
Predicting Productive Trends Related to Wrench Faults,
W76-10100 8E

STUCK DRILL STRING
How to Free a Stuck String,
W76-10110 8G

SUBLETHAL EFFECTS
Delta-Amino Levulinic Acid Dehydratase Activity in Fish Blood as an Indicator of a Harmful Exposure to Lead,
W76-10338 5C

SUBSURFACE INVESTIGATIONS
Electrical Water Prospecting.
W76-10090 4B

SUBSURFACE MAPPING
Electrical Water Prospecting.
W76-10090 4B

SUBSURFACE WATERS
The Fate of Pollutants in Subsurface Environments,
W76-10253 5B

SUCCESSION
Mineral Cycling in Marine Ecosystems,
W76-10278 5C

SULFIDE STRESS CRACKING
How to Cope with Sulfide Corrosion,
W76-10116 8G

SULFUR
Mobilization of Nutrients in Soil by Acids of Sulfur and Chelating Agents,
W76-10316 5B

SUNFISHES
Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

Low Thermal Responsiveness in the Bluegill, Lepomis Macrochirus,
W76-10369 5C

SURF
Modeling of Turbulence in the Surf Zone,
W76-10432 2L

SURFACE AERATOR
Techniques for Power Measurement for Surface Aerator,
W76-10251 5D

SURFACE-GROUND WATER RELATIONSHIPS
Tacoma's North Fork Wells.
W76-10089 4B

SURFACE IRRIGATION
Effects of Treated Municipal Wastewater on Oat Forage and Grain,
W76-10119 5D

LIBRARY U. OF I. URBANA-CHAMPAIGN

SURFACE WATERS
Pollution Effects on Surface Waters and Ground Waters, (Literature Review),
W76-10104 5C

SURFACTANTS
Effect of Surfactants on the Spectrophotometric Determination of Phosphate by Direct and Extraction Procedures,
W76-10027 5A

SURGE PRESSURE
Run Drill Pipe Slower and Reduce Formation Damage,
W76-10097 8G

SURVEYS
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

Savannah River Biological Survey, South Carolina and Georgia, August, 1954.
W76-10044 5C

SUSPENDED SOLIDS
Beneficial Effects of Baking Soda Added to Septic Tanks,
W76-10012 5D

Designing Microscreens. Here's Some Help,
W76-10033 5D

Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

The Effect of urban Land Use on Nutrient and Suspended-Solids Export from North Florida Watersheds,
W76-10331 4C

SWAMPS
Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

The Santee Swamp as a Nutrient Sink,
W76-10288 5C

SWEDEN
Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

SWINE WASTES
Swine Waste Digestion Enhancement with Nutrient Separation,
W76-10128 5D

SYMBIOSIS
Nitrogen Fixation by Lichens of the Northern Piedmont,
W76-10327 5C

SYNERGISTIC EFFECT (INSECTS)
Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

SYSTEMS ANALYSIS
How to Use a Systems Approach to Combat Lost Circulation,
W76-10115 8G

A Specific-Activity and Concentration Model Applied to Cesium Movement in an Oligotrophic Lake,
W76-10275 5C

Systems Models for Phosphorus Management in Florida,
W76-10277 5C

The Systems Concept and Pollution Control,
W76-10357 5G

TAICHUNG HARBOR (TAIWAN)
Movable-Bed Model Investigation of Taichung Harbor, Taiwan, Rep. of China,
W76-10427 2L

TAIGA (ALAS)
Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

TAIWAN
Movable-Bed Model Investigation of Taichung Harbor, Taiwan, Rep. of China,
W76-10427 2L

TANKERS
Maritime Considerations,
W76-10377 5G

TAR
Quantitative Monitoring and Variability of Pelagic Tar in the North Atlantic,
W76-10378 5B

TAR BALLS
Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

TECTONIC STRAIN
Water Wells as Possible Indicators of Tectonic Strain,
W76-10105 8G

TEMPERATURE
Influence of Temperature and Salinity on Routine Metabolic Rate and Growth of Young Atlantic Menhaden,
W76-10063 5C

Physical Factors Controlling Abundance of Meiofauna on Tidal and Atidal Beaches,
W76-10069 5A

Aspects of Physiological Condition in Mytilus Edulis L., with Special Reference to the Effects of Oxygen Tension and Salinity,
W76-10070 5C

Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

Interaction of Water Potential and Temperature Effects on Germination of Three Semi-Arid Plant Species,
W76-10185 2I

Biological Treatment Process in Cold Climates,
W76-10222 5D

Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10239 5C

TEMPORAL DISTRIBUTION
Population Characteristics of a Species Ensemble of Waterboatmen (Corixidae),
W76-10123 2H

TERTIARY TREATMENT
Design Criteria for Microscreening Biological Wastewater Plant Effluents,
W76-10232 5D

TESTING
Pollutant Analysis Cost Survey,
W76-10259 5A

TETHERED FLOAT BREAKWATERS
Wave Induced Loads on Multi-Element Structures,
W76-10458 8B

TEXAS
Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1974,
W76-10141 7C

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1974,
W76-10145 7C

Hydrologic Data for Cow Bayou, Brazos River Basin, Texas, 1974,
W76-10146 7C

Hydrologic Data for North Creek Trinity River Basin, Texas, 1974,
W76-10147 7C

Large-Scale Estuarine Water Quality Matrix Model,
W76-10191 5B

THE NETHERLANDS
Measured Contributions of the Terms of the Vertically Integrated Hydrodynamic Equations,
W76-10442 2L

THEORETICAL ANALYSIS
A Theoretical Basis for Ecosystem Analysis with Particular Reference to Element Cycling,
W76-10268 5C

THERMAL POLLUTION
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

Low Thermal Responsiveness in the Bluegill, Lepomis Macrochirus,
W76-10369 5C

Ohio River Cooling Water Study,
W76-10414 5C

THERMAL POLLUTION

Scaling and Sizing Criteria for Thermal-Hydraulic Models,
W76-10437 5B

THERMAL POWERPLANTS
Scaling and Sizing Criteria for Thermal-Hydraulic Models,
W76-10437 5B

THROUGHFALL
Nutrient Return in the Stemflow and Throughfall of Individual Trees in the Piedmont Deciduous Forest,
W76-10326 5B

TIDAL EFFECTS
Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

TIDAL MARSHES
The Role of Physical Modeling in Marsh-Estuarine Mineral-Cycling Research,
W76-10276 5B

TIDAL RUN-UP
Numerical Model for Storm Surge and Tidal Run-Up Studies,
W76-10456 2L

TIDAL WATERS
A Comparison of Growth and Abundance for Tidal Pool Fishes in California and British Columbia,
W76-10064 2L

Measured Contributions of the Terms of the Vertically Integrated Hydrodynamic Equations,
W76-10442 2L

Comparison Between Physical and Mathematical Modelling of a Tidal Fjord System in Northern Norway,
W76-10445 2L

Comparison of Hydraulic and Numerical Tidal Models,
W76-10446 2L

Numerical Model for Storm Surge and Tidal Run-Up Studies,
W76-10456 2L

TIME SERIES ANALYSIS
Design A River Basin Sampling System,
W76-10131 5A

TISSUE ACCUMULATION
Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

TISSUE ANALYSIS
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

Distribution of Selected Metals in Tissue Samples of Carp, Cyprinus Carpio,
W76-10082 5C

Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

TOXICANTS
Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

Boron and Arsenic Studies in Florida Waters,
W76-10265 5B

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

TOXICITY
Chlorine Looks Secure as Water Reagent.
W76-10011 5D

Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

A Review of the Literature on the Use of Simazine in Fisheries,
W76-10052 5C

Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

Changes in Some Hematological Characteristics of Coho Salmon (Oncorhynchus Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

A Discussion of the Effects of Certain Potential Toxicants on Fish and Shellfish in the Upper Delaware Estuary,
W76-10352 5C

The Need for More Intercomparable Field Data and Widely Applicable Short-Term Survey,
W76-10358 5G

Biological Consideration of a Bioassay System,
W76-10359 5C

A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

Byssal Thread Production as a Toxicity Test,
W76-10362 5A

The Activities of Enzymes as Pollution Indicators,
W76-10363 5A

Chemical Problems Encountered in Toxicity Studies,
W76-10364 5B

Antifouling Coatings and their Influence on the Marine Environment,
W76-10365 5G

Disease Responses in Southern California Coastal Fishes,
W76-10366 5C

Comparison of Toxicity Tests,
W76-10367 5C

Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

Effects of Oils on Baltic Littoral Community, as Studied in an Outdoor Model Test System,
W76-10411 5C

Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

Marine Pollution by Carcinogenic Hydrocarbons,
W76-10413 5C

TRACE ELEMENTS
Pollutant Analysis Cost Survey,
W76-10259 5A

Effects of Age, Sex, and Pelage Phenotype on the Elemental Composition of the Old-Field Mouse,
W76-10301 5A

Prediction of Elemental Content in the Old-Field Mouse,
W76-10302 5A

Chemical Composition of White-Tailed Deer: Whole-Body Concentrations of Macro- and Micronutrients,
W76-10303 5C

Seasonal and Annual Variations in the Quantities of Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, and Manganese Reaching the Forest Floor as Mast in Pennsylvania and Vermont Forests,
W76-10306 5B

Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

TRACE METALS
Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

TRACERS
Interpretation of Internal Tracer Experiments and Local Sojourn Time Distributions,
W76-10039 5B

LIBRARY U. OF I. URBANA-CHAMP.

he Influence of Hardness Components (CA2+ d MG2+) in Water on the Uptake and Concntration of Cadmium in a Simulated Freshater Ecosystem,
76-10346 5C

corporation of 203HG into Methylmercury in sh Liver: Studies in Biochemical Mechanisms Vitro,
76-10347 5C

INING
xxon Uses Hands-On Methods to Train illing Personnel,
76-10098 8G

NSFER
ertical Static Tube Aerators: Evaluating Their rformance,
76-10223 5D

NSLOCATION
erium and Cobalt Movement with Litter achate in a Forest Soil,
76-10311 5B

NSPIRATION
ater Expenditure on Transpiration by Plants ommunities Dominant in Eastern Kara Kum, Russian),
76-10341 2D

NSPORTATION
aritime Consideration of Oil Transportation,
76-10375 5G

aritime Considerations,
76-10377 5G

ATMENT FACILITIES
peration and Impact of NPDES in Region II, rt I,
76-10005 5G

aste Water Treatment.
76-10202 5D

ewage Handling and Disposal Process for hloride (NACL) Contaminated Sludges,
76-10205 5D

ecirculating Sewerage System,
76-10209 5D

ydrogen Peroxide Solves Sludge Odor oblem,
76-10211 5D

our-Mode Treatment Plant Will Generate odium Hypochlorite Onsite.
76-10213 5D

xperiments on Rapid Sand Filtration of ological Sewage Treatment-Plant Effluents ntersuchungen Ueber Das Verhalten von hnell-Sandfiltern Bei der Filtration Eines ologisch Gereinigten Klaeranlagenablaufs),
76-10215 5D

ptimizing Centrifuge Decantation for Sludge ickening (Optimisation Des Decanteuses ntrifuges Pour La Concentration Des Bous),
76-10217 5D

nall Sewage Works that Function Satisfacrily,
76-10228 5D

ames Water Opens Stanford Rivers Sewage eatment Works,
76-10229 5D

Sodium Bicarbonate Doses Upgrade Plant to '77 Standards.
W76-10233 5D

Fluctuations of the Runoff of Two Activated Sludge Plants and Its Consequences for the Observance of Limit Values (Schwankungen der Ablaeufe Zweier Schlammbelebunsanlagen und Inre Konsequenzen Fuer die Einhaltbarkeit von Grenzwerten),
W76-10242 5D

Evaluation of the Ciria Prototype Model for the Design of Sewage-Treatment Works,
W76-10245 5D

The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

System for Total Direct Recycle of Secondary Municipal Wastewater, Vol I -- Design Concepts,
W76-10257 5D

LSW-500 Disposal of Air Force Liquid Wastes,
W76-10258 5E

Water Reuse in the United States,
W76-10260 5D

Phosphorus Removal Demonstration Studies at C.F.B. Trenton, Phase II,
W76-10490 5D

Effluent Polishing by Filtration Through Activated Alumina, Volume I.
W76-10491 5D

TREE SURVIVAL
Techniques for Improving Tree Survival and Growth in Semiarid Areas,
W76-10175 2I

TREES
Accumulation and Mobility of Cesium in Roots of Tulip Poplar Seedlings,
W76-10297 5B

Seasonal Variation in Radiocesium Concentrations in Three Tree Species,
W76-10299 5C

Leaching of Nutrients from Leaves of Selected Tree Species in New Hampshire,
W76-10312 5B

Effects of Tree Species, Temperature, and Soil on Transfer of Manganese-54 from Litter to Roots in a Microcosm,
W76-10317 5C

Mineral Cycling Strategies of Two Deciduous and Two Evergreen Tree Species on a Southern Appalachian Watershed,
W76-10321 5C

TRICKLING FILTERS
Application of Activated Sludge Design and Operation,
W76-10221 5D

Biological Treatment Process in Cold Climates,
W76-10222 5D

TRINITY RIVER BASIN (TEX)
Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1974,
W76-10144 7C

Hydrologic Data for North Creek Trinity River Basin, Texas, 1974,
W76-10147 7C

TUBE WORMS
Tube-Worm-Sediment Relationships in Populations of Pectinaria Gouldii (Polychaeta: Pectinariidae) from Barnegat Bay, New Jersey,
W76-10061 2L

TULIP POPLAR
Accumulation and Mobility of Cesium in Roots of Tulip Poplar Seedlings,
W76-10297 5B

TUNE
Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

TUNGSTEN
Uptake and Elimination of Radiotungsten in Black Bullheads,
W76-10293 5C

TURBULENCE
Principles and Measuring Techniques of Turbulence Characteristics in Open-Channel Flows,
W76-10134 8B

Modeling of Turbulence in the Surf Zone,
W76-10432 2L

ULTRAFILTRATION
What's New in Ozonation, Oxygenation, Reverse Osmosis and Ultrafiltration.
W76-10214 5D

UNDERGROUND STORAGE
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

Use of the Earth's Crust for Treatment or Storage of Sewage Effluent and Other Waste Fluids,
W76-10216 5D

UNIT COSTS
A Present Value-Unit Cost Methodology for Evaluating Wastewater Reclamation and Direct Reuse at a Military Base of Operations,
W76-10255 5D

URBAN HYDROLOGY
Application of a Water Quality Model to the Denver Metropolitan Area,
W76-10438 5B

URBAN RUNOFF
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1974,
W76-10141 7C

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1974,
W76-10145 7C

The Effect of urban Land Use on Nutrient and Suspended-Solids Export from North Florida Watersheds,
W76-10331 4C

UREASE
Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

URINE
Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

USSR (AZOV SEA)
Seasonal Dynamics of Suspended Matter in the Azov Sea, (In Russian),
W76-10126 2J

USSR (DON RIVERMOUTH)
Isolation of the Runoff-Dependent Salinity in a Shallow River-Mouth Offshore Zone Under Conditions of Wind-Induced Rise and Fall of the Water Level, (In Russian),
W76-10361 2L

USSR (KARA KUM)
Water Expenditure on Transpiration by Plants Communities Dominant in Eastern Kara Kum, (In Russian),
W76-10341 2D

USSR (UZBEK-SSR)
Macrozoobenthos of Water Bodies of the Khazarasp Region of the Khorezm Oblast, (In Russian),
W76-10476 2H

UTAH
Salt-Load Computations--Colorado River; Cameo, Colorado, to Cisco, Utah: Part 2. Basic Data,
W76-10143 7C

Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah,
W76-10171 5G

UTILITY THEORY
Models for Evaluation of Hazardous Wastes,
W76-10190 5B

VALVES
Sewer Pest Control Check Valve,
W76-10199 8C

VANADIUM
Interlaboratory Quality Control Study No. 5, Chromium, Iron, Molybdenum and Vanadium,
W76-10493 5A

VEGETATION
Radiocesium Cycling in Vegetation and Soil,
W76-10296 5B

Radiocesium Levels in Vegetation Colonizing a Contaminated Flood Plain,
W76-10298 5C

Mobilization of Nutrients in Soil by Acids of Sulfur and Chelating Agents,
W76-10316 5B

VEGETATION EFFECTS
Nutrient Losses in Particulate Form as Weir Pond Sediments from Four Unit Watersheds in the Southern Appalachians,
W76-10330 5C

VEGETATION ESTABLISHMENT
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

VIRGINIA
Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

VIRUS REMOVAL
Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

Virus Removal in an Activated Sludge Plant,
W76-10230 5D

VIRUSES
Virus Removal in an Activated Sludge Plant,
W76-10230 5D

WASHINGTON
Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

Hydrologic Unit Map--1974, State of Washington.
W76-10150 7C

WASTE ASSIMILATIVE CAPACITY
Computer-Aided Modelling of Stream Purification Capacity, Part I: Nonlinear DO Model,
W76-10024 5B

Computer-Aided Modelling of Stream Purification Capacity, Part II: Multiple Linear Correlation Method,
W76-10025 5B

WASTE DISPOSAL
Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part II: An Index of the Water Pollution Potential of Sanitary Landfills,
W76-10014 5B

Effects of a Landfill on Ground-water Quality,
W76-10137 5B

The Fate of Pollutants in Subsurface Environments,
W76-10253 5B

WASTE IDENTIFICATION
Determination of Aromatic Hydrocarbons in Sea Water using an Electrolytic Stripping Cell,
W76-10390 5A

Determination of Aromatic and Total Hydrocarbon Content in Submicrogram and Microgram Quantities in Aqueous Systems by Means of High Performance Liquid Chromatography,
W76-10391 5A

Suspensions of Crude Oils in Sea Water: Rapid Methods of Characterizing Light Hydrocarbon Solutes,
W76-10393 5A

Identification, Estimation and Monitoring of Petroleum in Marine Waters by Luminescence Methods,
W76-10395 5B

Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage,
W76-10399 5A

Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

WASTE STORAGE
Use of the Earth's Crust for Treatment or Storage of Sewage Effluent and Other Waste Fluids,
W76-10216 5D

Method of Storing Sludge Recovered from the Hot Water Extraction of Bitumen from Tar Sands,
W76-10474 5D

WASTE TREATMENT
Floating Structural Plastic Truss System Protects Waste Lagoon Lining,
W76-10007 5G

WASTE WATER DISPOSAL
Computer-Aided Modelling of Stream Purification Capacity, Part I: Nonlinear DO Model,
W76-10024 5B

Water Quality Data from Truckee and Carson Rivers, Pyramid Lake and Lahontan Reservoir, A Working Paper.
W76-10054 5C

WASTE WATER (POLLUTION)
Important Aspects of Phosphorus Analysis,
W76-10241 5A

WASTE WATER TREATMENT
Operation and Impact of NPDES in Region II, Part I,
W76-10005 5G

Muds, Slimes and Sludges,
W76-10008 5D

Use of High Level Radiation in Waste Treatment--Status and Prospects,
W76-10010 5D

Chlorine Looks Secure as Water Reagent.
W76-10011 5D

Beneficial Effects of Baking Soda Added to Septic Tanks,
W76-10012 5D

Dynamic Modelling and Control Simulation of a Biological Wastewater Treatment Process,
W76-10018 5D

Computer Based Control for Wastewater Systems,
W76-10019 5D

Selective Renovation of Eutrophic Wastes Phosphate Removal,
W76-10026 5D

Cost-Effective Goal,
W76-10032 5D

Designing Microscreens. Here's Some Help,
W76-10033 5D

LIBRARY U. OF I. URBANA-CHAMPAIGN

Design of a Stormwater Sewer by Nonlinear Programming--1,
W76-10034 5D

Mathematical Model Simplifies Design of Sludge Drying Beds,
W76-10035 5D

The Role of Hydroxyl Radical Reactions in Ozonation Processes in Aqueous Solutions,
W76-10036 5D

Biochemical and Physical Properties of an Activated Sludge on Settling Characteristics,
W76-10037 5D

Assessment of the Maximum Concentration of Heavy Metals in Crude Sewage Which Will Not Inhibit the Anaerobic Digestion of Sludge,
W76-10040 5D

Swine Waste Digestion Enhancement with Nutrient Separation,
W76-10128 5D

Nitrogen Removal Depends on Form Nutrient Takes,
W76-10174 5D

Aquiculture - New Broom Cleans up Wastewater,
W76-10180 5G

Apparatus and Method for Removing Pollutants from Wastewater,
W76-10200 5D

Waste Water Treatment.
W76-10202 5D

Process for Decontaminating Sewage Containing Cyanide,
W76-10203 5D

Sewage Handling and Disposal Process for Chloride (NACL) Contaminated Sludges,
W76-10205 5D

Traction-Driven Composite Sludge Raking Mechanism for Sedimentation Tanks,
W76-10206 5D

Waste Treatment Process,
W76-10207 5D

Method and Apparatus for the Activated Sludge Treatment of Wastewater,
W76-10208 5D

Recirculating Sewerage System,
W76-10209 5D

What to Do with Sewage Sludge.
W76-10210 5D

Hydrogen Peroxide Solves Sludge Odor Problem,
W76-10211 5D

Treatment of Waste with Oxygen or Ozone.
W76-10212 5D

Four-Mode Treatment Plant Will Generate Sodium Hypochlorite Onsite.
W76-10213 5D

What's New in Ozonation, Oxygenation, Reverse Osmosis and Ultrafiltration.
W76-10214 5D

Experiments on Rapid Sand Filtration of Biological Sewage Treatment-Plant Effluents (Untersuchungen Ueber Das Verhalten von Schnell-Sandfiltern Bei der Filtration Eines Biologisch Gereinigten Klaeranlagenablaufs),
W76-10215 5D

Use of the Earth's Crust for Treatment or Storage of Sewage Effluent and Other Waste Fluids,
W76-10216 5D

Optimizing Centrifuge Decantation for Sludge Thickening (Optimisation Des Decanteuses Centrifuges Pour La Concentration Des Bous),
W76-10217 5D

Buffering Aids Digestion of Waste.
W76-10218 5D

Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

General Considerations in Wastewater Disinfection,
W76-10220 5D

Application of Activated Sludge Design and Operation,
W76-10221 5D

Biological Treatment Process in Cold Climates,
W76-10222 5D

Vertical Static Tube Aerators: Evaluating Their Performance,
W76-10223 5D

The Disposal of Sewage from Coastal Towns: The Case for Treatment,
W76-10225 5D

Diffused Air in Deep Tank Aeration,
W76-10226 5D

Important Considerations in Designing Activated Sludge Processes,
W76-10227 5D

Small Sewage Works that Function Satisfactorily,
W76-10228 5D

Thames Water Opens Stanford Rivers Sewage Treatment Works,
W76-10229 5D

Virus Removal in an Activated Sludge Plant,
W76-10230 5D

Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

Design Criteria for Microscreening Biological Wastewater Plant Effluents,
W76-10232 5D

Anionic and Non-Ionic Surfactant Biodegradation in a Purifying Plant using Activating Muds (Biodegradazione de Tensioattivi Anionici e Non-Ionici in un Impianto di Trattamento a Fanghi Attivati),
W76-10238 5A

Effect of Wastewater Composition and Cell Residence Time on Phosphorus Removal in Activated Sludge,
W76-10239 5D

Fluctuations of the Runoff of Two Activated Sludge Plants and Its Consequences for the Observance of Limit Values (Schwankungen der Ablaeufe Zweier Schlammbelebunsanlagen und Inre Konsequenzen Fuer die Einhaltbarkeit von Grenzwerten),
W76-10242 5D

Contribution to Optimizing Chemical Precipitation in Untreated Waste Water Through Control of the Added Flocculant Quantity (Beitrag Zur Optimierung Chemischer Faellung Im Rohabwasser Durch Die Steuerung Der Faellmittelzugabemenge),
W76-10246 5D

Verification Studies of the Biofilm Model for Bacterial Substrate Utilization,
W76-10247 5D

Techniques for Power Measurement for Surface Aerator,
W76-10251 5D

Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

A Present Value-Unit Cost Methodology for Evaluating Wastewater Reclamation and Direct Reuse at a Military Base of Operations,
W76-10255 5D

The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

System for Total Direct Recycle of Secondary Municipal Wastewater, Vol I -- Design Concepts,
W76-10257 5D

Water Reuse in the United States,
W76-10260 5D

Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

Method for Treating Fouled Water,
W76-10467 5D

Flocculation of Suspended Solids,
W76-10468 5D

Process and Apparatus for Treating Fatty Waste Water,
W76-10471 5D

Photooxidative Destruction of Organic Wastes,
W76-10472 5D

Filtration Process,
W76-10473 5D

Method of Storing Sludge Recovered from the Hot Water Extraction of Bitumen from Tar Sands,
W76-10474 5D

Filter Press,
W76-10481 5D

Modular Container,
W76-10483 5D

Clarification Tank,
W76-10486 5D

Chevron Clarifier,
W76-10488 5D

Phosphorus Removal Demonstration Studies at C.F.B. Trenton, Phase II,
W76-10490 5D

Effluent Polishing by Filtration Through Activated Alumina, Volume I.
W76-10491 5D

Assessment of Polyelectrolytes for Phosphorus Removal,
W76-10492 5D

Harvest of Biological Production as a Means of Improving Effluents form Sewage Lagoons,
W76-10500 5G

WASTES
Models for Evaluation of Hazardous Wastes,
W76-10190 5B

WATER ANALYSIS
Evaluation of Thin Film Oil Samplers,
W76-10381 5A

WATER CHEMISTRY
Changes in Water Chemistry and Primary Productivity of a Reactor Cooling Reservoir (Par Pond),
W76-10290 5C

Survey Analyses for Petroleum Derived Hydrocarbons in the Ocean,
W76-10374 5B

WATER COOLING
Changes in Water Chemistry and Primary Productivity of a Reactor Cooling Reservoir (Par Pond),
W76-10290 5C

WATER CURRENTS
Movement of Spilled Oil in San Francisco Bay as Predicted by Estuarine Nontidal Drift,
W76-10385 5B

WATER DEMAND
Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

WATER DISTRIBUTION (APPLIED)
Network Models and the Impact of Modeling Assumptions,
W76-10196 4A

WATER LEVEL FLUCTUATIONS
Water Wells as Possible Indicators of Tectonic Strain,
W76-10105 8G

WATER LEVELS
Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

Maps Showing Ground-Water Conditions in the Ranegras Plain and Butler Valley Areas, Yuma County, Arizona--1975,
W76-10149 7C

WATER LOSS
Puddling Tropical Rice Soils: 2. Effects of Water Losses,
W76-10118 3F

WATER MANAGEMENT (APPLIED)
International Survey on Existing Water Recharge Facilities.
W76-10085 4B

Well Field Maintenance Avoids Crises,
W76-10103 8G

Use of Saline Water in Agriculture. I. Description of the System,
W76-10168 3C

WATER POLLUTION
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

Ground-Water Pollution Problems in the Northwestern United States,
W76-10083 5B

Hydrogeologic and Other Considerations Related to the Selection of Sanitary-Landfill Sites in Ohio,
W76-10084 5D

Guardians of Ground Water Quality,
W76-10096 5G

PL92-500: Mid-Course Correction Grants Options; Next Move up to Congress,
W76-10106 5G

Pollutant Analysis Cost Survey,
W76-10259 5A

Survey Analyses for Petroleum Derived Hydrocarbons in the Ocean,
W76-10374 5B

Marine Pollution Data Archiving and Exchange,
W76-10376 5A

Determination of C1-C10 Hydrocarbons in Water,
W76-10392 5A

Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

WATER POLLUTION CONTROL
Pollution of Groundwater by Landfills (Pollution de L'eau Souterraine par les Decharges),
W76-10016 5B

Optimal Allocation of Measurement and Control Resources with Application to River Depollution,
W76-10017 5A

Pollution Monitoring Doesn't Have to be Costly,
W76-10029 5A

PL92-500: Mid-Course Correction Grants Options; Next Move up to Congress,
W76-10106 5G

Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah,
W76-10171 5G

Oil Skimmer Module with Free Floating Weir Trough,
W76-10482 5G

WATER POLLUTION EFFECTS
Industrial Research Institute Studying Pollution Problems of Seto Inland Sea,
W76-10031 5B

Pollution Effects on Surface Waters and Ground Waters, (Literature Review),
W76-10104 5C

Comparison of Toxicity Tests,
W76-10367 5C

Ohio River Cooling Water Study,
W76-10414 5C

WATER POLLUTION EFFTS
Disease Responses in Southern California Coastal Fishes,
W76-10366 5C

WATER POLLUTION SOURCES
Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part I: Sanitary Landfill Leachate...What It Is,
W76-10013 5B

Phosphorus Distribution from Septic Tank Effluent in Coastal Plain Soils,
W76-10015 5B

Alfalfa Safeguards Ground Water.
W76-10093 5G

An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

Effects of a Landfill on Ground-water Quality,
W76-10137 5B

Microbial Petroleum Degradation: Use of Mixed Hydrocarbon Substrates,
W76-10350 5B

WATER POLLUTION TREATMENT
PL92-500: Mid-Course Correction Grants Options; Next Move up to Congress,
W76-10106 5G

Method for Treating Fouled Water,
W76-10467 5D

Process and Apparatus for Treating Fatty Waste Water,
W76-10471 5D

Photooxidative Destruction of Organic Wastes,
W76-10472 5D

Clarifier Apparatus,
W76-10479 5F

Filter Press,
W76-10481 5D

Modular Container,
W76-10483 5D

Coalescing Unit for Gravity Separator,
W76-10484 5G

Composite Semipermeable Membranes Made from Polyethylenimine,
W76-10485 3A

WATER POTENTIAL
Interaction of Water Potential and Temperature Effects on Germination of Three Semi-Arid Plant Species,
W76-10185 2I

WATER PURIFICATION
The Santee Swamp as a Nutrient Sink,
W76-10288 5C

Process and Apparatus for Treating Fatty Waste Water,
W76-10471 5D

Clarifier Apparatus,
W76-10479 5F

Modular Container,
W76-10483 5D

Clarification Tank,
W76-10486 5D

LIBRARY U. OF I. URBANA-CHAMP.

Chevron Clarifier,
W76-10488 5D

WATER QUALITY
Compilation and Analysis of Water Quality Rights and Responsibilities in Hawaii,
W76-10001 5G

Industrial Research Institute Studying Pollution Problems of Seto Inland Sea,
W76-10031 5B

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Savannah River Biological Survey, South Carolina and Georgia, August, 1954.
W76-10044 5C

Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

Water Quality Data from Truckee and Carson Rivers. Pyramid Lake and Lahontan Reservoir, A Working Paper.
W76-10054 5C

Water, Its Effects on Life Quality.
W76-10087 5F

Guardians of Ground Water Quality,
W76-10096 5G

Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

Salt-Load Computations--Colorado River; Cameo, Colorado to Cisco, Utah: Part 1. Data Summary,
W76-10142 7C

Salt-Load Computations--Colorado River; Cameo, Colorado, to Cisco, Utah: Part 2. Basic Data,
W76-10143 7C

Maps Showing Ground-Water Conditions in the Ranegras Plain and Butler Valley Areas, Yuma County, Arizona--1975,
W76-10149 7C

Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah,
W76-10171 5G

Large-Scale Estuarine Water Quality Matrix Model,
W76-10191 5B

Microbiology and Chemistry Studies of Water Quality Factors in a Watershed Used for Municipal Supply and Waste Disposal,
W76-10263 5B

Hydrocarbon Content and Chlorophyll Correlation in the Waters Between Nova Scotia and the Gulf Stream,
W76-10389 5B

Application of a Water Quality Model to the Denver Metropolitan Area,
W76-10438 5B

Combined Use of Physical and Mathematical Models for Analysis of Reservoir Water Quality,
W76-10439 5B

Application of a Dynamic Network Model to Hydraulic and Water Quality Studies of the St. Lawrence River,
W76-10440 5B

Finite Difference Approximation to the Convective Transport Equation,
W76-10441 5B

Applicability of the Technicon Autoanalyzer I and II Systems for Shipboard Analysis of Great Lakes Water Samples,
W76-10497 5A

WATER QUALITY CONTROL
Short-Term Regulation of BOD Upsets in an Estuary,
W76-10020 5G

An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

A Review on Decision Models in Economics of Regional Water Quality Management,
W76-10195 5G

Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

Planning Implications of Dissolved Oxygen Depletion in the Willamette River, Oregon,
W76-10332 5G

The Systems Concept and Pollution Control,
W76-10357 5G

WATER QUALITY STANDARDS
Operation and Impact of NPDES in Region II, Part I,
W76-10005 5G

PL92-500: Mid-Course Correction Grants Options; Next Move up to Congress,
W76-10106 5G

The Need for More Intercomparable Field Data and Widely Applicable Short-Term Survey,
W76-10358 5G

WATER REQUIREMENTS
Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

WATER RESOURCES DEVELOPMENT
Arizona's Water Supply-Some Reflections,
W76-10183 4A

An LP-10 Model for Coordinating Multi-Group Inputs in Resource Planning,
W76-10192 6A

Cost Functions for Additional Ground Water Development,
W76-10194 4B

WATER REUSE
Effects of Treated Municipal Wastewater on Oat Forage and Grain,
W76-10119 5D

Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

A Present Value-Unit Cost Methodology for Evaluating Wastewater Reclamation and Direct Reuse at a Military Base of Operations,
W76-10255 5D

System for Total Direct Recycle of Secondary Municipal Wastewater, Vol I -- Design Concepts,
W76-10257 5D

Water Reuse in the United States,
W76-10260 5D

WATER RIGHTS
Compilation and Analysis of Water Quality Rights and Responsibilities in Hawaii,
W76-10001 5G

Cost Functions for Additional Ground Water Development,
W76-10194 4B

WATER SAMPLING
Water Pollution Sampler Evaluation,
W76-10261 5A

Applicability of the Technicon Autoanalyzer I and II Systems for Shipboard Analysis of Great Lakes Water Samples,
W76-10497 5A

WATER SOFTENING
Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

Water Softener,
W76-10475 5F

Water Conditioning Apparatus,
W76-10480 5F

WATER STORAGE
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

WATER SUPPLY
Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

Arizona's Water Supply-Some Reflections,
W76-10183 4A

1975 Arizona Agricultural Statistics.
W76-10187 3F

Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

WATER TABLES
Effect of Water Regime on Productivity of Cultivated Plants, (In Belorussian),
W76-10189 3F

WATER TEMPERATURE
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

Water Quality Data from Truckee and Carson Rivers. Pyramid Lake and Lahontan Reservoir, A Working Paper.
W76-10054 5C

Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

WATER TEMPERATURE

Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

Low Thermal Responsiveness in the Bluegill, Lepomis Macrochirus,
W76-10369 5C

WATER TREATMENT
Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

Method for Treating Fouled Water,
W76-10467 5D

Method for Controlling Scale,
W76-10469 5G

Water Softener,
W76-10475 5F

Clarifier Apparatus,
W76-10479 5F

Water Conditioning Apparatus,
W76-10480 5F

Modular Container,
W76-10483 5D

WATER UTILIZATION
Arizona's Water Supply-Some Reflections,
W76-10183 4A

Moisture use Efficiency of Dryland Crops as Influenced by Fertilizer Use II. Rabi Cereals,
W76-10186 3F

WATER WELL CONSTRUCTION
Guardians of Ground Water Quality,
W76-10096 5G

WATER WELL CONTRACTORS
Guardians of Ground Water Quality,
W76-10096 5G

WATER WELLS
Change in Drawdown Caused by Enlarging a Well in a Dolomite Aquifer,
W76-10088 4B

Tacoma's North Fork Wells.
W76-10089 4B

Electrical Water Prospecting.
W76-10090 4B

Recording Equipment Booster.
W76-10091 8G

Pitless Unit and Adapter Update.
W76-10092 8G

What Type of Rig Should You Buy,
W76-10094 8C

Guardians of Ground Water Quality,
W76-10096 5G

Well Field Maintenance Avoids Crises,
W76-10103 8G

Water Wells as Possible Indicators of Tectonic Strain,
W76-10105 8G

WATERBOATMEN
Population Characteristics of a Species Ensemble of Waterboatmen (Corixidae),
W76-10123 2H

WATERSHEDS (BASINS)
Redistribution of Cesium-137 in Southeastern Watersheds,
W76-10295 5B

Nutrient Losses in Particulate Form as Weir Pond Sediments from Four Unit Watersheds in the Southern Appalachians,
W76-10330 5C

WAVE OSCILLATIONS
Nonlinear Lateral Oscillation in a Harbour Model,
W76-10418 8B

Free Oscillations in Bays and Harbors,
W76-10420 8B

Computations of Harbor Oscillations by Ray Methods,
W76-10421 8B

WAVES (WATER)
Resonances in Harbors with Variable Depths,
W76-10416 8B

Wave Response of Offshore Bottomless Harbors,
W76-10417 8B

Nonlinear Lateral Oscillation in a Harbour Model,
W76-10418 8B

Numerical Prediction of Harbor Responses,
W76-10419 8B

Free Oscillations in Bays and Harbors,
W76-10420 8B

Computations of Harbor Oscillations by Ray Methods,
W76-10421 8B

Nearshore Water Circulation Induced by Wind and Waves,
W76-10433 2L

Numerical Model for Wave Refraction by Finite Amplitude Wave Theories,
W76-10434 2L

Computer Simulation of Beach Erosion and Profile Modification Due to Waves,
W76-10448 2L

Problems of Physical Model Tests with Harbours,
W76-10451 8B

Wave Induced Loads on Multi-Element Structures,
W76-10458 8B

Analysis of Floating Breakwater Performance,
W76-10460 8B

Reliability of Rubble-Mound Breakwater Stability Models,
W76-10461 8B

WEATHER DATA
1975 Arizona Agricultural Statistics.
W76-10187 3F

WEATHERED OIL
Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

WELL CASING
Tubing-Casing Reclamation Saved Shell Over $3 Million,
W76-10101 8G

WELL CASINGS
Corrosion,
W76-10095 8G

WELL COMPLETION TECHNIQUES
Guardians of Ground Water Quality,
W76-10096 5G

WELL CONTROL
Exxon Uses Hands-On Methods to Train Drilling Personnel,
W76-10098 8G

WELL ENLARGEMENT
Change in Drawdown Caused by Enlarging a Well in a Dolomite Aquifer,
W76-10088 4B

WELL FIELD MAINTENANCE
Well Field Maintenance Avoids Crises,
W76-10103 8G

WELL FIELDS
Well Field Maintenance Avoids Crises,
W76-10103 8G

WELL MODIFICATION
Change in Drawdown Caused by Enlarging a Well in a Dolomite Aquifer,
W76-10088 4B

WELL REGULATIONS
Pitless Unit and Adapter Update.
W76-10092 8G

WELL SPACING
Well Field Maintenance Avoids Crises,
W76-10103 8G

WELL TUBING
Tubing-Casing Reclamation Saved Shell Over $3 Million,
W76-10101 8G

WELLS
How to Free a Stuck String,
W76-10110 8G

How to Perform a Through-Tubing Gravel Pack,
W76-10113 8G

WETLANDS
Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

WETTABILITY
Filtration Process,
W76-10473 5D

WHEAT
Effect of Cultural Practices on Grain Yield and Yield Components in Irrigated Wheat,
W76-10176 3F

Fertilization, Nutrient Composition, and Yield Relationships in Irrigated Spring Wheat,
W76-10177 3F

WHITE PINE TREES
The Effect of Nonremoval Clear-Cutting and Pine Reforestation of the Cation Composition of a Hardwood Forest Soil,
W76-10322 4C

Cation Flux in Hardwood and White Pine Watersheds,
W76-10329 5B

LIBRARY U. OF I. URBANA-CHAMPAIGN

LDLIFE
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

LDLIFE HABITATS
Preliminary Environmental Survey, Newport Army Ammunition Plant, Newport, Indiana, January, 1973,
W76-10056 5C

LLAMETTE RIVER (OREG)
Planning Implications of Dissolved Oxygen Depletion in the Willamette River, Oregon,
W76-10332 5G

NDS
Nearshore Water Circulation Induced by Wind and Waves,
W76-10433 2L

ORMS
Tube-Worm-Sediment Relationships in Populations of Pectinaria Gouldii (Polychaeta: Pectinariidae) from Barnegat Bay, New Jersey,
W76-10061 2L

RENCHING DEFORMATION
Predicting Productive Trends Related to Wrench Faults,
W76-10100 8E

RAY ANALYSIS
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

RAY DIFFRACTION
Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

YLEM
Anomalous Diurnal Patterns of Stem Xylem Water Potentials in Larrea Tridentata,
W76-10172 2I

AMPA RIVER BASIN (COLO-WYO)
An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

ORK RIVER (VA)
Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

UMA COUNTY (ARIZ)
Maps Showing Ground-Water Conditions in the Ranegras Plain and Butler Valley Areas, Yuma County, Arizona--1975,
W76-10149 7C

INC
Organically Complexed Copper, Zinc, and Chelating Agents in Rivers of Western Puerto Rico,
W76-10292 5B

Byssal Thread Production as a Toxicity Test,
W76-10362 5A

ZINC PHOSPHATE
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

ZOOBENTHOS
Macrozoobenthos of Water Bodies of the Khazarasp Region of the Khorezm Oblast, (In Russian),
W76-10476 2H

ZOOPLANKTON
Nitrogen Regeneration by the Ctenophore Mnemiopsis Leidyi,
W76-10284 5C

ZOSTERA SP.
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

AUTHOR INDEX

ADEE, B. H.
Analysis of Floating Breakwater Performance,
W76-10460 8B

ADELMAN, I. R.
Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

ADRIAN, D. D.
Design A River Basin Sampling System,
W76-10131 5A

AHMADJIAN, M.
Sampling of Oil Spills and Fingerprinting by Infrared Spectroscopy,
W76-10383 5B

AHMED, A. M.
Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

ALBERTS, J. J.
Mobilization of Mercury from Freshwater Sediments by Humic Acid,
W76-10294 5C

ALDRICH, J. C.
On the Relationship Between Oxygen Consumption and Feeding Level in Decapods,
W76-10072 5C

ALEMU, A.
Effect of Cultural Practices on Grain Yield and Yield Components in Irrigated Wheat,
W76-10176 3F

ALLAN, J. D.
Competition and the Relative Abundances of Two Cladocerans,
W76-10125 2I

ALLEE, D. J.
Basin Governance,
W76-10130 6E

ALLEN, S. E.
Yield-Nutrient Absorption Relationships as Affected by Environmental Growth Factors,
W76-10184 2I

ALTMANN, H.
Distribution of Selected Metals in Tissue Samples of Carp, Cyprinus Carpio,
W76-10082 5C

AMBE, M.
Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

ANDERSON, J. W.
Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

ANDREWS, R. K.
Floating Structural Plastic Truss System Protects Waste Lagoon Lining,
W76-10007 5G

ANDREWS, W. H.
Basin Governance,
W76-10130 6E

APPUKUTTAN, K. N.
Simulation of Delta Building Process,
W76-10426 2L

ARNOLD, R.
Muds, Slimes and Sludges,
W76-10008 5D

ARPINO, A.
Anionic and Non-Ionic Surfactant Biodegradation in a Purifying Plant using Activating Muds (Biodegradazione de Tensioattivi Anionici e Non-Ionici in un Impianto di Trattamento a Fanghi Attivati),
W76-10238 5A

ASHTON, J. E.
Method of Storing Sludge Recovered from the Hot Water Extraction of Bitumen from Tar Sands,
W76-10474 5D

AUDUNSON, T.
Comparison Between Physical and Mathematical Modelling of a Tidal Fjord System in Northern Norway,
W76-10445 2L

AULENBACHER, M. W.
How to Free a Stuck String,
W76-10110 8G

AUSMUS, B.
Effects of Tree Species, Temperature, and Soil on Transfer of Manganese-54 from Litter to Roots in a Microcosm,
W76-10317 5C

AUSMUS, B. S.
A Theoretical Basis for Ecosystem Analysis with Particular Reference to Element Cycling,
W76-10268 5C

AZORLOSA, J. L.
Flocculation of Suspended Solids,
W76-10468 5D

BABU, V. R.
Seed Germination and Early Seedling Growth of Wheat (Triticum Aestivum Linn.) CV. 1553 Under the Influence of Salinity and Plant-Growth Hormones,
W76-10169 3C

BACCI, E.
Bodily Distribution, Accumulation and Excretion of Mercury in a Fresh-Water Mussel,
W76-10081 5C

BACKMAN, T. W.
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

BADER, H.
The Role of Hydroxyl Radical Reactions in Ozonation Processes in Aqueous Solutions,
W76-10036 5D

BAILARD, J. A.
Analytical Model of Duct-Flow Fluidization,
W76-10450 8B

BAKER, C. H. JR.
National Water Data Storage and Retrieval System: Instructions for Preparation and Submission of Ground-Water Data,
W76-10148 10D

BALLOTTI, E. F.
Computer Based Control for Wastewater Systems,
W76-10019 5D

BANBURY, E. E.
Techniques for Improving Tree Survival and Growth in Semiarid Areas,
W76-10175 2I

BANCSI, J. J.
Assessment of Polyelectrolytes for Phosphorus Removal,
W76-10492 5D

BANKS, D. H.
Small Sewage Works that Function Satisfactorily,
W76-10228 5D

BARBARICK, K. A.
Percolation Tests for Septic Tank Suitability in Southern Arizona Soils,
W76-10248 5D

BARILOTTI, D. C.
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

BARKLEY, J. J.
Water Pollution Sampler Evaluation,
W76-10261 5A

BASCOPE, A. H.
Clarification Tank,
W76-10486 5D

BATTAERD, H. A. J.
Filtration Process,
W76-10473 5D

BATTJES, J. A.
Modeling of Turbulence in the Surf Zone,
W76-10432 2L

BAUER, D. P.
An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

BAYNE, B. L.
Aspects of Physiological Condition in Mytilus Edulis L., with Special Reference to the Effects of Oxygen Tension and Salinity,
W76-10070 5C

BEALL, R. M.
Selected Streamflow Experience Graphs for Southwestern Pennsylvania,
W76-10132 7C

BEAN, R. M.
Suspensions of Crude Oils in Sea Water: Rapid Methods of Characterizing Light Hydrocarbon Solutes,
W76-10393 5A

BEASLEY, M. D.
Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

BECKER, V. E.

BECKER, V. E.
Nitrogen Fixation by Lichens of the Northern Piedmont,
W76-10327 5C

BEHRMAN, B. W.
Nitrogen Removal Depends on Form Nutrient Takes,
W76-10174 5D

BEITINGER, T. L.
Low Thermal Responsiveness in the Bluegill, Lepomis Macrochirus,
W76-10369 5C

BENDER, E. S.
Preliminary Environmental Survey, Newport Army Ammunition Plant, Newport, Indiana, January, 1973,
W76-10056 5C

BENDER, M. E.
Distribution of Copper and Zinc in Oysters and Sediments from Three Coastal-Plain Estuaries,
W76-10279 5C

Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

BENEDEK, A.
Assessment of Polyelectrolytes for Phosphorus Removal,
W76-10492 5D

BENKERT, W. M.
Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

BENTLEY, T. L.
Application of Activated Sludge Design and Operation,
W76-10221 5D

BERGER, B. B.
Design A River Basin Sampling System,
W76-10131 5A

Strengthening Lake-Shoreland Management in Massachusetts,
W76-10264 6E

BEST, G. R.
Cation Flux in Hardwood and White Pine Watersheds,
W76-10329 5B

BHATIA, O. P.
Use of Saline Water in Agriculture. I. Description of the System,
W76-10168 3C

BIERI, R. H.
Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

BIERSDORF, G. T.
Retention of Metals in Sewage Sludge II: Incorporated Radioisotopes,
W76-10006 5A

BIESEL, F.
LCHF Coastal Sediment Modeling Techniques,
W76-10463 2L

BIRKEMEIER, W. A.
Nearshore Water Circulation Induced by Wind and Waves,
W76-10433 2L

BLACKWELDER, P. L.
Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

BLACKWELDER, R. L.
Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

BLYTHE, W. D.
Applicability of the Technicon Autoanalyzer I and II Systems for Shipboard Analysis of Great Lakes Water Samples,
W76-10497 5A

BOARI, G.
Selective Renovation of Eutrophic Wastes Phosphate Removal,
W76-10026 5D

BODDEKE, R.
Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

BOGGESS, D. H.
Effects of a Landfill on Ground-water Quality,
W76-10137 5B

BOGOMOLOV, G. V.
Analogous Modelling of Aquiferous Systems in Coastal Zones,
W76-10455 2L

BOGOMOLOV, Y. G.
Analogous Modelling of Aquiferous Systems in Coastal Zones,
W76-10455 2L

BOGUSZ, F. J.
Recirculating Sewerage System,
W76-10209 5D

BOHAN, J. P.
Combined Use of Physical and Mathematical Models for Analysis of Reservoir Water Quality,
W76-10439 5B

BOOTH, R. S.
A Specific-Activity and Concentration Model Applied to Cesium Movement in an Oligotrophic Lake,
W76-10275 5C

BORMANN, F. H.
Leaching of Nutrients from Leaves of Selected Tree Species in New Hampshire,
W76-10312 5B

BORTLESON, G. C.
Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

BOSNJAK, M.
Chevron Clarifier,
W76-10488 5D

BOUSH, G. M.
Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

BOUWER, H.
Use of the Earth's Crust for Treatment or Storage of Sewage Effluent and Other Waste Fluids,
W76-10216 5D

Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

BOWDEN, K.
Evaluation of the Ciria Prototype Model for the Design of Sewage-Treatment Works,
W76-10245 5D

BOWMAN, M. D.
How to Perform a Through-Tubing Gravel Pack,
W76-10113 8G

BOYD, R. N.
Determination of Aromatic Hydrocarbons in Sea Water using an Electrolytic Stripping Cell,
W76-10390 5A

BOYKIN, E. H.
Analytical Notes--Electrochemical Method for Early Detection and Monitoring of Coliforms,
W76-10237 5A

BOYLE, J. D.
Biological Treatment Process in Cold Climates,
W76-10222 5D

BRADLEY, W. B.
Heavy Collars Aid Hole Control,
W76-10102 8G

BRENNAN, R.
Salt-Load Computations--Colorado River; Cameo, Colorado to Cisco, Utah: Part 1. Data Summary,
W76-10142 7C

Salt-Load Computations--Colorado River; Cameo, Colorado, to Cisco, Utah: Part 2. Basic Data,
W76-10143 7C

BREZONIK, P. L.
Boron and Arsenic Studies in Florida Waters,
W76-10265 5B

BRIAND, F. J. P.
Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

BRIESE, L. A.
Distribution of Radiocesium in Vegetation Along a Contaminated Stream,
W76-10300 5B

Radiocesium Levels in Vegetation Colonizing a Contaminated Flood Plain,
W76-10298 5C

Seasonal Variation in Radiocesium Concentrations in Three Tree Species,
W76-10299 5C

BRISBIN, I. L.
Chemical Composition of White-Tailed Deer: Whole-Body Concentrations of Macro- and Micronutrients,
W76-10303 5C

Radiocesium Concentrations in Whole-Body Homogenates and Several Body Compartments of Naturally Contaminated White-Tailed Deer,
W76-10304 5C

BRONFMAN, A. M.
Isolation of the Runoff-Dependent Salinity in a Shallow River-Mouth Offshore Zone Under Conditions of Wind-Induced Rise and Fall of the Water Level, (In Russian),
W76-10361 2L

BROOKS, J. M.
Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

BROWER, D. L.
Retention of Metals in Sewage Sludge II: Incorporated Radioisotopes,
W76-10006 5A

BROWN, C. W.
Sampling of Oil Spills and Fingerprinting by Infrared Spectroscopy,
W76-10383 5B

BROWN, R. A.
Measurement and Characterization of Nonvolatile Hydrocarbons in Ocean Water,
W76-10394 5B

BRUCE, H. E.
Sampling Marine Organisms and Sediments for High Precision Gas Chromatographic Analysis of Aromatic Hydrocarbons,
W76-10401 5A

BUCKHOUSE, J. C.
Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah,
W76-10171 5G

BUNDGAARD-NIELSEN, M.
A Review on Decision Models in Economics of Regional Water Quality Management,
W76-10195 5G

BUOL, S. W.
Some Effects of Fertilization on Mineral Cycling in Loblolly Pine,
W76-10323 5C

BURNS, L. A.
Ecosystems Analysis of the Big Cypress Swamp and Estuaries,
W76-10046 6G

BURRIS, M. A.
Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

BURTON, T. M.
The Effect of urban Land Use on Nutrient and Suspended-Solids Export from North Florida Watersheds,
W76-10331 4C

BUSCH, D. A.
Tube-Worm-Sediment Relationships in Populations of Pectinaria Gouldii (Polychaeta: Pectinariidae) from Barnegat Bay, New Jersey,
W76-10061 2L

BUTLER, J. N.
Quantitative Monitoring and Variability of Pelagic Tar in the North Atlantic,
W76-10378 5B

BUTZ, B. P.
Ohio River Cooling Water Study,
W76-10414 5C

CAIRNS, J. JR.
Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

CALANDRA, J. C.
Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

CALOMIRIS, J. J.
Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

CALVERT, J. T.
Disposal of Sewage from Coastal Towns: The Case for Sea Outfalls,
W76-10224 5E

CAPENER, H. R.
Basin Governance,
W76-10130 6E

CARRIKER, N. E.
Boron and Arsenic Studies in Florida Waters,
W76-10265 5B

CARTER, F. L.
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

CARTER, H. R.
Ecosystems Analysis of the Big Cypress Swamp and Estuaries,
W76-10046 6G

CASEY, H. F.
Maritime Consideration of Oil Transportation,
W76-10375 5G

CASOLO, A. J.
Modular Container,
W76-10483 5D

CAVINDER, T. R.
Ecosystems Analysis of the Big Cypress Swamp and Estuaries,
W76-10046 6G

CERCEAU, J.
Simulation of the Salinity Distribution in the St. Lawrence Estuary by a Two-Dimensional Mathematical Model,
W76-10443 5B

CERRILLO, L. A.
Ground-Water Pollution Problems in the Northwestern United States,
W76-10083 5B

CHA, J. W.
Different Levels of Soil Organic Matter in Desert Soil and Nitrogen Fertilizer on Yields and Mineral Composition of Barley Grown in the Soil,
W76-10170 3F

CHADWICK, E. M. P.
A Comparison of Growth and Abundance for Tidal Pool Fishes in California and British Columbia,
W76-10064 2L

CHANG, W. J.
Evaluation of Thin Film Oil Samplers,
W76-10381 5A

CHAUVIN, D. J.
Selecting Packer Fluids: Here's What to Consider,
W76-10099 8G

CHENG, E. D. H.
Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

CHERNOUSOVA, L. A.
Seasonal Dynamics of Suspended Matter in the Azov Sea, (In Russian),
W76-10126 2J

CHESNUTT, C. B.
Laboratory Effects in Coastal Movable-Bed Models,
W76-10425 2L

Tests on the Equilibrium Probiles of Model Beaches and the Effects of Grain Shape and Size Distribution,
W76-10422 2L

CHILDRESS, J. D.
Different Levels of Soil Organic Matter in Desert Soil and Nitrogen Fertilizer on Yields and Mineral Composition of Barley Grown in the Soil,
W76-10170 3F

CHITALE, S. V.
Simulation of Delta Building Process,
W76-10426 2L

CHIU, T. Y.
Movable-Bed Model Investigation of Taichung Harbor, Taiwan, Rep. of China,
W76-10427 2L

CHRISTENSEN, B. A.
Movable-Bed Model Investigation of Taichung Harbor, Taiwan, Rep. of China,
W76-10427 2L

Physical Modeling of Scour Initiation and Sediment Transport in Distorted Tidal Models,
W76-10423 2L

CHRISTIANSEN, P. L.
Computations of Harbor Oscillations by Ray Methods,
W76-10421 8B

CHRISTODOULOU, G.
Two-Dimensional Finite Element Dispersion Model,
W76-10453 5B

CHU, H-L.
Numerical Model for Wave Refraction by Finite Amplitude Wave Theories,
W76-10434 2L

CHURCH, B. D.
The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

CICCONE, V. J.
A Present Value-Unit Cost Methodology for Evaluating Wastewater Reclamation and Direct Reuse at a Military Base of Operations,
W76-10255 5D

CLARK, F. H.
A Specific-Activity and Concentration Model Applied to Cesium Movement in an Oligotrophic Lake,
W76-10275 5C

CLARK, R. C. JR.
Analytical Techniques for Isolating and Quantifying Petroleum Paraffin Hydrocarbons in Marine Organisms,
W76-10406 5A

Methods for Establishing Levels of Petroleum Contamination in Organisms and Sediment as Related to Marine Pollution Monitoring,
W76-10403 5B

CLARKSON, J. W.
Information Booklet for Iceref, The Bibliography of Canadian Glaciers, Glacier Inventory Note No. 8,
W76-10494 2C

CLAUSEN, C. D.
Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

CLUBB, R. W.
Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

COLE, J. E.
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

COLLINS, J. I.
Tests on the Equilibrium Probiles of Model Beaches and the Effects of Grain Shape and Size Distribution,
W76-10422 2L

COLTON, J. B.
Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

COLWELL, R. R.
Deep-Sea Bacteria: Growth and Utilization of Hydrocarbons at Ambient and in Situ Pressure,
W76-10349 5B

Microbial Petroleum Degradation: Use of Mixed Hydrocarbon Substrates,
W76-10350 5B

Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

CONNOR, J.
Two-Dimensional Finite Element Dispersion Model,
W76-10453 5B

CONOMOS, T. J.
Movement of Spilled Oil in San Francisco Bay as Predicted by Estuarine Nontidal Drift,
W76-10385 5B

COOMBS, T. L.
A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

COOPER, C. A.
Optimal Allocation of Measurement and Control Resources with Application to River Depollution,
W76-10017 5A

COOPER, J. H.
The Santee Swamp as a Nutrient Sink,
W76-10288 5C

CORNABY, B. W.
Resource Partitioning in Leaf-Litter Faunas from Hardwood and Hardwood-Converted-To-Pine Forests,
W76-10308 5B

Significance of Biological Nitrogen Fixation and Denitrification in a Deciduous Forest Ecosystem,
W76-10320 5B

CORRELL, D. L.
Phosphorus Cycling in a Maryland Deciduous Forest Subjected to Various Levels of Mineral-Nutrient Loading,
W76-10313 5B

COSENS, K. W.
Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

COWLEY, J. E.
Scaling and Sizing Criteria for Thermal-Hydraulic Models,
W76-10437 5B

COX, T. L.
Accumulation and Mobility of Cesium in Roots of Tulip Poplar Seedlings,
W76-10297 5B

CRISAFULLI, A. J.
Oil Skimmer Module with Free Floating Weir Trough,
W76-10482 5G

CRISP, D. J.
Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

CROMACK, K.
Litter Production, Decomposition, and Nutrient Cycling in a Mixed Hardwood Watershed and a White Pine Watershed.
W76-10310 5B

CROSS, F. A.
Distribution of Copper and Zinc in Oysters and Sediments from Three Coastal-Plain Estuaries,
W76-10279 5C

CROSSLEY, D. A.
Fallout Cesium-137 and Mineral-Element Distribution in Food Chains of Granitic-Outcrop Ecosystems,
W76-10307 5B

A Model of Mineral-Element Cycling for an Invertebrate Food Web in a Southeastern Hardwood Forest Litter Community,
W76-10272 5C

Resource Partitioning in Leaf-Litter Faunas from Hardwood and Hardwood-Converted-To-Pine Forests,
W76-10308 5B

CUNGE, J. A.
Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

CUNNINGHAM, G. L.
Anomalous Diurnal Patterns of Stem Xylem Water Potentials in Larrea Tridentata,
W76-10172 2I

CURTIS, M.
Tar Ball Loadings on Golden Beach, Florida,
W76-10379 5B

DAHLMAN, R. C.
Radiocesium Cycling in Vegetation and Soil,
W76-10296 5B

DALRYMPLE, R. A.
Computer Simulation of Beach Erosion and Profile Modification Due to Waves,
W76-10448 2L

Nearshore Water Circulation Induced by Wind and Waves,
W76-10433 2L

DAMSGAARD, A.
Numerical Simulation of Storm Surges in Bays,
W76-10457 2L

DAVIDSON, B.
Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

DAVIDSON, D. D.
Reliability of Rubble-Mound Breakwater Stability Models,
W76-10461 8B

DAVIS, N.
How to Drill Troublesome Shales,
W76-10108 8G

DAVITT, J.
Method of Storing Sludge Recovered from the Hot Water Extraction of Bitumen from Tar Sands,
W76-10474 5D

DAY, A. D.
Effect of Cultural Practices on Grain Yield and Yield Components in Irrigated Wheat,
W76-10176 3F

Effects of Treated Municipal Wastewater on Oat Forage and Grain,
W76-10119 5D

DAY, F. P.
Mineral Cycling Strategies of Two Deciduous and Two Evergreen Tree Species on a Southern Appalachian Watershed,
W76-10321 5C

DAY, J. B.
Exxon Uses Hands-On Methods to Train Drilling Personnel,
W76-10098 8G

DE VRIES, PENNING F. W. T.
Simulation of Nitrogen Distribution and Its Effect on Productivity in Even-Aged Loblolly Pine Plantations,
W76-10271 5B

DE WILDE, P. A. W. J.
Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

DEAN, J. M.
The Santee Swamp as a Nutrient Sink,
W76-10288 5C

DEDKOV, V. P.
Water Expenditure on Transpiration by Plants Communities Dominant in Eastern Kara Kum, (In Russian),
W76-10341 2D

DELARUE, R.
Design of a Stormwater Sewer by Nonlinear Programming--1,
W76-10034 5D

DENN, M. M.
Short-Term Regulation of BOD Upsets in an Estuary,
W76-10020 5G

DEROUINEAU, R.
Water Softener,
W76-10475 5F

DHIR, R. P.
Use of Saline Water in Agriculture. I. Description of the System,
W76-10168 3C

DIAZ, B.
Sewer Pest Control Check Valve,
W76-10199 8C

DICK, T. M.
Exchange Flow Between Lake Ontario and Hamilton Harbour,
W76-10496 5B

DICKERSON, J. D.
Techniques for Improving Tree Survival and Growth in Semiarid Areas,
W76-10175 2I

DICKSON, L. L.
Heavy Collars Aid Hole Control,
W76-10102 8G

DINSMORE, A. F.
Numerical Simulation of Storm Surges in Bays,
W76-10457 2L

DION, N. P.
Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

DISALVO, L. H.
Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

DODD, J. C.
Algae Harvester,
W76-10478 5G

DOLAN, T.
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

DOLAN, T. IV
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

DONCER, A. J.
Process and Apparatus for Treating Fatty Waste Water,
W76-10471 5D

Waste Treatment Process,
W76-10207 5D

DONOVAN, D. J.
Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

DOWTY, B.
Application of a Computer-Based Chromatograph for Automated Water Pollution Analyses,
W76-10038 5A

DRYFOOS, R. L.
Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

DUGGER, R. R.
Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

DUKE, K. M.
Fallout Cesium-137 and Mineral-Element Distribution in Food Chains of Granitic-Outcrop Ecosystems,
W76-10307 5B

DUNCAN, T. K.
Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

DUNN, I. J.
Dynamic Modelling and Control Simulation of a Biological Wastewater Treatment Process,
W76-10018 5D

DUNSON, W. A.
Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

DUNSTAN, W. M.
River Input of Inorganic Phosphorus and Nitrogen to the Southeastern Salt-Marsh Estuarine Environment,
W76-10286 5C

The Role of Spartina Alterniflora in the Flow of Lead, Cadmium, and Copper Through the Salt-Marsh Ecosystem,
W76-10281 5C

DWIVEDI, S. N.
Oil Pollution Along the Indian Coastline,
W76-10386 5B

EAGON, H. B.
Well Field Maintenance Avoids Crises,
W76-10103 8G

EATON, J. S.
Leaching of Nutrients from Leaves of Selected Tree Species in New Hampshire,
W76-10312 5B

ECHEVARRIA, J. E.
Organically Complexed Copper, Zinc, and Chelating Agents in Rivers of Western Puerto Rico,
W76-10292 5B

EDGERTON, B. R.
Reclamation of A Burned Anthracite Refuse Bank with Municipal Sludge,
W76-10249 5E

EFROMSON, A. C.
Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

EGGENER, C. L.
Network Models and the Impact of Modeling Assumptions,
W76-10196 4A

ELEY, R. L.
The Role of Physical Modeling in Marsh-Estuarine Mineral-Cycling Research,
W76-10276 5B

ELKEI, O.
Applicability of the Technicon Autoanalyzer I and II Systems for Shipboard Analysis of Great Lakes Water Samples,
W76-10497 5A

ELLIOTT, J. J.
Measurement and Characterization of Non-volatile Hydrocarbons in Ocean Water,
W76-10394 5B

EMBERGENOV, S.
Macrozoobenthos of Water Bodies of the Khazarasp Region of the Khorezm Oblast, (In Russian),
W76-10476 2H

ENGELSTAD, O. P.
Yield-Nutrient Absorption Relationships as Affected by Environmental Growth Factors,
W76-10184 2I

ERDMAN, H. E.
The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

ERHARDT, M.
Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

ESPINOSA, R.
The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

EVANS, E. C.
The Need for More Intercomparable Field Data and Widely Applicable Short-Term Survey,
W76-10358 5G

EWEL, K. C.
Aspects of Mineral-Nutrient Cycling in a Southern Mixed-Hardwood Forest in North Central Florida,
W76-10318 5B

EWING, L.
Design Criteria for Microscreening Biological Wastewater Plant Effluents,
W76-10232 5D

FALCO, J. W.
The Role of Physical Modeling in Marsh-Estuarine Mineral-Cycling Research,
W76-10276 5B

FANNON, R. D.
Field Research and Testing of a Water Hand Pump for use in Developing Countries,
W76-10086 8G

FARRINGTON, J. W.
Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage,
W76-10399 5A

FEATHER, T. V.
Anomalous Diurnal Patterns of Stem Xylem Water Potentials in Larrea Tridentata,
W76-10172 2I

FEDORENKO, Z. P.
Standardization of the Content of Benzo(a)-Pyrene in Water Bodies, (In Russian),
W76-10351 5C

FINLEY, J. S.
Analytical Techniques for Isolating and Quantifying Petroleum Paraffin Hydrocarbons in Marine Organisms,
W76-10406 5A

FISCHER, E. C.
The Fouling Community as a Field Monitoring Technique,
W76-10354 5C

FISCHER, W. K.
Biodegradability--An Important Criterion for the Environmental Compatibility of Surfactants and Other Product Compounds,
W76-10235 5A

FLAKE, R. H.
Large-Scale Estuarine Water Quality Matrix Model,
W76-10191 5B

FOLSOM, B. L.
Solution Phosphorus Concentration and Growth of Rice (Oryza Sativa L.) in Flooded Soils,
W76-10122 3F

FORE, P. L.
Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

FORESTER, J.
Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

FOSTER, P.
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

FOULK, D. G.
National Water Data Storage and Retrieval System: Instructions for Preparation and Submission of Ground-Water Data,
W76-10148 10D

FRANCIS, C. W.
Radiocesium Cycling in Vegetation and Soil,
W76-10296 5B

FRANKLIN, T. M.
Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

FREED, R.
Urban Service Pricing and Land Use: Some Preliminary Results,
W76-10193 6C

FREEOUF, J. A.
Solution Phosphorus Concentration and Growth of Rice (Oryza Sativa L.) in Flooded Soils,
W76-10122 3F

FRENZEL, H-J.
Fluctuations of the Runoff of Two Activated Sludge Plants and Its Consequences for the Observance of Limit Values (Schwankungen der Ablaeufe Zweier Schlammbelebunsanlagen und Inre Konsequenzen Fuer die Einhaltbarkeit von Grenzwerten),
W76-10242 5D

FREY, P. J.
Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

FRIEND, D. G.
An Instrument with Internal Calibration for Monitoring Chlorine Residuals in Natural Waters,
W76-10028 5A

FRUH, E. G.
Large-Scale Estuarine Water Quality Matrix Model,
W76-10191 5B

FUJISAWA, T.
Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

FUKUDA, T.
Industrial Research Institute Studying Pollution Problems of Seto Inland Sea,
W76-10031 5B

FURUKAWA, K.
Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

GALE, R. S.
Evaluation of the Ciria Prototype Model for the Design of Sewage-Treatment Works,
W76-10245 5D

GALGALI, V. G.
Simulation of Delta Building Process,
W76-10426 2L

GAMBLE, J. F.
Aspects of Mineral-Nutrient Cycling in a Southern Mixed-Hardwood Forest in North Central Florida,
W76-10318 5B

Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

GANDHI, S. L.
System for Total Direct Recycle of Secondary Municipal Wastewater, Vol I -- Design Concepts,
W76-10257 5D

GANICHEVA, L. Z.
Seasonal Dynamics of Suspended Matter in the Azov Sea, (In Russian),
W76-10126 2J

GARDNER, B. R.
Fertilization, Nutrient Composition, and Yield Relationships in Irrigated Spring Wheat,
W76-10177 3F

GARDNER, W. S.
Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

River Input of Inorganic Phosphorus and Nitrogen to the Southeastern Salt-Marsh Estuarine Environment,
W76-10286 5C

GARTEN, C. T.
Distribution of Radiocesium in Vegetation Along a Contaminated Stream,
W76-10300 5B

Radiocesium Levels in Vegetation Colonizing a Contaminated Flood Plain,
W76-10298 5C

Seasonal Variation in Radiocesium Concentrations in Three Tree Species,
W76-10299 5C

GASS, T. E.
Guardians of Ground Water Quality,
W76-10096 5G

GAUDY, A. E. JR.
Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

GAUFIN, A. R.
Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

GEIGER, R. A.
Radiocesium Levels in Vegetation Colonizing a Contaminated Flood Plain,
W76-10298 5C

GENTRY, J. B.
Seasonal Variation in Radiocesium Concentrations in Three Tree Species,
W76-10299 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

GEORGE, S. G.
A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

GERBA, C. P.
Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

GIAM, C. S.
Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

GIBSON, C. I.
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

GIBSON, J. S.
Preliminary Environmental Survey, Newport Army Ammunition Plant, Newport, Indiana, January, 1973,
W76-10056 5C

GIFFORD, G. F.
Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah,
W76-10171 5G

GILBERT, R. G.
Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

GILL, J. A.
Pollution-Free Well Cuttings Disposal Apparatus,
W76-10464 5G

GILLESPIE, J. B.
Results of Infiltration Tests Near Scott City, Western Kansas,
W76-10136 2G

GILLESPIE, W. T.
Boron and Arsenic Studies in Florida Waters,
W76-10265 5B

GILLILAND, M. W.
Systems Models for Phosphorus Management in Florida,
W76-10277 5C

GILMAN, H. D.
Computer Based Control for Wastewater Systems,
W76-10019 5D

GILMORE, R. JR.
Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

GIST, C. S.
A Model of Mineral-Element Cycling for an Invertebrate Food Web in a Southeastern Hardwood Forest Litter Community,
W76-10272 5C

Resource Partitioning in Leaf-Litter Faunas from Hardwood and Hardwood-Converted-To-Pine Forests,
W76-10308 5B

GORDON, D. C. JR.
Hydrocarbon Concentrations in Seawater along the Halifax-Bermuda Section: Lessons Learned Regarding Sampling and some Results,
W76-10388 5A

GORDON, R. B.
Finite Difference Approximation to the Convective Transport Equation,
W76-10441 5B

GOSZ, J. R.
Leaching of Nutrients from Leaves of Selected Tree Species in New Hampshire,
W76-10312 5B

Nutrient Budgets for Undisturbed Ecosystems Along an Elevational Gradient in New Mexico,
W76-10325 5C

GOTOH DOHERTY, Y.
Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

GRAVESEN, H.
Problems of Physical Model Tests with Harbours,
W76-10451 8B

GRAY, J. S.
Physical Factors Controlling Abundance of Meiofauna on Tidal and Atidal Beaches,
W76-10069 5A

GRAYBILL, D. L.
Seasonal and Annual Variations in the Quantities of Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, and Manganese Reaching the Forest Floor as Mast in Pennsylvania and Vermont Forests,
W76-10306 5B

GREEN, L.
Application of a Computer-Based Chromatograph for Automated Water Pollution Analyses,
W76-10038 5A

GREER, G. L.
Changes in Some Hematological Characteristics of Coho Salmon (Oncorhynchus Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

GREILER, B.
Pollutant Analysis Cost Survey,
W76-10259 5A

GRIFFIN, L.
The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

GRIZZARD, E. H.
Clarification Tank,
W76-10486 5D

GROENEWOLD, G. H.
Hydrogeologic and Other Considerations Related to the Selection of Sanitary-Landfill Sites in Ohio,
W76-10084 5D

GROZIER, R. U.
Salt-Load Computations--Colorado River; Cameo, Colorado to Cisco, Utah: Part 1. Data Summary,
W76-10142 7C

Salt-Load Computations--Colorado River; Cameo, Colorado, to Cisco, Utah: Part 2. Basic Data,
W76-10143 7C

GUARD, H. E.
Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

GUARINO, C. F.
Computer Based Control for Wastewater Systems,
W76-10019 5D

GUNDERMANN, N.
Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

GUNIN, P. D.
Water Expenditure on Transpiration by Plants Communities Dominant in Eastern Kara Kum, (In Russian),
W76-10341 2D

GURLEY, D. G.
How to Perform a Through-Tubing Gravel Pack,
W76-10113 8G

HADERLIE, E. C.
Antifouling Coatings and their Influence on the Marine Environment,
W76-10365 5G

HADERLIE, E. E.
An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

HAGSTROM, A.
Effects of Oils on Baltic Littoral Community, as Studied in an Outdoor Model Test System,
W76-10411 5C

HALE, S. S.
The Role of Benthic Communities in the Nitrogen and Phosphorus Cycles of an Estuary,
W76-10285 5C

HAMEILEC, A. E.
Assessment of Polyelectrolytes for Phosphorus Removal,
W76-10492 5D

HANDLER, H.
Modular Container,
W76-10483 5D

HANISCH, B.
Experiments on Rapid Sand Filtration of Biological Sewage Treatment-Plant Effluents (Untersuchungen Ueber Das Verhalten von Schnell-Sandfiltern Bei der Filtration Eines Biologisch Gereinigten Klaeranlagenablaufs),
W76-10215 5D

HANNAN, P. J.
A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

HANSEN, D. J.
Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

HARDING, T. P.
Predicting Productive Trends Related to Wrench Faults,
W76-10100 8E

HARGADINE, G. D.
Results of Infiltration Tests Near Scott City, Western Kansas,
W76-10136 2G

HARLEY, B. M.
FLOW2D: A Two-Dimensional Flow Model for Flood Plains and Estuaries,
W76-10454 2L

HARRIS, R. C.
The Effect of urban Land Use on Nutrient and Suspended-Solids Export from North Florida Watersheds,
W76-10331 4C

HARRIS, W. F.
A Theoretical Basis for Ecosystem Analysis with Particular Reference to Element Cycling,
W76-10268 5C

HARTMAN, R. T.
Seasonal and Annual Variations in the Quantities of Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, and Manganese Reaching the Forest Floor as Mast in Pennsylvania and Vermont Forests,
W76-10306 5B

HATHAWAY, S. W.
Improving the Fuel Value of Sewage Sludge,
W76-10234 5E

HAYAKAWA, N.
Industrial Research Institute Studying Pollution Problems of Seto Inland Sea,
W76-10031 5B

Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

HEBERT, V.
Pollution Monitoring Doesn't Have to be Costly,
W76-10029 5A

HECKROTH, C. W.
PL92-500: Mid-Course Correction Grants Options; Next Move up to Congress,
W76-10106 5G

HEINEMANN, J.
Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

HEKIMIAN, E. C.
Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

HELER, J-J.
Minimization of Core Required in Routing Through a Channel Newtwork,
W76-10243 2E

HERBERT, T. L.
Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

HERRMANN, F. A. JR.
Overview of Physical Estuary Practice,
W76-10444 2L

HETTLER, W. F.
Influence of Temperature and Salinity on Routine Metabolic Rate and Growth of Young Atlantic Menhaden,
W76-10063 5C

HIGGINS, G. R.
Evaluation and Adaptation of Selected Computer Programs to Water Resource Problems in Massachusetts,
W76-10129 7C

HIGHFILL, J. W.
Water Pollution Sampler Evaluation,
W76-10261 5A

HIGO, T.
Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

HIGUCHI, H.
Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

HILL, D. R.
Traction-Driven Composite Sludge Raking Mechanism for Sedimentation Tanks,
W76-10206 5D

HINES, W. G.
Planning Implications of Dissolved Oxygen Depletion in the Willamette River, Oregon,
W76-10332 5G

HITES, R. A.
Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

HOBBS, E. J.
Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

HODSON, P. V.
Delta-Amino Levulinic Acid Dehydratase Activity in Fish Blood as an Indicator of a Harmful Exposure to Lead,
W76-10338 5C

HOIGNE, J.
The Role of Hydroxyl Radical Reactions in Ozonation Processes in Aqueous Solutions,
W76-10036 5D

HOLLAND, D. L.
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

HOLLEMAN, D. G.
Relationship Between Potassium Intake and Radiocesium Retention in the Reindeer,
W76-10305 5C

HOLLY, F. M. JR.
Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

HORI, S.
Survey Analyses for Petroleum Derived Hydrocarbons in the Ocean,
W76-10374 5B

HOSSNER, L. R.
Solution Phosphorus Concentration and Growth of Rice (Oryza Sativa L.) in Flooded Soils,
W76-10122 3F

HOU, H-S.
Movable-Bed Model Investigation of Taichung Harbor, Taiwan, Rep. of China,
W76-10427 2L

HUANG, C. Y.
Method for Treating Fouled Water,
W76-10467 5D

HUDES, G. M.
Compilation and Analysis of Water Quality Rights and Responsibilities in Hawaii,
W76-10001 5G

HUDSON, R. Y.
Reliability of Rubble-Mound Breakwater Stability Models,
W76-10461 8B

HUFFORD, G. L.
Tar Ball Sampling in the Western North Atlantic,
W76-10380 5B

HUGGETT, R. J.
Distribution of Copper and Zinc in Oysters and Sediments from Three Coastal-Plain Estuaries,
W76-10279 5C

Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

An Instrument with Internal Calibration for Monitoring Chlorine Residuals in Natural Waters,
W76-10028 5A

HUGHES, G. M.
Pollution Effects on Surface Waters and Ground Waters, (Literature Review),
W76-10104 5C

HULINGS, N. C.
Physical Factors Controlling Abundance of Meiofauna on Tidal and Atidal Beaches,
W76-10069 5A

HUNTER, L.
Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

HWANG, C. L.
A Review on Decision Models in Economics of Regional Water Quality Management,
W76-10195 5G

HYLAND, J. L.
Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

INMAN, D. L.
Analytical Model of Duct-Flow Fluidization,
W76-10450 8B

ISHIGE, T.
Assessment of Polyelectrolytes for Phosphorus Removal,
W76-10492 5D

ISTOCK, C. A.
Population Characteristics of a Species Ensemble of Waterboatmen (Corixidae),
W76-10123 2H

IWAMA, G. K.
Changes in Some Hematological Characteristics of Cobo Salmon (Oncorhynchus

Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

JACKSON, E. B.
Effect of Cultural Practices on Grain Yield and Yield Components in Irrigated Wheat,
W76-10176 3F

Fertilization, Nutrient Composition, and Yield Relationships in Irrigated Spring Wheat,
W76-10177 3F

JADAMAC, J. R.
Evaluation of Thin Film Oil Samplers,
W76-10381 5A

JAIN, R. K.
Short-Term Regulation of BOD Upsets in an Estuary,
W76-10020 5G

JAMES, B. M.
Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

JANZEN, S.
The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

JEFFREY, L. M.
Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

JIANG, L.
Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

JOHANSSON, N.
Pikes (Esox Lucius L.) Shown to be Affected by Low pH Values During First Weeks After Hatching,
W76-10343 5C

Some Effects of Acidified Water on the Early Development of Roach (Rutilus Rutilus L.) and Perch (Perca Fluviatilis L.),
W76-10076 5C

JOHNSON, D. E.
Floating Structure Arrangement,
W76-10465 8A

JOHNSON, D. L.
Apparatus and Method for Removing Pollutants from Wastewater,
W76-10200 5D

JONES, R. M.
Floating Structure Arrangement,
W76-10465 8A

JORGENSEN, J. R.
Simulation of Nitrogen Distribution and Its Effect on Productivity in Even-Aged Loblolly Pine Plantations,
W76-10271 5B

KALLSTROM, L.
Optimizing Centrifuge Decantation for Sludge Thickening (Optimisation Des Decanteuses Centrifuges Pour La Concentration Des Bous),
W76-10217 5D

KAMPHUIS, J. W.
Coastal Mobile Bed Model - Does it Work,
W76-10428 2L

KARDOS, L. T.
Reclamation of A Burned Anthracite Refuse Bank with Municipal Sludge,
W76-10249 5E

KARIMIAN-TEHERANI, D.
Distribution of Selected Metals in Tissue Samples of Carp, Cyprinus Carpio,
W76-10082 5C

KAUFMAN, D. W.
Effects of Age, Sex, and Pelage Phenotype on the Elemental Composition of the Old-Field Mouse,
W76-10301 5A

Prediction of Elemental Content in the Old-Field Mouse,
W76-10302 5A

KAUFMAN, G. A.
Effects of Age, Sex, and Pelage Phenotype on the Elemental Composition of the Old-Field Mouse,
W76-10301 5A

Prediction of Elemental Content in the Old-Field Mouse,
W76-10302 5A

KAUL, S. N.
Techniques for Power Measurement for Surface Aerator,
W76-10251 5D

KAWAHARA, F. K.
Recent Developments in the Identification of Asphalts and Other Petroleum Products,
W76-10396 5A

KAWATA, K.
Virus Removal in an Activated Sludge Plant,
W76-10230 5D

KAZMANN, R. G.
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

KEIZER, P. D.
Hydrocarbon Concentrations in Seawater along the Halifax-Bermuda Section: Lessons Learned Regarding Sampling and some Results,
W76-10388 5A

KENIS, P. R.
Comparison of Toxicity Tests,
W76-10367 5C

KENNEDY, E. A.
Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

KEPLINGER, M. L.
Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

KHASAWNEH, F. E.
Yield-Nutrient Absorption Relationships as Affected by Environmental Growth Factors,
W76-10184 2I

KHRUSTALEV, YU. P.
Seasonal Dynamics of Suspended Matter in the Azov Sea, (In Russian),
W76-10126 2J

KIBLER, J. F.
A Simulation of Water Pollution Model Parameter Estimation,
W76-10021 5B

KIDWELL, C. C.
Hydrologic Data for North Creek Trinity River Basin, Texas, 1974,
W76-10147 7C

KIHLSTROM, J. E.
Pikes (Esox Lucius L.) Shown to be Affected by Low pH Values During First Weeks After Hatching,
W76-10343 5C

KIM, H. H.
Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

KIMBLE, O. K.
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

KINCANNON, D. F.
Application of Activated Sludge Design and Operation,
W76-10221 5D

KING, D. B.
Modeling of Inlet-Bay Systems in Relation to Sand Trapping,
W76-10462 2L

KINKADE, M. L.
The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

KINNEAR, B. S.
Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

KIRBY, C. J.
The Role of Physical Modeling in Marsh-Estuarine Mineral-Cycling Research,
W76-10276 5B

KIRKEGAARD, J.
Problems of Physical Model Tests with Harbours,
W76-10451 8B

KIRKPATRICK, R. M.
Effects of Treated Municipal Wastewater on Oat Forage and Grain,
W76-10119 5D

KIRY, P.
A Discussion of the Effects of Certain Potential Toxicants on Fish and Shellfish in the Upper Delaware Estuary,
W76-10352 5C

KITCHENS, W. M.
The Santee Swamp as a Nutrient Sink,
W76-10288 5C

KLEE, A. J.
Models for Evaluation of Hazardous Wastes,
W76-10190 5B

KLINGINER, S. G.
Strengthening Lake-Shoreland Management in Massachusetts,
W76-10264 6E

KLOPATEK, J. M.
The Role of Emergent Macrophytes in Mineral Cycling in a Freshwater Marsh,
W76-10289 5C

KLOSTER, H.
Process for Decontaminating Sewage Containing Cyanide,
W76-10203 5D

KNAPP, K. D.
Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

KOBAYASHI, N.
Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

KOBAYASHI, S.
Use of High Level Radiation in Waste Treatment--Status and Prospects,
W76-10010 5D

KOLLMAR, U.
Filter Press,
W76-10481 5D

KORMANIK, R. A.
Designing Microscreens. Here's Some Help,
W76-10033 5D

KOSTOVETSKII, YA. I.
Standardization of the Content of Benzo(a)-Pyrene in Water Bodies, (In Russian),
W76-10351 5C

KOZERSKI, H. P.
A Mathematical Model of Blooms of Plankton Diatoms, (In German),
W76-10127 5C

KRAUTH, K.
The Effect of Various Designs of Rain Catching Basins on the Pollution of the Receiving Water and the Economy of the Sewer System (Die Auswirkung Der Verschiedenen Bauarten Von Regenuberlaufbecken Auf Die Schmutzbelastung Des Vorfluters Und Die Wirtschaftlichkeit Des Kanalnetzes),
W76-10198 5D

KREMER, P.
Nitrogen Regeneration by the Ctenophore Mnemiopsis Leidyi,
W76-10284 5C

KRUEGER, D. L.
Coalescing Unit for Gravity Separator,
W76-10484 5G

KUHNERT, B. R.
The Effect of In Vivo Chromium Exposure on Na/K- and Mg-ATPase Activity in Several Tissues of the Rainbow Trout (Salmo Gairdneri),
W76-10337 5C

KUHNERT, R. M.
The Effect of In Vivo Chromium Exposure on Na/K- and Mg-ATPase Activity in Several Tissues of the Rainbow Trout (Salmo Gairdneri),
W76-10337 5C

KUMAR, S.
Seed Germination and Early Seedling Growth of Wheat (Triticum Aestivum Linn.) CV. 1553 Under the Influence of Salinity and Plant-Growth Hormones,
W76-10169 3C

KUSLER, J. A.
Strengthening Lake-Shoreland Management in Massachusetts,
W76-10264 6E

LAEVASTU, T.
Multilayer Hydrodynamical-Numerical Models,
W76-10429 2L

LAGERWERFF, J. V.
Retention of Metals in Sewage Sludge II: Incorporated Radioisotopes,
W76-10006 5A

LANDRUM, W. R.
How to Perform a Through-Tubing Gravel Pack,
W76-10113 8G

LARKIN, P. A.
Changes in Some Hematological Characteristics of Coho Salmon (Oncorhynchus Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

LARSEN, J.
Computations of Harbor Oscillations by Ray Methods,
W76-10421 8B

LASETER, J. L.
Application of a Computer-Based Chromatograph for Automated Water Pollution Analyses,
W76-10038 5A

LASHKYEVICH, R. I.
Effect of Water Regime on Productivity of Cultivated Plants, (In Belorussian),
W76-10189 3F

LAVENDER, S. T.
Scaling and Sizing Criteria for Thermal-Hydraulic Models,
W76-10437 5B

LAWS, E. A.
The Effect of urban Land Use on Nutrient and Suspended-Solids Export from North Florida Watersheds,
W76-10331 4C

LAZAREVA, V. V.
Characteristics of the Accumulation of Free Amino Acids by Some Nonsporulating Bacteria from Typical Irrigated Sierozem, (In Russian),
W76-10188 5B

LECHNER, J. F.
Potentiometric Determination of Low Levels of Simple and Total Cyanides,
W76-10030 5A

LEE, T. T.
Numerical Prediction of Harbor Responses,
W76-10419 8B

Scale Effects on Physical/Mathematical Modeling,
W76-10435 8B

LEE, W. L.
An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

LEEDY, D. L.
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

LEFEBVRE, E. E.
Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

LEGAN, R. W.
System for Total Direct Recycle of Secondary Municipal Wastewater, Vol I -- Design Concepts,
W76-10257 5D

LEGGETT, J. E.
Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

LEIMKUHLER, W.
Two-Dimensional Finite Element Dispersion Model,
W76-10453 5B

LELAND, L. A.
Evaluation and Adaptation of Selected Computer Programs to Water Resource Problems in Massachusetts,
W76-10129 7C

LEMIEUX, P. F.
Design of a Stormwater Sewer by Nonlinear Programming--1,
W76-10034 5D

LEVINS, P. L.
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

LEWIS, B. A.
Ohio River Cooling Water Study,
W76-10414 5C

LEWIS, B. W.
Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

LEWIS, W. M.
Effects of Forest Fires on Atmospheric Loads of Soluble Nutrients,
W76-10328 4C

LEYTHAM, K. M.
The Simulation of Sediment Transport,
W76-10244 2J

LIANG, T.
An LP-10 Model for Coordinating Multi-Group Inputs in Resource Planning,
W76-10192 6A

LIBERATORE, G. L.
Biological Consideration of a Bioassay System,
W76-10359 5C

LIBERTI, L.
Selective Renovation of Eutrophic Wastes Phosphate Removal,
W76-10026 5D

LIDKEA, T. R.
Vertical Static Tube Aerators: Evaluating Their Performance,
W76-10223 5D

LIKENS, G. E.
Leaching of Nutrients from Leaves of Selected Tree Species in New Hampshire,
W76-10312 5B

Nutrient Flux and Cycling in Freshwater Ecosystems,
W76-10287 5C

LIPPER, R. I.
Swine Waste Digestion Enhancement with Nutrient Separation,
W76-10128 5D

LIUM, B. W.
The Measurement of Adenosine Triphosphate in Pure Algal Cultures and Natural Aquatic Samples,
W76-10133 5A

LIVINGSTON, R. J.
Effects of Kraft Mill Effluents on Benthic Macrophyte Assemblages in a Shallow-Bay System (Apalachee Bay, North Florida, U.S.A.),
W76-10077 5C

LOFTIS, B.
Combined Use of Physical and Mathematical Models for Analysis of Reservoir Water Quality,
W76-10439 5B

LONGMAN, R. W.
Optimal Allocation of Measurement and Control Resources with Application to River Depollution,
W76-10017 5A

LORDS, J. L.
Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

LOSSER, G.
Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

LOTSPEICH, F. B.
Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

LOVELAND, R. E.
Tube-Worm-Sediment Relationships in Populations of Pectinaria Gouldii (Polychaeta: Pectinariidae) from Barnegat Bay, New Jersey,
W76-10061 2L

LUGO, A. E.
Aspects of Mineral-Nutrient Cycling in a Southern Mixed-Hardwood Forest in North Central Florida,
W76-10318 5B

LUICK, J. R.
Relationship Between Potassium Intake and Radiocesium Retention in the Reindeer,
W76-10305 5C

LUND, J. A.
Effects of Clear-Cutting on Nutrient Losses in Aspen Forests on Three Soil Types in Michigan,
W76-10315 4C

LUNDE, T. T.
Portable Breakwater with Ship Hulks,
W76-10459 8B

LYNCH, P.
Sampling of Oil Spills and Fingerprinting by Infrared Spectroscopy,
W76-10383 5B

MACK, D.
The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

MADDOCK, T. III.
Cost Functions for Additional Ground Water Development,
W76-10194 4B

MADDOX, J. JR.
Method for Controlling Scale,
W76-10469 5G

MAGARA, Y.
Biochemical and Physical Properties of an Activated Sludge on Settling Characteristics,
W76-10037 5D

MAGNUSON, J. J.
Low Thermal Responsiveness in the Bluegill, Lepomis Macrochirus,
W76-10369 5C

MAIR, D. M.
Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

MALLICK, S.
Effect of Tillage on Soil Structure and Plant Growth Under Rain-Fed Conditions,
W76-10487 2G

MAMOLITO, G. E.
Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

MANICKAM, T. S.
Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

MARINENKO, G.
An Instrument with Internal Calibration for Monitoring Chlorine Residuals in Natural Waters,
W76-10028 5A

MARR, G.
Contribution to Optimizing Chemical Precipitation in Untreated Waste Water Through Control of the Added Flocculant Quantity (Beitrag Zur Optimierung Chemischer Faellung Im Rohabwasser Durch Die Steuerung Der Faellmittelzugabemenge),
W76-10246 5D

MARSALEK, J.
Exchange Flow Between Lake Ontario and Hamilton Harbour,
W76-10496 5B

MATHEWSON, J. H.
The Activities of Enzymes as Pollution Indicators,
W76-10363 5A

The Systems Concept and Pollution Control,
W76-10357 5G

MATHIESON, A. C.
Photosynthetic Studies of Chondrus Crispus,
W76-10060 5C

MATHISEN, J. P.
Comparison Between Physical and Mathematical Modelling of a Tidal Fjord System in Northern Norway,
W76-10445 2L

MATSUMURA, F.
Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

MATTHESS, G.
Pollution of Groundwater by Landfills (Pollution de L'eau Souterraine par les Decharges),
W76-10016 5B

MAUCK, W. L.
A Review of the Literature on the Use of Simazine in Fisheries,
W76-10052 5C

MAUK, C. E.
System for Total Direct Recycle of Secondary Municipal Wastewater, Vol I -- Design Concepts,
W76-10257 5D

MAYER, V.
Experiments on Rapid Sand Filtration of Biological Sewage Treatment-Plant Effluents (Untersuchungen Ueber Das Verhalten von Schnell-Sandfiltern Bei der Filtration Eines Biologisch Gereinigten Klaeranlagenablaufs),
W76-10215 5D

MAYO, D. W.
Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

MAYOR-MORA, R. E.
Application of a Dynamic Network Model to Hydraulic and Water Quality Studies of the St. Lawrence River,
W76-10440 5B

MCAULIFFE, C. D.
Determination of C1-C10 Hydrocarbons in Water,
W76-10392 5A

MCCAMMON, G.
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

MCCARTY, P. L.
Verification Studies of the Biofilm Model for Bacterial Substrate Utilization,
W76-10247 5D

MCCLIMANS, T.
Comparison Between Physical and Mathematical Modelling of a Tidal Fjord System in Northern Norway,
W76-10445 2L

MCCONNELL, J. B.
Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin,

MCCONNELL, J. B.

Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

MCCORMICK, J. F.
Influence of Nutrient Availability on Ecosystem Structure,
W76-10324 5C

MCDANNALD, R. B.
Corrosion,
W76-10095 8G

What Type of Rig Should You Buy,
W76-10094 8C

MCGINTY, D. T.
Mineral Cycling Strategies of Two Deciduous and Two Evergreen Tree Species on a Southern Appalachian Watershed,
W76-10321 5C

MCGIRR, D. J.
Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

Interlaboratory Quality Control Study No. 5, Chromium, Iron, Molybdenum and Vanadium,
W76-10493 5A

MCGOWEN, W. E.
Tar Ball Sampling in the Western North Atlantic,
W76-10380 5B

MCHENRY, J. R.
Redistribution of Cesium-137 in Southeastern Watersheds,
W76-10295 5B

MCINTIRE, G. L.
The Role of Spartina Alterniflora in the Flow of Lead, Cadmium, and Copper Through the Salt-Marsh Ecosystem,
W76-10281 5C

MCKENZIE, S. W.
Planning Implications of Dissolved Oxygen Depletion in the Willamette River, Oregon,
W76-10332 5G

MCLAMORE, R. T.
Heavy Collars Aid Hole Control,
W76-10102 8G

MCQUIVEY, R. S.
Principles and Measuring Techniques of Turbulence Characteristics in Open-Channel Flows,
W76-10134 8B

MEARNS, A. J.
Disease Responses in Southern California Coastal Fishes,
W76-10366 5C

MEDEIROS, G. C.
Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage,
W76-10399 5A

MERCER, W. B.
Chemical Problems Encountered in Toxicity Studies,
W76-10364 5B

METRY, A. A.
The Fate of Pollutants in Subsurface Environments,
W76-10253 5B

MEYER, K. A.
Influence of Nutrient Availability on Ecosystem Structure,
W76-10324 5C

MEYER, W. R.
Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

MIGNIOT, C.
LCHF Coastal Sediment Modeling Techniques,
W76-10463 2L

MIKLAS, J. J.
Phosphorus Cycling in a Maryland Deciduous Forest Subjected to Various Levels of Mineral-Nutrient Loading,
W76-10313 5B

MILBRINK, G.
Some Effects of Acidified Water on the Early Development of Roach (Rutilus Rutilus L.) and Perch (Perca Fluviatilis L.),
W76-10076 5C

MILLER, D. W.
Ground-Water Pollution Problems in the Northwestern United States,
W76-10083 5B

MILLER, R. G.
Hydrogen Peroxide Solves Sludge Odor Problem,
W76-10211 5D

MILLER, R. W.
Mobilization of Mercury from Freshwater Sediments by Humic Acid,
W76-10294 5C

MILLETTE, J. R.
Analyzing for Asbestos in Drinking Water,
W76-10240 5A

MILLWARD, R. S.
Sewage Handling and Disposal Process for Chloride (NACL) Contaminated Sludges,
W76-10205 5D

MITCHELL, J. E.
A Preliminary Compartment Model of the Nitrogen Cycle in a Deciduous Forest Ecosystem,
W76-10269 5B

MITCHELL, R. N.
Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1974,
W76-10145 7C

MONK, C. D.
Cation Flux in Hardwood and White Pine Watersheds,
W76-10329 5B

Litter Production, Decomposition, and Nutrient Cycling in a Mixed Hardwood Watershed and a White Pine Watershed.
W76-10310 5B

Nutrient Losses in Particulate Form as Weir Pond Sediments from Four Unit Watersheds in the Southern Appalachians,
W76-10330 5C

MONTGOMERY, J. R.
Organically Complexed Copper, Zinc, and Chelating Agents in Rivers of Western Puerto Rico,
W76-10292 5B

MOORE, A.
A Model of Water Content and Evaporation for Hardwood Leaf Litter,
W76-10270 2D

MORNIG, A. W.
Identification, Estimation and Monitoring of Petroleum in Marine Waters by Luminescence Methods,
W76-10395 5B

MORRIS, B. F.
Quantitative Monitoring and Variability of Pelagic Tar in the North Atlantic,
W76-10378 5B

MORSE, R. M.
Marine Pollution Data Archiving and Exchange,
W76-10376 5A

MOSEY, F. E.
Assessment of the Maximum Concentration of Heavy Metals in Crude Sewage Which Will Not Inhibit the Anaerobic Digestion of Sludge,
W76-10040 5D

MUELLER, E. W.
Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

MURPHEY, C. E.
Heavy Collars Aid Hole Control,
W76-10102 8G

MURPHY, C. E.
Simulation of Nitrogen Distribution and Its Effect on Productivity in Even-Aged Loblolly Pine Plantations,
W76-10271 5B

MURPHY, J. C.
Nitrogen Fixation by Lichens of the Northern Piedmont,
W76-10327 5C

MURTY, T. S.
Free Oscillations in Bays and Harbors,
W76-10420 8B

MUSZYNSKI, W. J.
Operation and Impact of NPDES in Region II, Part I,
W76-10005 5G

NABHOLZ, J. B.
Factor Analysis: An Exploratory Technique Applied to Mineral Cycling,
W76-10274 5B

NACHTSCHEIM, J. J.
Maritime Considerations,
W76-10377 5G

NAESER, H.
Comparison Between Physical and Mathematical Modelling of a Tidal Fjord System in Northern Norway,
W76-10445 2L

NAGARAJARAO, Y. N.
Effect of Tillage on Soil Structure and Plant Growth Under Rain-Fed Conditions,
W76-10487 2G

NAKAMURA, S.
Nonlinear Lateral Oscillation in a Harbour Model,
W76-10418 8B

NAMBU, S.
Biochemical and Physical Properties of an Activated Sludge on Settling Characteristics,
W76-10037 5D

NANAGARA, T.
Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

NAPARSTEK, J. D.
Virus Removal in an Activated Sludge Plant,
W76-10230 5D

NATTER, A. S.
Aquiculture - New Broom Cleans up Wastewater,
W76-10180 5G

NEFF, G. E.
Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

NEIL, J. H.
Harvest of Biological Production as a Means of Improving Effluents form Sewage Lagoons,
W76-10500 5G

NELSON, L. M.
Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

NICHOLAS, A. L.
Some Effects of Fertilization on Mineral Cycling in Loblolly Pine,
W76-10323 5C

NIELSEN, A. H.
Problems of Physical Model Tests with Harbours,
W76-10451 8B

NISHIMURA, T.
Method for Treating Fouled Water,
W76-10467 5D

NOBLE, H. M.
Portable Breakwater with Ship Hulks,
W76-10459 8B

NORALL, T. L.
Photosynthetic Studies of Chondrus Crispus,
W76-10060 5C

NORRIS, S. E.
Change in Drawdown Caused by Enlarging a Well in a Dolomite Aquifer,
W76-10088 4B

NOTINI, M.
Effects of Oils on Baltic Littoral Community, as Studied in an Outdoor Model Test System,
W76-10411 5C

O'BRIEN, P. J.
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

O'NEILL, R. V.
A Theoretical Basis for Ecosystem Analysis with Particular Reference to Element Cycling,
W76-10268 5C

OLECKNO, W. A.
Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part I: Sanitary Landfill Leachate...What It Is,
W76-10013 5B

Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part II: An Index of the Water Pollution Potential of Sanitary Landfills,
W76-10014 5B

OLENIK, T. J.
Operation and Impact of NPDES in Region II, Part I,
W76-10005 5G

OLEXSEY, R. A.
Improving the Fuel Value of Sewage Sludge,
W76-10234 5E

OLGAC, N. M.
Optimal Allocation of Measurement and Control Resources with Application to River Depollution,
W76-10017 5A

OLIVIERI, V. P.
Virus Removal in an Activated Sludge Plant,
W76-10230 5D

OMMANNEY, C. S. L.
Information Booklet for Iceref, The Bibliography of Canadian Glaciers, Glacier Inventory Note No. 8,
W76-10494 2C

ORDONEZ, J. I.
Modeling Sediment Deposition in a Tidal River,
W76-10447 2L

ORGERON, C.
LCHF Coastal Sediment Modeling Techniques,
W76-10463 2L

ORLOB, G. T.
Problems and Techniques of Marine Biology in the Field: Modeling the Marine Ecosystem,
W76-10355 5C

OSAWA, A.
Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

OUELLET, Y.
Simulation of the Salinity Distribution in the St. Lawrence Estuary by a Two-Dimensional Mathematical Model,
W76-10443 5B

OVERATH, H.
Contribution to Optimizing Chemical Precipitation in Untreated Waste Water Through Control of the Added Flocculant Quantity (Beitrag Zur Optimierung Chemischer Faellung Im Rohabwasser Durch Die Steuerung Der Faellmittelzugabemenge),
W76-10246 5D

PAKALNS, P.
Effect of Surfactants on the Spectrophotometric Determination of Phosphate by Direct and Extraction Procedures,
W76-10027 5A

PALMER, R. R.
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

PARKER, P. L.
Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

PARRISH, P. R.
Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

PARULEKAR, A. H.
Oil Pollution Along the Indian Coastline,
W76-10386 5B

PASSINO, R.
Selective Renovation of Eutrophic Wastes Phosphate Removal,
W76-10026 5D

PATEL, B. R.
Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

PATEL, H. C.
Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

PATEL, J. A.
Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

PATRICK, R.
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

PATTEN, B. C.
Nutrient Recycling and the Stability of Ecosystems,
W76-10267 5C

PATTERSON, D. T.
Nutrient Return in the Stemflow and Throughfall of Individual Trees in the Piedmont Deciduous Forest,
W76-10326 5B

PEARSON, H. W.
Application of a Dynamic Network Model to Hydraulic and Water Quality Studies of the St. Lawrence River,
W76-10440 5B

PEARSON, J. G.
Preliminary Environmental Survey, Newport Army Ammunition Plant, Newport, Indiana, January, 1973,
W76-10056 5C

PEIL, K. M.
Water Pollution Sampler Evaluation,
W76-10261 5A

PEIRCE, H. W.
Arizona's Water Supply-Some Reflections,
W76-10183 4A

PENUMALLI, B. R.
Large-Scale Estuarine Water Quality Matrix Model,
W76-10191 5B

PEQUEGNAT, W. E.
Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

PETROCELLI, S. R.
Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

PETTRY, D. E.
Phosphorus Distribution from Septic Tank Effluent in Coastal Plain Soils,
W76-10015 5B

PFUDERER, P.
The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

PHILBERT, F. J.
Applicability of the Technicon Autoanalyzer I and II Systems for Shipboard Analysis of Great Lakes Water Samples,
W76-10497 5A

PHILLIPS, J. H.
An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

PHILLIPS, R. E.
Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

PINDER, J. E.
Frequency Distributions of Radiocesium Concentrations in Soil and Biota,
W76-10273 5B

POLICASTRO, A.
Ohio River Cooling Water Study,
W76-10414 5C

POLKOWSKI, L. B.
Network Models and the Impact of Modeling Assumptions,
W76-10196 4A

POMEROY, L. R.
Mineral Cycling in Marine Ecosystems,
W76-10278 5C

POPPER, D.
Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

POST, D. F.
Percolation Tests for Septic Tank Suitability in Southern Arizona Soils,
W76-10248 5D

PRESTON, E. M.
A Computer Simulation of Competition Among Five Sympatric Congeneric Species of Xanthid Crabs,
W76-10124 2L

PREUSSER, G.
Process for Decontaminating Sewage Containing Cyanide,
W76-10203 5D

PRICE, W. A.
Time Growth of Tidal Dunes in a Physical Model,
W76-10424 2L

PRINGLE, B. H.
Water Reuse in the United States,
W76-10260 5D

PROCOPIOU, J.
Mobilization of Nutrients in Soil by Acids of Sulfur and Chelating Agents,
W76-10316 5B

QUING, J. G.
Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

RADUSCH, P.
Process for Decontaminating Sewage Containing Cyanide,
W76-10203 5D

RAINBOW, P. S.
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

RAINEY, S. C.
Systematic Analysis of Field Survey Techniques and Operational Utility of Environmental Research to the Navy,
W76-10356 5G

RAINEY, W. T. JR.
The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

RAISSI, H.
Wave Response of Offshore Bottomless Harbors,
W76-10417 8B

RAMAKRISHNA, Y. S.
Moisture use Efficiency of Dryland Crops as Influenced by Fertilizer Use II. Rabi Cereals,
W76-10186 3F

RAMAN, V.
Techniques for Power Measurement for Surface Aerator,
W76-10251 5D

RAMIREZ, E. R.
Apparatus and Method for Removing Pollutants from Wastewater,
W76-10200 5D

RECORDS, L.
Run Drill Pipe Slower and Reduce Formation Damage,
W76-10097 8G

REDDY, M. P.
Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

REDMON, D. T.
Diffused Air in Deep Tank Aeration,
W76-10226 5D

REED, J. R.
Uptake and Elimination of Radiotungsten in Black Bullheads,
W76-10293 5C

REHWOLDT, R.
Distribution of Selected Metals in Tissue Samples of Carp, Cyprinus Carpio,
W76-10082 5C

REISA, J. J. JR.
Ohio River Cooling Water Study,
W76-10414 5C

RENEAU, R. B. JR.
Phosphorus Distribution from Septic Tank Effluent in Coastal Plain Soils,
W76-10015 5B

RENZONI, S.
Bodily Distribution, Accumulation and Excretion of Mercury in a Fresh-Water Mussel,
W76-10081 5C

REYNOLDS, D.
How to Cope with Sulfide Corrosion,
W76-10116 8G

RICE, R. C.
Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

RICHARDSON, C. A.
Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

RICHARDSON, C. J.
Effects of Clear-Cutting on Nutrient Losses in Aspen Forests on Three Soil Types in Michigan,
W76-10315 4C

RICHARDSON, T. H.
Factor Analysis: An Exploratory Technique Applied to Mineral Cycling,
W76-10274 5B

RICKERT, D. A.
Planning Implications of Dissolved Oxygen Depletion in the Willamette River, Oregon,
W76-10332 5G

RITCHIE, J. C.
Redistribution of Cesium-137 in Southeastern Watersheds,
W76-10295 5B

ROAN, C. C.
Evaluation of the Army Pesticide Monitoring Program, Evaluation of Data from Environmental Samples Collected Prior to 1 January 1974, Part I, Soil, Sediment, Water,
W76-10048 5A

ROBACK, S.
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

ROBINSON, G. D.
Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

ROESIJADI, G.
Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

ROGERS, W.
How to Avoid Downhole Failures and Maximize Pipe Use,
W76-10114 8G

ROMER, L. S.
Comparison of Hydraulic and Numerical Tidal Models,
W76-10446 2L

ROMNEY, E. M.
Different Levels of Soil Organic Matter in Desert Soil and Nitrogen Fertilizer on Yields and Mineral Composition of Barley Grown in the Soil,
W76-10170 3F

Mobilization of Nutrients in Soil by Acids of Sulfur and Chelating Agents,
W76-10316 5B

ROSS, S.
Effects of Hyperbaric Pressure on Oxygen Concentration in the Swim Bladder of Poecilia Latipinna,
W76-10066 5C

ROTH, A. A.
Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

RUFFO, C.
Anionic and Non-Ionic Surfactant Biodegradation in a Purifying Plant using Activating Muds (Biodegradazione de Tensioattivi Anionici e Non-Ionici in un Impianto di Trattamento a Fanghi Attivati),
W76-10238 5A

RUNCHAL, A. K.
Numerical Model for Storm Surge and Tidal Run-Up Studies,
W76-10456 2L

SACKETT, W. M.
Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

SAFFRAN, E. P.
Designing Microscreens. Here's Some Help,
W76-10033 5D

SAIDI, H.
Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

SALAZAR, M. H.
Byssal Thread Production as a Toxicity Test,
W76-10362 5A

SAMOLLOW, P.
Asymmetry Analysis in Fishes: A Possible Statistical Indicator of Environmental Stress,
W76-10121 5C

SANCHEZ, P.
Puddling Tropical Rice Soils: 2. Effects of Water Losses,
W76-10118 3F

SANDERS, T. G.
Design A River Basin Sampling System,
W76-10131 5A

SANDERSON, C. H.
Water Conditioning Apparatus,
W76-10480 5F

SANER, W. A.
Tar Ball Loadings on Golden Beach, Florida,
W76-10379 5B

Tar Ball Sampling in the Western North Atlantic,
W76-10380 5B

SANFORD, L.
How to Sand Frac Multiple Zone Open Hole Sections,
W76-10117 8G

SARFERT, F.
Fluctuations of the Runoff of Two Activated Sludge Plants and Its Consequences for the Observance of Limit Values (Schwankungen der Ablaeufe Zweier Schlammbelebunsanlagen und Inre Konsequenzen Fuer die Einhaltbarkeit von Grenzwerten),
W76-10242 5D

SARTAIN, J. B.
Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

SCHAAKE, J. C. JR.
FLOW2D: A Two-Dimensional Flow Model for Flood Plains and Estuaries,
W76-10454 2L

SCHAAP, H. Y.
Measured Contributions of the Terms of the Vertically Integrated Hydrodynamic Equations,
W76-10442 2L

SCHEIER, A.
A Discussion of the Effects of Certain Potential Toxicants on Fish and Shellfish in the Upper Delaware Estuary,
W76-10352 5C

SCHEMNITZ, S. D.
Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

SCHILLINGER, J.
Microbiology and Chemistry Studies of Water Quality Factors in a Watershed Used for Municipal Supply and Waste Disposal,
W76-10263 5B

SCHINDLER, J. E.
Mobilization of Mercury from Freshwater Sediments by Humic Acid,
W76-10294 5C

SCHLICHTER, D.
The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

SCHMID, L. A.
Swine Waste Digestion Enhancement with Nutrient Separation,
W76-10128 5D

SCHMIT, F. L.
Diffused Air in Deep Tank Aeration,
W76-10226 5D

SCHNEIDER, M. J.
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

SCHREGARDUS, D. R.
Ohio River Cooling Water Study,
W76-10414 5C

SCHULZ, H.
The Influence of the Surface Runoff of Heavy Rains on the Calculation of Sewers (Uber Den Einfluss Des Flachenabflusses Der Starkregen Auf Die Berechung Von Kanalisationen),
W76-10197 5D

SCHWARZ, J. R.
Deep-Sea Bacteria: Growth and Utilization of Hydrocarbons at Ambient and in Situ Pressure,
W76-10349 5B

SCHWEMMER, G. K.
Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

SEARL, T. D.
Measurement and Characterization of Non-volatile Hydrocarbons in Ocean Water,
W76-10394 5B

SEELY, G. R.
Photooxidative Destruction of Organic Wastes,
W76-10472 5D

SEIFERT, J. A.
Traction-Driven Composite Sludge Raking Mechanism for Sedimentation Tanks,
W76-10206 5D

SEKERKA, I.
Potentiometric Determination of Low Levels of Simple and Total Cyanides,
W76-10030 5A

SELBY, A. J.
A Method for Assessing Friction Losses for a Non-Newtonian Fluid, Such as Sewage Sludge, under Laminar Flow Conditions,
W76-10009 5B

SEYMOUR, R. J.
Wave Induced Loads on Multi-Element Structures,
W76-10458 8B

SHARITZ, R. R.
Distribution of Radiocesium in Vegetation Along a Contaminated Stream,
W76-10300 5B

Radiocesium Levels in Vegetation Colonizing a Contaminated Flood Plain,
W76-10298 5C

Seasonal Variation in Radiocesium Concentrations in Three Tree Species,
W76-10299 5C

SHARMA, M. L.
Interaction of Water Potential and Temperature Effects on Germination of Three Semi-Arid Plant Species,
W76-10185 2I

SHEIKH, Y. M.
Applicability of the Technicon Autoanalyzer I and II Systems for Shipboard Analysis of Great Lakes Water Samples,
W76-10497 5A

SHEMDIN, O. H.
Modeling of Inlet-Bay Systems in Relation to Sand Trapping,
W76-10462 2L

SHERMAN, K.
Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

SHERMAN, V. R.
Virus Removal in an Activated Sludge Plant,
W76-10230 5D

SHERRARD, J. H.
Effect of Wastewater Composition and Cell Residence Time on Phosphorus Removal in Activated Sludge,
W76-10239 5D

SHERWOOD, M. J.
Disease Responses in Southern California Coastal Fishes,
W76-10366 5C

SHIAU, J. C.
Computer Simulation of Beach Erosion and Profile Modification Due to Waves,
W76-10448 2L

SHIMIZU, K.
Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

SHINNAR, R.
Interpretation of Internal Tracer Experiments and Local Sojourn Time Distributions,
W76-10039 5B

SHOAF, W. T.
The Measurement of Adenosine Triphosphate in Pure Algal Cultures and Natural Aquatic Samples,
W76-10133 5A

SHTERN, V. A.
Change of Water Regime and Content of Mobile Forms of N, K, Mn and Fe in Meadow-Peat Soil of the Ramensk Floodplain of the Moscow River in Connection with Agricultural Use, (In Russian),
W76-10477 2G

SICK, L. B.
Effects of Environmental Levels of Mercury and Cadmium on Rates of Metal Uptake and Growth Physiology of Selected Genera of Marine Phytoplankton,
W76-10280 5C

SIESENNOP, G. D.
Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

SIMONOV, A. I.
Scientific Problems of the Systems for Global Monitoring and Investigation of Oil Pollution in the World Ocean,
W76-10372 5B

SINGH, R. P.
Moisture use Efficiency of Dryland Crops as Influenced by Fertilizer Use II. Rabi Cereals,
W76-10186 3F

SKJEI, S. S.
Urban Service Pricing and Land Use: Some Preliminary Results,
W76-10193 6C

SKLARZ, M. A.
Numerical Prediction of Harbor Responses,
W76-10419 8B

SLADE JR, R. M.
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1974,
W76-10141 7C

SLADE , R. M. JR.
Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1974,
W76-10144 7C

SMITH, F. G.
Tubing-Casing Reclamation Saved Shell Over $3 Million,
W76-10101 8G

SMITH, L. L. JR.
Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

SMITH, M.
Traction-Driven Composite Sludge Raking Mechanism for Sedimentation Tanks,
W76-10206 5D

SMITH, M. H.
Chemical Composition of White-Tailed Deer: Whole-Body Concentrations of Macro- and Micronutrients,
W76-10303 5C

Frequency Distributions of Radiocesium Concentrations in Soil and Biota,
W76-10273 5B

Radiocesium Concentrations in Whole-Body Homogenates and Several Body Compartments of Naturally Contaminated White-Tailed Deer,
W76-10304 5C

Radiocesium Levels in Vegetation Colonizing a Contaminated Flood Plain,
W76-10298 5C

SMITH, T. B.
How to Make Your Drill String Last Longer,
W76-10109 8G

SNYDER, D. P.
Seasonal and Annual Variations in the Quantities of Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, and Manganese Reaching the Forest Floor as Mast in Pennsylvania and Vermont Forests,
W76-10306 5B

SNYDER, R. M.
Physical Modeling of Scour Initiation and Sediment Transport in Distorted Tidal Models,
W76-10423 2L

SOICE, V. P.
Application of a Water Quality Model to the Denver Metropolitan Area,
W76-10438 5B

SOPPER, W. E.
Reclamation of A Burned Anthracite Refuse Bank with Municipal Sludge,
W76-10249 5E

SORENSEN, E. M. B.
Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

SOULE, M. E.
Asymmetry Analysis in Fishes: A Possible Statistical Indicator of Environmental Stress,
W76-10121 5C

SOYFER, A. M.
Analogous Modelling of Aquiferous Systems in Coastal Zones,
W76-10455 2L

SPAULDING, M. L.
Finite Difference Approximation to the Convective Transport Equation,
W76-10441 5B

SPLINTER, W. E.
Center-Pivot Irrigation,
W76-10173 3F

STALL, T. R.
Effect of Wastewater Composition and Cell Residence Time on Phosphorus Removal in Activated Sludge,
W76-10239 5D

STEARNS, M. O.
Pollution-Free Well Cuttings Disposal Apparatus,
W76-10464 5G

STEELE, T. D.
An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

STEMAN, H. T.
Effect of Surfactants on the Spectrophotometric Determination of Phosphate by Direct and Extraction Procedures,
W76-10027 5A

STEPHENS, J. A.
Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

STEPKO, W. E.
Phosphorus Removal Demonstration Studies at C.F.B. Trenton, Phase II,
W76-10490 5D

STEVENSON, L. H.
The Santee Swamp as a Nutrient Sink,
W76-10288 5C

STEWART, M. J.
Vertical Static Tube Aerators: Evaluating Their Performance,
W76-10223 5D

STICKNEY, R. R.
Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

Heavy-Metal Concentrations in Selected Georgia Estuarine Organisms with Comparative Food-Habit Data,
W76-10282 5C

STILES, D. A.
Preliminary Environmental Survey, Newport Army Ammunition Plant, Newport, Indiana, January, 1973,
W76-10056 5C

STOKES, R. M.
The Effect of In Vivo Chromium Exposure on Na/K- and Mg-ATPase Activity in Several Tissues of the Rainbow Trout (Salmo Gairdneri),
W76-10337 5C

STRAUGHAN, D.
Field Sampling Methods and Techniques for Marine Organisms and Sediments,
W76-10402 5A

STUART, D.
Microbiology and Chemistry Studies of Water Quality Factors in a Watershed Used for Municipal Supply and Waste Disposal,
W76-10263 5B

SU, C-L.
Resonances in Harbors with Variable Depths,
W76-10416 8B

SUGIMOTO, T.
Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

SULLIVAN, J. B.
Marine Pollution by Carcinogenic Hydrocarbons,
W76-10413 5C

SUMMERS, C. H.
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

SUNDGREN, S.
Two-Dimensional Finite Element Dispersion Model,
W76-10453 5B

SWANK, W. T.
A Model of Water Content and Evaporation for Hardwood Leaf Litter,
W76-10270 2D

SWEARINGEN, J. S.
Geothermal Power Method,
W76-10470 3C

SYVERTSEN, J. P.
Anomalous Diurnal Patterns of Stem Xylem Water Potentials in Larrea Tridentata,
W76-10172 2I

TAKARADA, M.
Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

TAKASHINA, N.
Method for Treating Fouled Water,
W76-10467 5D

TAKASUGI, Y.
Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

TAMURA, T.
Radiocesium Cycling in Vegetation and Soil,
W76-10296 5B

TANABE, H.
Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

TATE, J. F.
Method for Controlling Scale,
W76-10469 5G

TAYLOR, F. E.
Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

Heavy-Metal Concentrations in Selected Georgia Estuarine Organisms with Comparative Food-Habit Data,
W76-10282 5C

TAYLOR, J. D.
Free Oscillations in Bays and Harbors,
W76-10420 8B

TAYLOR, J. K.
Pollutant Analysis Cost Survey,
W76-10259 5A

TAYLOR, J. M.
Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1974,
W76-10144 7C

Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1974,
W76-10141 7C

TCHOBANOGLOUS, G.
Method and Apparatus for the Activated Sludge Treatment of Wastewater,
W76-10208 5D

TEAL, J. M.
Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

TEICHLE, D. E.
A Theoretical Basis for Ecosystem Analysis with Particular Reference to Element Cycling,
W76-10268 5C

TELETZKE, G. H.
Treatment and Disposal of Sewage Sludge,
W76-10204 5D

TEMPLETON, W. L.
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

TERMAN, G. L.
Yield-Nutrient Absorption Relationships as Affected by Environmental Growth Factors,
W76-10184 2I

TERRY, R. D.
Pollution Effects on Surface Waters and Ground Waters, (Literature Review),
W76-10104 5C

TESAKER, E.
Modelling of Suspension Currents,
W76-10449 5B

THATCHER, M. L.
Application of a Dynamic Network Model to Hydraulic and Water Quality Studies of the St. Lawrence River,
W76-10440 5B

THAYER, P. M.
Diffused Air in Deep Tank Aeration,
W76-10226 5D

THOMAS, J. F.
Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

THOMAS, W. A.
Cerium and Cobalt Movement with Litter Leachate in a Forest Soil,
W76-10311 5B

THORNTON, E. B.
Comparison of Hydraulic and Numerical Tidal Models,
W76-10446 2L

TILLY, L. J.
Changes in Water Chemistry and Primary Productivity of a Reactor Cooling Reservoir (Par Pond),
W76-10290 5C

TODD, R. L.
A Preliminary Compartment Model of the Nitrogen Cycle in a Deciduous Forest Ecosystem,
W76-10269 5B

Significance of Biological Nitrogen Fixation and Denitrification in a Deciduous Forest Ecosystem,
W76-10320 5B

TOLKACHEV, A.
Pilot Project on Marine Pollution Monitoring Under the Framework of Igoss,
W76-10373 5B

TONELLI, F. A.
General Considerations in Wastewater Disinfection,
W76-10220 5D

TRYON, C. A.
Seasonal and Annual Variations in the Quantities of Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, and Manganese Reaching the Forest Floor as Mast in Pennsylvania and Vermont Forests,
W76-10306 5B

TSENG, M-T.
Finite Element Model for Backwater Computation,
W76-10452 8B

TURNER, R. R.
The Effect of urban Land Use on Nutrient and Suspended-Solids Export from North Florida Watersheds,
W76-10331 4C

UESHIMA, H.
Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

UTOSAWA, K.
Biochemical and Physical Properties of an Activated Sludge on Settling Characteristics,
W76-10037 5D

VALENTINE, D. W.
Asymmetry Analysis in Fishes: A Possible Statistical Indicator of Environmental Stress,
W76-10121 5C

VAN DE REE, W. J.
Measured Contributions of the Terms of the Vertically Integrated Hydrodynamic Equations,
W76-10442 2L

VAN DER LEEDEN, F.
Ground-Water Pollution Problems in the Northwestern United States,
W76-10083 5B

VANDENBERG, A.
Program Esoph - Extended Soph, Simulation of Time-Variant Piezometric Surface in a Confined, Leaky Aquifer Subjected to Pumping.
W76-10498 7C

VANDERPLOEG, H. A.
A Specific-Activity and Concentration Model Applied to Cesium Movement in an Oligotrophic Lake,
W76-10275 5C

VANZANDT, J. K.
Hydrologic Data for Cow Bayou, Brazos River Basin, Texas, 1974,
W76-10146 7C

VERPLANCK, E. L.
Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

VICENS, G. J.
FLOW2D: A Two-Dimensional Flow Model for Flood Plains and Estuaries,
W76-10454 2L

VIELKIND, D.
Computer-Aided Modelling of Stream Purification Capacity, Part I: Nonlinear DO Model,
W76-10024 5B

Computer-Aided Modelling of Stream Purification Capacity, Part II: Multiple Linear Correlation Method,
W76-10025 5B

VIETH, W.
Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

VOHRA, P.
Fluoride Tolerance of Japanese Quail,
W76-10120 5C

VOLK, B. G.
Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

VON JESZENSZKY, T.
Dynamic Modelling and Control Simulation of a Biological Wastewater Treatment Process,
W76-10018 5D

VORA, A. B.
Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

VOS, A.
Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

VYAS, A. V.
Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

WAIDE, J. B.
Fallout Cesium-137 and Mineral-Element Distribution in Food Chains of Granitic-Outcrop Ecosystems,
W76-10307 5B

Nutrient Recycling and the Stability of Ecosystems,
W76-10267 5C

A Preliminary Compartment Model of the Nitrogen Cycle in a Deciduous Forest Ecosystem,
W76-10269 5B

WAIDER, J. B.
Significance of Biological Nitrogen Fixation and Denitrification in a Deciduous Forest Ecosystem,
W76-10320 5B

WAKITA, H.
Water Wells as Possible Indicators of Tectonic Strain,
W76-10105 8G

WALES, R. W.
Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

Interlaboratory Quality Control Study No. 5, Chromium, Iron, Molybdenum and Vanadium,
W76-10493 5A

WALKER, A. L.
Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

WALKER, G.
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

WALKER, J. D.
Deep-Sea Bacteria: Growth and Utilization of Hydrocarbons at Ambient and in Situ Pressure,
W76-10349 5B

Important Considerations in Designing Activated Sludge Processes,
W76-10227 5D

Microbial Petroleum Degradation: Use of Mixed Hydrocarbon Substrates,
W76-10350 5B

Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

WALLACE, A.
Different Levels of Soil Organic Matter in Desert Soil and Nitrogen Fertilizer on Yields and Mineral Composition of Barley Grown in the Soil,
W76-10170 3F

Mobilization of Nutrients in Soil by Acids of Sulfur and Chelating Agents,
W76-10316 5B

WALLACE, J. B.
Mineral Pathways in Small Appalachian Streams,
W76-10291 5B

WALLACE, J. H.
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

WALLACE, N. M.
Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

WALLIS, C.
Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

WALRATH, D.
Aquiculture - New Broom Cleans up Wastewater,
W76-10180 5G

WALSKI, T. M.
Mathematical Model Simplifies Design of Sludge Drying Beds,
W76-10035 5D

WANG, H.
Computer Simulation of Beach Erosion and Profile Modification Due to Waves,
W76-10448 2L

WANG, J.
Two-Dimensional Finite Element Dispersion Model,
W76-10453 5B

WANG, L. K.
Computer-Aided Analysis of Environmental Data, Part I: Linear Regression, Precision and Accuracy,
W76-10022 5A

Computer-Aided Analysis of Environmental Data, Part II: Biochemical Oxygen Demand Model,
W76-10023 5A

Computer-Aided Modelling of Stream Purification Capacity, Part I: Nonlinear DO Model,
W76-10024 5B

Computer-Aided Modelling of Stream Purification Capacity, Part II: Multiple Linear Correlation Method,
W76-10025 5B

WANG, M. H.
Computer-Aided Analysis of Environmental Data, Part I: Linear Regression, Precision and Accuracy,
W76-10022 5A

Computer-Aided Analysis of Environmental Data, Part II: Biochemical Oxygen Demand Model,
W76-10023 5A

Computer-Aided Modelling of Stream Purification Capacity, Part I: Nonlinear DO Model,
W76-10024 5B

Computer-Aided Modelling of Stream Purification Capacity, Part II: Multiple Linear Correlation Method,
W76-10025 5B

LIBRARY U. OF I. URBANA-CHAMPAIGN

WANG, S.
Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

WARNER, J. S.
Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

WARNER, J. W.
An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

WARRICK, A. W.
Percolation Tests for Septic Tank Suitability in Southern Arizona Soils,
W76-10248 5D

WASIK, S. P.
Determination of Aromatic Hydrocarbons in Sea Water using an Electrolytic Stripping Cell,
W76-10390 5A

WAY, E.
How to Get the Most from Mud Pump Parts,
W76-10112 8G

WEAVER, G. T.
The Quantity and Distribution of Four Nutrient Elements in High-Elevation Forest Ecosystems, Balsam Mountains, North Carolina,
W76-10319 5B

WEBB, W. C.
Maps Showing Ground-Water Conditions in the Ranegras Plain and Butler Valley Areas, Yuma County, Arizona--1975,
W76-10149 7C

WEBSTER, J. R.
Nutrient Recycling and the Stability of Ecosystems,
W76-10267 5C

WEINBERG, M. S.
Beneficial Effects of Baking Soda Added to Septic Tanks,
W76-10012 5D

WEISS, D. E.
Filtration Process,
W76-10473 5D

WEISS, R. E.
Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

WELLS, C. G.
Influence of Nutrient Availability on Ecosystem Structure,
W76-10324 5C

Simulation of Nitrogen Distribution and Its Effect on Productivity in Even-Aged Loblolly Pine Plantations,
W76-10271 5B

Some Effects of Fertilization on Mineral Cycling in Loblolly Pine,
W76-10323 5C

WENTZ, D. A.
An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

WESTOO, G.
Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

WHITAKER, E. C.
The Disposal of Sewage from Coastal Towns: The Case for Treatment,
W76-10225 5D

WHITE, D. B.
Heavy-Metal Concentrations in Selected Georgia Estuarine Organisms with Comparative Food-Habit Data,
W76-10282 5C

WHITE, H. R.
Process and Apparatus for Treating Fatty Waste Water,
W76-10471 5D

Waste Treatment Process,
W76-10207 5D

WHITE, R. M.
United Nations Environment Program Earthwatch and Marine Pollution,
W76-10371 5B

WHITEHEAD, W. R.
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

WHITLATCH, E. E. JR.
Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

WIENER, J. G.
Chemical Composition of White-Tailed Deer: Whole-Body Concentrations of Macro- and Micronutrients,
W76-10303 5C

WILBUR, K. M.
Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

WILKINS, D. W.
Maps Showing Ground-Water Conditions in the Ranegras Plain and Butler Valley Areas, Yuma County, Arizona--1975,
W76-10149 7C

WILKINS, J. R.
Analytical Notes--Electrochemical Method for Early Detection and Monitoring of Coliforms,
W76-10237 5A

WILLIAMS, E.
How to Use a Systems Approach to Combat Lost Circulation,
W76-10115 8G

WILLIAMS, E. P.
Flocculation of Suspended Solids,
W76-10468 5D

WILLIAMS, K.
How to Use a Systems Approach to Combat Lost Circulation,
W76-10115 8G

WILLIAMSON, K.
Verification Studies of the Biofilm Model for Bacterial Substrate Utilization,
W76-10247 5D

WILSON, A. D.
Comparison of Sheep and Cattle Grazing on Semiarid Grassland,
W76-10181 4C

WILSON, G. E.
How to Drill Without Troublesome Dog-Legs,
W76-10111 8G

WINDOM, H. L.
Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

Effects of Environmental Levels of Mercury and Cadmium on Rates of Metal Uptake and Growth Physiology of Selected Genera of Marine Phytoplankton,
W76-10280 5C

Heavy-Metal Concentrations in Selected Georgia Estuarine Organisms with Comparative Food-Habit Data,
W76-10282 5C

River Input of Inorganic Phosphorus and Nitrogen to the Southeastern Salt-Marsh Estuarine Environment,
W76-10286 5C

The Role of Spartina Alterniflora in the Flow of Lead, Cadmium, and Copper Through the Salt-Marsh Ecosystem,
W76-10281 5C

WINNEBERGER, J. H. T.
Beneficial Effects of Baking Soda Added to Septic Tanks,
W76-10012 5D

WINSLOW, T. S.
Portable Breakwater with Ship Hulks,
W76-10459 8B

WINTERS, J. K.
Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

WITKAMP, M.
Effects of Tree Species, Temperature, and Soil on Transfer of Manganese-54 from Litter to Roots in a Microcosm,
W76-10317 5C

WOODALL, W. R.
Mineral Pathways in Small Appalachian Streams,
W76-10291 5B

WOODRUFF, N. P.
Techniques for Improving Tree Survival and Growth in Semiarid Areas,
W76-10175 2I

WRASIDLO, W. J.
Composite Semipermeable Membranes Made from Polyethylenimine,
W76-10485 3A

WRIGHT, D. E.
Cost-Effective Goal,
W76-10032 5D

Evaluation of the Ciria Prototype Model for the Design of Sewage-Treatment Works,
W76-10245 5D

WRIGHT, J. E.
Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

YALIN, M. S.
Time Growth of Tidal Dunes in a Physical Model,
W76-10424 2L

YAMAUCHI, H.
Compilation and Analysis of Water Quality Rights and Responsibilities in Hawaii,
W76-10001 5G

YANAGI, T.
Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

YANYSHEVA, N. YA.
Standardization of the Content of Benzo(a)-Pyrene in Water Bodies, (In Russian),
W76-10351 5C

YASUDA, H.
Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

YOUNG, D. A.
Clarifier Apparatus,
W76-10479 5F

YOUNG, G. J.
Approach to Glacier Mass-Balance Analysis Utilizing Terrain Characterization,
W76-10499 2C

YOUNT, J. D.
The Effect of Nonremoval Clear-Cutting and Pine Reforestation of the Cation Composition of a Hardwood Forest Soil,
W76-10322 4C

Forest-Floor Nutrient Dynamics in Southern Appalachian Hardwood and White Pine Plantation Ecosystems,
W76-10309 5B

ZACHER, B.
Experiments on Rapid Sand Filtration of Biological Sewage Treatment-Plant Effluents (Untersuchungen Ueber Das Verhalten von Schnell-Sandfiltern Bei der Filtration Eines Biologisch Gereinigten Klaeranlagenablaufs),
W76-10215 5D

ZAHKA, J. G.
Oil Spillage Monitoring, Sampling and Recovery Systems,
W76-10382 5B

ZARTMAN, R. E.
Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

ZECH, Y.
Design of a Stormwater Sewer by Nonlinear Programming--1,
W76-10034 5D

ZIETZ, U.
Determination of the Chemical Oxygen Demand (COD) by Potassium Dichromate at Very High Chloride Concentrations (Bestimmung des Chemischen Sauerstoffbedarfs (CSB) Gegen Kaliumdichromat Bei Sehr Hohen Chloridkonzentrationen),
W76-10236 5A

ZIMMERMAN, M. S.
Effects of Kraft Mill Effluents on Benthic Macrophyte Assemblages in a Shallow-Bay System (Apalachee Bay, North Florida, U.S.A.),
W76-10077 5C

ZSOLNAY, A.
Determination of Aromatic and Total Hydrocarbon Content in Submicrogram and Microgram Quantities in Aqueous Systems by Means of High Performance Liquid Chromatography,
W76-10391 5A

Hydrocarbon Content and Chlorophyll Correlation in the Waters Between Nova Scotia and the Gulf Stream,
W76-10389 5B

ZUERN, H. E.
Important Aspects of Phosphorus Analysis,
W76-10241 5A

ZVIRIN, Y.
Interpretation of Internal Tracer Experiments and Local Sojourn Time Distributions,
W76-10039 5B

LIBRARY U. OF A. ENVIRONMENTAL SCIENCES

ORGANIZATIONAL INDEX

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, PA. DEPT. OF LIMNOLOGY.
Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part I - Report on the Work Done and Tentative Conclusions on the Summer Survey,
W76-10041 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project, Part II - Report on Work Done and Tentative Conclusions on the Fall Survey,
W76-10042 5C

Biological Survey of the Savannah River in the Vicinity of the Savannah River Project. Part III - Report on the Work Done and Tentative Conclusions on the Winter Survey,
W76-10043 5C

Savannah River Biological Survey, South Carolina and Georgia, August, 1954.
W76-10044 5C

Considerations on the Effects of High Temperatures on Algae and Fishes, A Literature Review, 1954,
W76-10055 5C

ACRES CONSULTING SERVICES LTD., NIAGARA FALLS (ONTARIO).
Scaling and Sizing Criteria for Thermal-Hydraulic Models,
W76-10437 5B

AEROSPACE MEDICAL RESEARCH LAB., WRIGHT-PATTERSON AFB, OHIO.
Water Reuse in the United States,
W76-10260 5D

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. AGRICULTURAL ENVIRONMENTAL QUALITY INST.
Retention of Metals in Sewage Sludge II: Incorporated Radioisotopes,
W76-10006 5A

AGRICULTURAL RESEARCH SERVICE, MANHATTAN, KANS.
Techniques for Improving Tree Survival and Growth in Semiarid Areas,
W76-10175 2I

AGRICULTURAL RESEARCH SERVICE, OXFORD, MISS. SEDIMENTATION LAB.
Redistribution of Cesium-137 in Southeastern Watersheds,
W76-10295 5B

AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.
Use of the Earth's Crust for Treatment or Storage of Sewage Effluent and Other Waste Fluids,
W76-10216 5D

Wastewater Renovation and Reuse: Virus Removal by Soil Filtration,
W76-10219 5D

AGRICULTURAL RESEARCH SERVICE, TUCSON, ARIZ. STATISTICAL REPORTING SERVICE.
1975 Arizona Agricultural Statistics.
W76-10187 3F

AGRICULTURAL UNIV., WAGENINGEN (NETHERLANDS). DEPT. OF THEORETICAL PRODUCTION ECOLOGY.
Simulation of Nitrogen Distribution and Its Effect on Productivity in Even-Aged Loblolly Pine Plantations,
W76-10271 5B

AKADEMIYA NAUK SSSR, MOSCOW. INTERAGENCY GEOPHYSICAL COMMITTEE.
Analogous Modelling of Aquiferous Systems in Coastal Zones,
W76-10455 2L

AKADEMIYA NAUK UZBEKSKOI SSR, TASHKENT. DEPT. OF MICROBIOLOGY.
Characteristics of the Accumulation of Free Amino Acids by Some Nonsporulating Bacteria from Typical Irrigated Sierozem, (In Russian),
W76-10188 5B

ALAR ENGINEERING CORP., CHICAGO, ILL. (ASSIGNEE).
Waste Treatment Process,
W76-10207 5D

Process and Apparatus for Treating Fatty Waste Water,
W76-10471 5D

ALASKA UNIV., COLLEGE. INST. OF ARCTIC BIOLOGY.
Relationship Between Potassium Intake and Radiocesium Retention in the Reindeer,
W76-10305 5C

ALFA-LAVAL A. B., TUMBA (SWEDEN).
Optimizing Centrifuge Decantation for Sludge Thickening (Optimisation Des Decanteuses Centrifuges Pour La Concentration Des Bous),
W76-10217 5D

ALLIED CHEMICAL CORP., MORRISTOWN, N. J.
Important Aspects of Phosphorus Analysis,
W76-10241 5A

ALMAG POLLUTION CONTROL CORP., BALTIMORE, MD. (ASSIGNEE).
Modular Container,
W76-10483 5D

ALYESKA PIPELINE SERVICE CO., ANCHORAGE, ALASKA.
Network Models and the Impact of Modeling Assumptions,
W76-10196 4A

AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK.
Symposium on Modeling Techniques, Volume II.
W76-10415 8B

AMF TUBOSCOPE, INC., HOUSTON, TEX.
How to Avoid Downhole Failures and Maximize Pipe Use,
W76-10114 8G

APPLETON PUBLIC WORKS, WIS.
Hydrogen Peroxide Solves Sludge Odor Problem,
W76-10211 5D

ARGONNE NATIONAL LAB., ILL.
Ohio River Cooling Water Study,
W76-10414 5C

ARIZONA AGRICULTURAL EXPERIMENT STATION, TUCSON.
Effects of Treated Municipal Wastewater on Oat Forage and Grain,
W76-10119 5D

ARIZONA AGRICULTURAL EXPERIMENT STATION, YUMA. DEPT. OF SOILS, WATER, ENGINEERING AND PLANT SCIENCES.
Fertilization, Nutrient Composition, and Yield Relationships in Irrigated Spring Wheat,
W76-10177 3F

ARIZONA BUREAU OF MINES, TUCSON.
Arizona's Water Supply-Some Reflections,
W76-10183 4A

ARIZONA UNIV., TUCSON. DEPT. OF AGRONOMY AND PLANT GENETICS.
Effect of Cultural Practices on Grain Yield and Yield Components in Irrigated Wheat,
W76-10176 3F

ARIZONA UNIV., TUSCON. DEPT OF SOILS, WATER, AND ENGINEERING.
Percolation Tests for Septic Tank Suitability in Southern Arizona Soils,
W76-10248 5D

ARMY ENGINEER DISTRICT, CHICAGO, ILL.
Flood Plain Information: East Arm Little Calumet River, Salt Creek-Coffee Creek, Porter County, Indiana.
W76-10152 4A

ARMY ENGINEER DISTRICT, HUNTINGTON, W. VA.
Flood Plain Information: Big Sandy River, Lawrence County, Kentucky.
W76-10159 4A

ARMY ENGINEER DISTRICT, LOUISVILLE, KY.
Flood Plain Information: Little Eagle Creek and Tributaries, Marion County, Indiana.
W76-10153 4A

Flood Plain Information: Crooked Creek and Williams Creek, Marion County, Indiana.
W76-10154 4A

Flood Plain Information: Clear Creek-Mulberry Creek, Vicinity of Shelbyville, Kentucky.
W76-10164 4A

Flood Plain Information: North Fork Kentucky River and Trace Fork, Vicinity of Hazard, Kentucky.
W76-10166 4A

ARMY ENGINEER DISTRICT, MEMPHIS, TENN.
Flood Plain Information: Portage Open Bay and Main Ditch, Vicinity of Portageville, Missouri.
W76-10156 4A

ARMY ENGINEER DISTRICT, NASHVILLE, TENN.
Flood Plain Information: Cumberland River, Burkesville, Kentucky.
W76-10151 4A

Flood Plain Information: Lynn Camp and East Fork Lynn Camp Creeks, Corbin, Kentucky.
W76-10163 4A

ARMY ENGINEER DISTRICT, PHILADELPHIA, PA.
Flood Plain Information: Pike Creek, New Castle County, Delaware.
W76-10165 4A

ARMY ENGINEER DISTRICT, SAN FRANCISCO, CALIF.
Flood Plain Information: Soquel Creek, Santa Cruz County, California.
W76-10157 4A

ARMY ENGINEER DISTRICT, ST. LOUIS, MO.
Flood Plain Information: South Fork Salt River and Davis Creek, Mexico, Missouri.
W76-10158 4A

ARMY ENGINEER DISTRICT, TULSA, OKLA.
Flood Plain Information: Turkey and Joplin Creeks, Joplin, Missouri.
W76-10155 4A

Special Flood Hazard Information: Arkansas River, Arkansas City, Kansas.
W76-10160 4A

Special Flood Hazard Information: Labette and Little Labette Creeks, Parsons, Kansas.
W76-10161 4A

Special Flood Hazard Information: Whiskey and Rock Creeks, Independence, Kansas.
W76-10162 4A

Flood Plain Information: Dry Turkey and Bull Creeks, McPherson, Kansas.
W76-10167 4A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Mathematical Model Simplifies Design of Sludge Drying Beds,
W76-10035 5D

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. ENVIRONMENTAL EFFECTS LAB.
The Role of Physical Modeling in Marsh-Estuarine Mineral-Cycling Research,
W76-10276 5B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. HYDRAULICS LAB.
Combined Use of Physical and Mathematical Models for Analysis of Reservoir Water Quality,
W76-10439 5B

Overview of Physical Estuary Practice,
W76-10444 2L

ARMY ENVIRONMENTAL HYGIENE AGENCY, ABERDEEN PROVING GROUND, MD.
Evaluation of the Army Pesticide Monitoring Program, Evaluation of Data from Environmental Samples Collected Prior to 1 January 1974, Part I, Soil, Sediment, Water,
W76-10048 5A

ARMY MEDICAL BIOENGINEERING RESEARCH AND DEVELOPMENT LAB., FORT DETRICK, MD.
Water Pollution Sampler Evaluation,
W76-10261 5A

ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT CENTER, FORT BELVOIR, VA. SANITARY SCIENCES DIV.
A Present Value-Unit Cost Methodology for Evaluating Wastewater Reclamation and Direct Reuse at a Military Base of Operations,
W76-10255 5D

ASSOCIATED ENGINEERING SERVICES, LTD., VANCOUVER (BRITISH COLUMBIA).
Vertical Static Tube Aerators: Evaluating Their Performance,
W76-10223 5D

AUSTRALIAN ATOMIC ENERGY COMMISSION RESEARCH ESTABLISHMENT, LUCAS HEIGHTS.
Effect of Surfactants on the Spectrophotometric Determination of Phosphate by Direct and Extraction Procedures,
W76-10027 5A

AZOVSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT RYBNOGO KHOZYAISTVA, ROSTOV-NA DONU (USSR).
Isolation of the Runoff-Dependent Salinity in a Shallow River-Mouth Offshore Zone Under Conditions of Wind-Induced Rise and Fall of the Water Level, (In Russian),
W76-10361 2L

BAIRD-ATOMIC, INC., BEDFORD, MASS.
Identification, Estimation and Monitoring of Petroleum in Marine Waters by Luminescence Methods,
W76-10395 5B

BATTELLE COLUMBUS LAB., OHIO.
Field Research and Testing of a Water Hand Pump for use in Developing Countries,
W76-10086 8G

BATTELLE COLUMBUS LABS., OHIO.
Quantitative Determination of Hydrocarbons in Marine Organisms,
W76-10404 5A

BATTELLE-COLUMBUS LABS., OHIO. ECOLOGY AND ECOSYSTEMS ANALYSIS SECTION.
Resource Partitioning in Leaf-Litter Faunas from Hardwood and Hardwood-Converted-To-Pine Forests,
W76-10308 5B

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Effects of Thermal and Chemical Discharges from Nuclear Power Plants,
W76-10051 5C

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH. ECOSYSTEMS DEPT.
Suspensions of Crude Oils in Sea Water: Rapid Methods of Characterizing Light Hydrocarbon Solutes,
W76-10393 5A

BEDFORD INST. OF OCEANOGRAPHY, DARTMOUTH (NOVA SCOTIA). MARINE ECOLOGY LAB.
Hydrocarbon Concentrations in Seawater along the Halifax-Bermuda Section: Lessons Learned Regarding Sampling and some Results,
W76-10388 5A

BERMUDA BIOLOGICAL STATION FOR RESEARCH, ST. GEORGE'S WEST.
Hydrocarbon Content and Chlorophyll Correlation in the Waters Between Nova Scotia and the Gulf Stream,
W76-10389 5B

Determination of Aromatic and Total Hydrocarbon Content in Submicrogram and Microgram Quantities in Aqueous Systems by Means of High Performance Liquid Chromatography,
W76-10391 5A

BLACK AND VEATCH, DENVER, COLO.
Application of a Water Quality Model to the Denver Metropolitan Area,
W76-10438 5B

BOWDOIN COLL., BRUNSWICK, MAINE. DEPT. OF CHEMISTRY.
Long Term Weathering Characteristics of Iranian Crude Oil: The Wreck of the 'Northern Gulf',
W76-10405 5B

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF ZOOLOGY.
Changes in Some Hematological Characteristics of Coho Salmon (Oncorhynchus Kisutch) in Response to Acute Exposure to Dehydroabietic Acid (DHAA) at Different Exercise Levels,
W76-10333 5C

BURMAH OIL AND GAS CO., HOUSTON, TEX. (ASSIGNEE).
Clarification Tank,
W76-10486 5D

CALIFORNIA STATE UNIV., LONG BEACH. DEPT. OF CIVIL ENGINEERING.
Numerical Model for Wave Refraction by Finite Amplitude Wave Theories,
W76-10434 2L

CALIFORNIA UNIV., BERKELEY. NAVAL BIOMEDICAL RESEARCH LAB.
Determination of Hydrocarbons in Marine Organisms and Sediments by Thin Layer Chromatography,
W76-10407 5A

CALIFORNIA UNIV., DAVIS. DEPT. OF AVIAN SCIENCE.
Fluoride Tolerance of Japanese Quail,
W76-10120 5C

CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
Problems and Techniques of Marine Biology in the Field: Modeling the Marine Ecosystem,
W76-10355 5C

CALIFORNIA UNIV., IRVINE. DEPT. OF ENVIRONMENTAL BIOLOGY.
Effects of Power-Plant Cooling Systems on Marine Phytoplankton,
W76-10339 5C

CALIFORNIA UNIV., LOS ANGELES. DIV. OF ENVIRONMENTAL BIOLOGY.
Different Levels of Soil Organic Matter in Desert Soil and Nitrogen Fertilizer on Yields and Mineral Composition of Barley Grown in the Soil,
W76-10170 3F

CALIFORNIA UNIV., LOS ANGELES, LAB., OF NUCLEAR MEDICINE AND RADIATION BIOLOGY.
Mobilization of Nutrients in Soil by Acids of Sulfur and Chelating Agents,
W76-10316 5B

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Potentiometric Determination of Low Levels of Simple and Total Cyanides,
W76-10030 5A

Delta-Amino Levulinic Acid Dehydratase Activity in Fish Blood as an Indicator of a Harmful Exposure to Lead,
W76-10338 5C

Interlaboratory Quality Control Study No. 5, Chromium, Iron, Molybdenum and Vanadium,
W76-10493 5A

Interlaboratory Quality Control Study No. 4, Arsenic, Cadmium, Cobalt, Mercury and Nickel,
W76-10495 5A

Exchange Flow Between Lake Ontario and Hamilton Harbour,
W76-10496 5B

Applicability of the Technicon Autoanalyzer I and II Systems for Shipboard Analysis of Great Lakes Water Samples,
W76-10497 5A

CENTER FOR SCIENCE IN THE PUBLIC INTEREST, WASHINGTON, D. C.
Marine Pollution by Carcinogenic Hydrocarbons,
W76-10413 5C

CENTRAL ARID ZONE RESEARCH INST., JODHPUR (INDIA).
Use of Saline Water in Agriculture. I. Description of the System,
W76-10168 3C

CENTRAL WATER AND POWER RESEARCH STATION, POONA (INDIA).
Simulation of Delta Building Process,
W76-10426 2L

CH2M/HILL, CORVALLIS, OREG. WASTEWATER RECLAMATION.
Biological Treatment Process in Cold Climates,
W76-10222 5D

CHARLES F. KETTERING FOUNDATION, DAYTON, OHIO. (ASSIGNEE).
Photooxidative Destruction of Organic Wastes,
W76-10472 5D

CHEVRON OIL FIELD RESEARCH CO., LA HABRA, CALIF.
Determination of C1-C10 Hydrocarbons in Water,
W76-10392 5A

CHUGOKU INST., OF INDUSTRIAL TECHNOLOGY, KURE (JAPAN). HYDRAULIC RESEARCH SECTION II.
Multi-Phased Model Study of the Seto Inland Sea,
W76-10430 2L

CHUGOKU NATIONAL INDUSTRIAL RESEARCH INST., HIROSHIMA (JAPAN).
Industrial Research Institute Studying Pollution Problems of Seto Inland Sea,
W76-10031 5B

CITY COLL., NEW YORK. DEPT. OF CHEMICAL ENGINEERING.
Interpretation of Internal Tracer Experiments and Local Sojourn Time Distributions,
W76-10039 5B

CLEVELAND METROPOLITAN GENERAL HOSPITAL, OHIO. DEPT. OF OBSTETRICS AND GYNECOLOGY.
The Effect of In Vivo Chromium Exposure on Na/K- and Mg-ATPase Activity in Several Tissues of the Rainbow Trout (Salmo Gairdneri),
W76-10337 5C

COAST GUARD RESEARCH AND DEVELOPMENT CENTER, GROTON, CONN.
Tar Ball Loadings on Golden Beach, Florida,
W76-10379 5B

Tar Ball Sampling in the Western North Atlantic,
W76-10380 5B

COAST GUARD, WASHINGTON, D.C.
Evaluation of Thin Film Oil Samplers,
W76-10381 5A

COAST GUARD, WASHINGTON, D. C. OFFICE OF MARINE ENVIRONMENT AND SYSTEMS.
Chemical Hazards Response Information System, A Condensed Guide to Chemical Hazards,
W76-10047 5A

COASTAL ENGINEERING RESEARCH CENTER, FORT BELVOIR, VA.
Laboratory Effects in Coastal Movable-Bed Models,
W76-10425 2L

COLOGNE UNIV. (WEST GERMANY). ZOOLOGICAL INSTITUT.
The Importance of Dissolved Organic Compounds in Sea Water for the Nutrition of Anemonia Sulcata Pennant (Coelenterata),
W76-10071 5C

COLORADO UNIV., BOULDER. DEPT. OF ENVIRONMENTAL, POPULATION, AND ORGANISMIC BIOLOGY.
Effects of Forest Fires on Atmospheric Loads of Soluble Nutrients,
W76-10328 4C

COLUMBIA UNIV., NEW YORK. DEPT. OF MECHANICAL ENGINEERING.
Optimal Allocation of Measurement and Control Resources with Application to River Depollution,
W76-10017 5A

COMBUSTION POWER CO., INC., MENLO PARK, CALIF.
LSW-500 Disposal of Air Force Liquid Wastes,
W76-10258 5E

COMMONWEALTH INDUSTRIAL GASES, LTD., SYDNEY (AUSTRALIA).
Treatment of Waste with Oxygen or Ozone.
W76-10212 5D

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CAMPBELL (AUSTRALIA); AND IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA, CAMPBELL; AND NEW ZEALAND LTD., CAMPBELL (AUSTRALIA). (ASSIGNEES).
Filtration Process,
W76-10473 5D

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, DENILIQUIN (AUSTRALIA). DIV. OF LAND RESOURCES MANAGEMENT.
Comparison of Sheep and Cattle Grazing on Semiarid Grassland,
W76-10181 4C

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, MELBOURNE (AUSTRALIA). DIV. OF MINERAL CHEMISTRY.
Muds, Slimes and Sludges,
W76-10008 5D

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, WEMBLEY (AUSTRALIA). DIV. OF LAND RESOURCES MANAGEMENT.
Interaction of Water Potential and Temperature Effects on Germination of Three Semi-Arid Plant Species,
W76-10185 2I

CONSIGLIO NAZIONALE DELLE RICERCHE, BARI (ITALY). INSTITUTO DI RICERCHA SULLE ACQUE.
Selective Renovation of Eutrophic Wastes Phosphate Removal,
W76-10026 5D

CORNELL UNIV., ITHACA, N. Y. SECTION OF ECOLOGY AND SYSTEMATICS.
Nutrient Flux and Cycling in Freshwater Ecosystems,
W76-10287 5C

DAMES AND MOORE, BETHESDA, MD.
Time-Dependent Mass Dispersion in Natural Streams,
W76-10436 5B

DAMES AND MOORE, CRANFORD, N.J.
Modeling Sediment Deposition in a Tidal River,
W76-10447 2L

Two-Dimensional Finite Element Dispersion Model,
W76-10453 5B

DAMES AND MOORE, LOS ANGELES, CALIF. ADVANCE TECHNOLOGY GROUP.
Numerical Model for Storm Surge and Tidal Run-Up Studies,
W76-10456 2L

DAMES AND MOORE, NEW YORK.
Portable Breakwater with Ship Hulks,
W76-10459 8B

DAMES AND MOORE, SAN FRANCISCO, CALIF.
Asymmetry Analysis in Fishes: A Possible Statistical Indicator of Environmental Stress,
W76-10121 5C

DANISH HYDRAULIC INST., COPENHAGEN.
Problems of Physical Model Tests with Harbours,
W76-10451 8B

DANISH HYDRAULIC INST., HORSHOLM.
Numerical Simulation of Storm Surges in Bays,
W76-10457 2L

DAVID W. TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
Systematic Analysis of Field Survey Techniques and Operational Utility of Environmental Research to the Navy,
W76-10356 5G

DELAWARE UNIV., NEWARK.
A Discussion of the Effects of Certain Potential Toxicants on Fish and Shellfish in the Upper Delaware Estuary,
W76-10352 5C

DELAWARE UNIV., NEWARK, DEPT. OF CHEMICAL ENGINEERING.
Short-Term Regulation of BOD Upsets in an Estuary,
W76-10020 5G

DELAWARE UNIV., NEWARK. DEPT. OF CIVIL ENGINEERING.
Nearshore Water Circulation Induced by Wind and Waves,
W76-10433 2L

DELAWARE UNIV., NEWARK. DEPT. OF CIVIL ENGINEERING.

Computer Simulation of Beach Erosion and Profile Modification Due to Waves,
W76-10448 2L

DELTA MUD AND CHEMICAL CO., HOUMA, LA.

Selecting Packer Fluids: Here's What to Consider,
W76-10099 8G

DELTA SERVICE, RIJKSWATERSTAAT (NETHERLANDS).

Measured Contributions of the Terms of the Vertically Integrated Hydrodynamic Equations,
W76-10442 2L

DENVER RESEARCH INST., DENVER, COLO.

The Development of a Simple Waste Treatment System for U.S. Naval Vessels,
W76-10256 5D

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (CANADA). INLAND WATERS DIRECTORATE.

Information Booklet for Iceref, The Bibliography of Canadian Glaciers, Glacier Inventory Note No. 8,
W76-10494 2C

Program Esoph - Extended Soph, Simulation of Time-Variant Piezometric Surface in a Confined, Leaky Aquifer Subjected to Pumping.
W76-10498 7C

Approach to Glacier Mass-Balance Analysis Utilizing Terrain Characterization,
W76-10499 2C

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). OCEANOGRAPHY BRANCH.

Free Oscillations in Bays and Harbors,
W76-10420 8B

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WASTEWATER TECHNOLOGY CENTRE.

Phosphorus Removal Demonstration Studies at C.F.B. Trenton, Phase II,
W76-10490 5D

DEUTSCHE AKADEMIE DER WISSENSCHAFTEN ZU BERLIN (EAST GERMANY). FORSCHUNGSSTELLE FUER UMWELTGESTALTUNG.

A Mathematical Model of Blooms of Plankton Diatoms, (In German),
W76-10127 5C

DORR-OLIVER INC., STAMFORD, CONN. (ASSIGNEE).

Sewage Handling and Disposal Process for Chloride (NACL) Contaminated Sludges,
W76-10205 5D

Traction-Driven Composite Sludge Raking Mechanism for Sedimentation Tanks,
W76-10206 5D

DOW CORNING CORP., MIDLAND, MICH.

Toxicity of Polydimethylsiloxanes in Certain Environmental Systems,
W76-10348 5C

DOWELL DIV., TULSA OKLA.

How to Perform a Through-Tubing Gravel Pack,
W76-10113 8G

DRESSER INDUSTRIES, INC., HOUSTON, TEX. MAGCOBAR DIV.

How to Drill Troublesome Shales,
W76-10108 8G

DRILCO, HOUSTON, TEX.

How to Drill Without Troublesome Dog-Legs,
W76-10111 8G

DUKE UNIV., DURHAM, N. C. DEPT. OF BOTANY.

Nutrient Return in the Stemflow and Throughfall of Individual Trees in the Piedmont Deciduous Forest,
W76-10326 5B

DUKE UNIV., DURHAM, N.C. DEPT. OF ZOOLOGY.

Effects of Calcium, Strontium and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. II. Cell Division,
W76-10079 5C

DUPONT DE NEMOURS (E. I.) AND CO., AIKEN, S. C. SAVANNAH RIVER LAB.

Changes in Water Chemistry and Primary Productivity of a Reactor Cooling Reservoir (Par Pond),
W76-10290 5C

DURHAM ASSOCIATES, INC., MILFORD, N. H.

Oil Spillage Monitoring, Sampling and Recovery Systems,
W76-10382 5B

ECODYNE CORP., LINCOLNSHIRE, ILL. (ASSIGNEE).

Clarifier Apparatus,
W76-10479 5F

EDGEWOOD ARSENAL, ABERDEEN PROVING GROUND, MD. BIOMEDICAL LAB.

Preliminary Environmental Survey, Newport Army Ammunition Plant, Newport, Indiana, January, 1973,
W76-10056 5C

EHIME UNIV., MATSUYAMA (JAPAN). DEPT. OF OCEAN ENGINEERING.

Tidal Residual Circulations in the Hydraulic Model,
W76-10431 2L

EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND).

The Role of Hydroxyl Radical Reactions in Ozonation Processes in Aqueous Solutions,
W76-10036 5D

EIDGENOSSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND). LABORATORIUM TECHNISCH-CHEMISCHES.

Dynamic Modelling and Control Simulation of a Biological Wastewater Treatment Process,
W76-10018 5D

ENVIREX, INC., WAUKESHA, WIS. WATER QUALITY CONTROL DIV.

Designing Microscreens. Here's Some Help,
W76-10033 5D

ENVIRONMENTAL HEALTH LAB., KELLY AFB, TEX.

Biodegradability and Toxicity Studies of Photographic Processing Wastes at Offutt AFB, Nebraska,
W76-10053 5C

ENVIRONMENTAL PROTECTION AGENCY, ATHENS, GA. SURVEILLANCE AND ANALYSIS DIV.

Ecosystems Analysis of the Big Cypress Swamp and Estuaties,
W76-10046 6G

ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO.

Recent Developments in the Identification of Asphalts and Other Petroleum Products,
W76-10396 5A

ENVIRONMENTAL PROTECTION AGENCY, GULF BREEZE, FLA. GULF BREEZE ENVIRONMENTAL RESEARCH LAB.

Aroclor 1016: Toxicity to and Uptake by Estuarine Animals,
W76-10340 5C

ENVIRONMENTAL PROTECTION AGENCY, NEW YORK. CARIBBEAN CONSTRUCTION GRANTS BRANCH.

Operation and Impact of NPDES in Region II, Part I,
W76-10005 5G

ENVIRONMENTAL PROTECTION AGENCY, SAN FRANCISCO, CALIF.

Water Quality Data from Truckee and Carson Rivers. Pyramid Lake and Lahontan Reservoir, A Working Paper.
W76-10054 5C

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C. OFFICE OF ENVIRONMENTAL SCIENCES.

Forest-Floor Nutrient Dynamics in Southern Appalachian Hardwood and White Pine Plantation Ecosystems,
W76-10309 5B

The Effect of Nonremoval Clear-Cutting and Pine Reforestation of the Cation Composition of a Hardwood Forest Soil,
W76-10322 4C

EWING ENGINEERING CO., MILWAUKEE, WIS.

Design Criteria for Microscreening Biological Wastewater Plant Effluents,
W76-10232 5D

EXXON CO., NEW ORLEANS, LA.

Exxon Uses Hands-On Methods to Train Drilling Personnel,
W76-10098 8G

EXXON PRODUCTION RESEARCH CO., HOUSTON, TEX.

Predicting Productive Trends Related to Wrench Faults,
W76-10100 8E

EXXON RESEARCH AND ENGINEERING CO., LINDEN, N. J.

Measurement and Characterization of Nonvolatile Hydrocarbons in Ocean Water,
W76-10394 5B

FISH AND WILDLIFE SERVICE, LACROSSE, WIS. FISH PESTICIDE RESEARCH UNIT.

A Review of the Literature on the Use of Simazine in Fisheries,
W76-10052 5C

FLORIDA ATLANTIC UNIV., BOCA RATON. DEPT. OF OCEAN ENGINEERING.

Resonances in Harbors with Variable Depths,
W76-10416 8B

FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF BIOLOGICAL SCIENCE.

Effects of Kraft Mill Effluents on Benthic Macrophyte Assemblages in a Shallow-Bay System (Apalachee Bay, North Florida, U.S.A.),
W76-10077 5C

LIBRARY U. OF F. ENVIRONMENTAL ENGR.

FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF OCEANOGRAPHY.
The Effect of urban Land Use on Nutrient and Suspended-Solids Export from North Florida Watersheds,
W76-10331 4C

FLORIDA UNIV., GAINESVILLE. COASTAL AND OCEANOGRAPHIC ENGINEERING LAB.
Modeling of Inlet-Bay Systems in Relation to Sand Trapping,
W76-10462 2L

FLORIDA UNIV., GAINESVILLE. DEPT. OF BOTANY.
Aspects of Mineral-Nutrient Cycling in a Southern Mixed-Hardwood Forest in North Central Florida,
W76-10318 5B

FLORIDA UNIV., GAINESVILLE. DEPT. OF CIVIL ENGINEERING.
Physical Modeling of Scour Initiation and Sediment Transport in Distorted Tidal Models,
W76-10423 2L

Movable-Bed Model Investigation of Taichung Harbor, Taiwan, Rep. of China,
W76-10427 2L

FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING SCIENCES.
Boron and Arsenic Studies in Florida Waters,
W76-10265 5B

Systems Models for Phosphorus Management in Florida,
W76-10277 5C

FLORIDA UNIV., GAINESVILLE. INST. OF FOOD AND AGRICULTURAL SCIENCES.
Base-Line Data on Everglades Soil-Plant Systems: Elemental Composition, Biomass, and Soil Depth,
W76-10314 5C

FMC CORP., SAN JOSE, CALIF.
Floating Structural Plastic Truss System Protects Waste Lagoon Lining,
W76-10007 5G

GAF CORP., NEW YORK. (ASSIGNEE).
Flocculation of Suspended Solids,
W76-10468 5D

GEBRUEDER BELLMER K.G. MASCHINENFABRIK, NIEFERN (WEST GERMANY). (ASSIGNEE).
Filter Press,
W76-10481 5D

GEOLOGICAL SURVEY, AUSTIN, TEX.
Digital Model for Simulated Effects of Ground-Water Pumping in the Hueco Bolson, El Paso Area, Texas, New Mexico, and Mexico,
W76-10140 4B

Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1974,
W76-10141 7C

Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1974,
W76-10144 7C

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1974,
W76-10145 7C

Hydrologic Data for Cow Bayou, Brazos River Basin, Texas, 1974,
W76-10146 7C

Hydrologic Data for North Creek Trinity River Basin, Texas, 1974,
W76-10147 7C

GEOLOGICAL SURVEY, COLUMBUS, OHIO. WATER RESOURCES DIV.
Change in Drawdown Caused by Enlarging a Well in a Dolomite Aquifer,
W76-10088 4B

GEOLOGICAL SURVEY, DENVER, COLO.
An Environmental Assessment of Impacts of Coal Development on the Water Sources of the Yampa River Basin, Colorado and Wyoming--Phase-1 Work Plan,
W76-10135 4C

Salt-Load Computations--Colorado River; Cameo, Colorado to Cisco, Utah: Part 1. Data Summary,
W76-10142 7C

Salt-Load Computations--Colorado River; Cameo, Colorado, to Cisco, Utah: Part 2. Basic Data,
W76-10143 7C

GEOLOGICAL SURVEY, DORAVILLE, GA.
The Measurement of Adenosine Triphosphate in Pure Algal Cultures and Natural Aquatic Samples,
W76-10133 5A

GEOLOGICAL SURVEY, HARRISBURG, PA.
Selected Streamflow Experience Graphs for Southwestern Pennsylvania,
W76-10132 7C

GEOLOGICAL SURVEY, LAWRENCE, KANS.
Results of Infiltration Tests Near Scott City, Western Kansas,
W76-10136 2G

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Movement of Spilled Oil in San Francisco Bay as Predicted by Estuarine Nontidal Drift,
W76-10385 5B

GEOLOGICAL SURVEY, PORTLAND, OREG.
Planning Implications of Dissolved Oxygen Depletion in the Willamette River, Oregon,
W76-10332 5G

GEOLOGICAL SURVEY, RESTON, VA.
Principles and Measuring Techniques of Turbulence Characteristics in Open-Channel Flows,
W76-10134 8B

National Water Data Storage and Retrieval System: Instructions for Preparation and Submission of Ground-Water Data,
W76-10148 10D

Hydrologic Unit Map--1974, State of Washington.
W76-10150 7C

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
Cost Functions for Additional Ground Water Development,
W76-10194 4B

GEOLOGICAL SURVEY, TACOMA, WASH.
Reconnaissance Data on Lakes in Washington--Volume 6. Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, and Whitman Counties,
W76-10138 7C

Reconnaissance Data on Lakes in Washington--Volume 7. Pend Oreille, Spokane, and Stevens Counties,
W76-10139 7C

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Effects of a Landfill on Ground-water Quality,
W76-10137 5B

GEOLOGICAL SURVEY, TUCSON, ARIZ.
Maps Showing Ground-Water Conditions in the Ranegras Plain and Butler Valley Areas, Yuma County, Arizona--1975,
W76-10149 7C

GEORGIA POWER CO., ATLANTA. ENVIRONMENTAL DIV.
Mineral Pathways in Small Appalachian Streams,
W76-10291 5B

GEORGIA UNIV., ATHENS. DEPT. OF AGRONOMY.
Significance of Biological Nitrogen Fixation and Denitrification in a Deciduous Forest Ecosystem,
W76-10320 5B

GEORGIA UNIV., ATHENS. DEPT. OF BOTANY.
Litter Production, Decomposition, and Nutrient Cycling in a Mixed Hardwood Watershed and a White Pine Watershed.
W76-10310 5B

Mineral Cycling Strategies of Two Deciduous and Two Evergreen Tree Species on a Southern Appalachian Watershed,
W76-10321 5C

Cation Flux in Hardwood and White Pine Watersheds,
W76-10329 5B

Nutrient Losses in Particulate Form as Weir Pond Sediments from Four Unit Watersheds in the Southern Appalachians,
W76-10330 5C

GEORGIA UNIV., ATHENS. DEPT. OF ZOOLOGY.
Nutrient Recycling and the Stability of Ecosystems,
W76-10267 5C

Mineral Cycling in Marine Ecosystems,
W76-10278 5C

Mobilization of Mercury from Freshwater Sediments by Humic Acid,
W76-10294 5C

GEORGIA UNIV., ATHENS. INST. OF ECOLOGY.
A Model of Mineral-Element Cycling for an Invertebrate Food Web in a Southeastern Hardwood Forest Litter Community,
W76-10272 5C

Factor Analysis: An Exploratory Technique Applied to Mineral Cycling,
W76-10274 5B

Fallout Cesium-137 and Mineral-Element Distribution in Food Chains of Granitic-Outcrop Ecosystems,
W76-10307 5B

GOTCO INTERNATIONAL, INC., HOUSTON, TEX.
How to Free a Stuck String,
W76-10110 8G

GREAT CANADIAN OIL SANDS LIMITED, TORONTO

GREAT CANADIAN OIL SANDS LIMITED, TORONTO (ONTARIO). (ASSIGNEE).
Method of Storing Sludge Recovered from the Hot Water Extraction of Bitumen from Tar Sands,
W76-10474 5D

GREELEY AND HANSEN, CHICAGO, ILL.
Computer Based Control for Wastewater Systems,
W76-10019 5D

GUELPH UNIV. (ONTARIO). DEPT. OF ZOOLOGY.
A Comparison of Growth and Abundance for Tidal Pool Fishes in California and British Columbia,
W76-10064 2L

GUJARAT UNIV., AHMEDABAD (INDIA). BOTANY DIV.
Effect of Low Moisture Level on Catalase Activity in Some Crop Plants During Juvenile Phase,
W76-10178 2I

HAMILTON COUNTY COMMUNITY DEVELOPMENT, TENN.
Virus Removal in an Activated Sludge Plant,
W76-10230 5D

HARVARD UNIVERSITY, CAMBRIDGE, MASS. DEPT. OF ENGINEERING AND APPLIED PHYSICS.
Quantitative Monitoring and Variability of Pelagic Tar in the North Atlantic,
W76-10378 5B

HAWAII UNIV., HONOLULU.
An LP-10 Model for Coordinating Multi-Group Inputs in Resource Planning,
W76-10192 6A

HAWAII UNIV., HONOLULU. DEPT. OF OCEAN ENGINEERING.
Numerical Prediction of Harbor Responses,
W76-10419 8B

Scale Effects on Physical/Mathematical Modeling,
W76-10435 8B

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
Compilation and Analysis of Water Quality Rights and Responsibilities in Hawaii,
W76-10001 5G

Numerical Analysis of One-Dimensional Water Infiltration,
W76-10262 2G

HAZEN AND SAWYER, NEW YORK.
Aquiculture - New Broom Cleans up Wastewater,
W76-10180 5G

HEINRICH KOPPERS GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, ESSEN (WEST GERMANY) (ASSIGNEE).
Process for Decontaminating Sewage Containing Cyanide,
W76-10203 5D

HENKEL AND CIE G.M.B.H., DUESSELDORF (WEST GERMANY).
Biodegradability--An Important Criterion for the Environmental Compatibility of Surfactants and Other Product Compounds,
W76-10235 5A

HEWLETT-PACKARD CO., LOVELAND, COLO.
Pollution Monitoring Doesn't Have to be Costly,
W76-10029 5A

HOUSTON RESEARCH, INC., TEX.
System for Total Direct Recycle of Secondary Municipal Wastewater, Vol I -- Design Concepts,
W76-10257 5D

HUGHES TOOL CO., HOUSTON, TEX.
How to Make Your Drill String Last Longer,
W76-10109 8G

HYDROCOMP, INC., PALO ALTO, CALIF.
The Simulation of Sediment Transport,
W76-10244 2J

HYDROCOMP INTERNATIONAL, PALO ALTO, CALIF.
Minimization of Core Required in Routing Through a Channel Newtwork,
W76-10243 2E

IDAHO UNIV., MOSCOW. COLLEGE OF FORESTRY, WILDLIFE AND RANGE SCIENCES.
A Preliminary Compartment Model of the Nitrogen Cycle in a Deciduous Forest Ecosystem,
W76-10269 5B

INDIAN AGRICULTURAL RESEARCH INST. NEW DELHI.
Moisture use Efficiency of Dryland Crops as Influenced by Fertilizer Use II. Rabi Cereals,
W76-10186 3F

Effect of Tillage on Soil Structure and Plant Growth Under Rain-Fed Conditions,
W76-10487 2G

INDIANA UNIV., INDIANAPOLIS. SCHOOL OF MEDICINE.
Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part I: Sanitary Landfill Leachate...What It Is,
W76-10013 5B

Predicting the Water Pollution Potential of Proposed Sanitary Landfills Part II: An Index of the Water Pollution Potential of Sanitary Landfills,
W76-10014 5B

INSTITUTE FOR MARINE ENVIRONMENTAL RESEARCH, PLYMOUTH (ENGLAND).
Aspects of Physiological Condition in Mytilus Edulis L., with Special Reference to the Effects of Oxygen Tension and Salinity,
W76-10070 5C

INSTITUTE OF MARINE BIOCHEMISTRY, ABERDEEN(SCOTLAND).
A Comparison of Trace-Metal and Metalloenzyme Profiles in Different Molluscs and During Development of the Oyster,
W76-10334 5C

INSTITUTE OF PUBLIC HEALTH, TOKYO (JAPAN). DEPT. OF SANITARY ENGINEERING.
Biochemical and Physical Properties of an Activated Sludge on Settling Characteristics,
W76-10037 5D

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION, PARIS (FRANCE).
Pilot Project on Marine Pollution Monitoring Under the Framework of Igoss,
W76-10373 5B

INTERNATIONAL ASSOCIATION OF SCIENTIFIC HYDROLOGY, GENTBRUGGE (BELGIUM).
International Survey on Existing Water Recharge Facilities.
W76-10085 4B

INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA (AUSTRIA). DIV. OF LIFE SCIENCES.
Use of High Level Radiation in Waste Treatment--Status and Prospects,
W76-10010 5D

INTERNATIONAL HYDROLOGICAL DECADE, OTTAWA (ONTARIO). CANADIAN NATIONAL COMMITTEE.
Canadian Participation in the International Hydrological Decade, Final Report, (Volume 2), Research Reports.
W76-10489 2A

JORDAN UNIV., AMMAN. MARINE SCIENCE PROGRAMME.
Physical Factors Controlling Abundance of Meiofauna on Tidal and Atidal Beaches,
W76-10069 5A

KANSAS WATER RESOURCES RESEARCH INST., MANHATTAN.
Swine Waste Digestion Enhancement with Nutrient Separation,
W76-10128 5D

KENTUCKY AGRICULTURAL EXPERIMENT STATION, LEXINGTON. DEPT. OF AGRONOMY.
Diffusion and Mass Flow of Nitrate-Nitrogen to Plant Roots,
W76-10182 2G

KIEL UNIV. (WEST GERMANY). INSTITUT FUER MEERESKUNDE.
Hydrocarbons in Blue Mussels from the Kiel Bight,
W76-10408 5B

KIEV RESEARCH INST. OF GENERAL COMMUNAL HYGIENE (USSR).
Standardization of the Content of Benzo(a)-Pyrene in Water Bodies, (In Russian),
W76-10351 5C

KOEHLER-DAYTON, INC., NEW BRITAIN, CONN. (ASSIGNEE).
Recirculating Sewerage System,
W76-10209 5D

KYOTO UNIV. (JAPAN). DISASTER PREVENTION RESEARCH INST.
Nonlinear Lateral Oscillation in a Harbour Model,
W76-10418 8B

LABORATOIRE CENTRAL D'HYDRAULIQUE DE FRANCE, PARIS.
LCHF Coastal Sediment Modeling Techniques,
W76-10463 2L

LAVAL UNIV., QUEBEC. DEPT. OF CIVIL ENGINEERING.
Simulation of the Salinity Distribution in the St. Lawrence Estuary by a Two-Dimensional Mathematical Model,
W76-10443 5B

LITTLE (ARTHUR D.), INC., CAMBRIDGE, MASS.
Chemical Impact of Snow Dumping Practices,
W76-10049 5C

LIBRARY U. OF L. Universal Serials

LOMA LINDA UNIV., CALIF. DEPT. OF BIOLOGY.
Effect of Temperature and Temperature Adaptation on Calcification Rate in the Hermatypic Coral Pocillopora Damicornis,
W76-10059 5C

LONDON UNIV. (ENGLAND). DEPT. OF ZOOLOGY AND COMPARATIVE PHYSIOLOGY.
On the Relationship Between Oxygen Consumption and Feeding Level in Decapods,
W76-10072 5C

LOUIS RECORDS AND ASSOCIATES INC., LAFAYETTE, LA.
Run Drill Pipe Slower and Reduce Formation Damage,
W76-10097 8G

LOUISIANA STATE UNIV., BATON ROUGE.
Fresh Water Can be Stored in Saline Aquifers,
W76-10107 4B

MANSFIELD STATE COLLEGE, PA. DEPT. OF BIOLOGY.
Influence of Nutrient Availability on Ecosystem Structure,
W76-10324 5C

MARIST COLLEGE, MARIST COLL., POUGHKEEPSIE, N. Y. ENVIRONMENTAL SCIENCE PROGRAM
Distribution of Selected Metals in Tissue Samples of Carp, Cyprinus Carpio,
W76-10082 5C

MARITIME ADMINISTRATION, WASHINGTON, D. C.
Maritime Consideration of Oil Transportation,
W76-10375 5G

Maritime Considerations,
W76-10377 5G

MARITIME SAFETY AGENCY, TOKYO (JAPAN). OCEANOGRAPHIC DIV.
Survey Analyses for Petroleum Derived Hydrocarbons in the Ocean,
W76-10374 5B

MARYLAND UNIV., COLLEGE PARK. DEPT. OF MICROBIOLOGY.
Petroleum Hydrocarbons: Degradation and Growth Potential for Atlantic Ocean Sediment Bacteria,
W76-10068 5C

Deep-Sea Bacteria: Growth and Utilization of Hydrocarbons at Ambient and in Situ Pressure,
W76-10349 5B

Microbial Petroleum Degradation: Use of Mixed Hydrocarbon Substrates,
W76-10350 5B

MARYLAND UNIV., COLLEGE PARK. DEPT. OF ZOOLOGY.
Competition and the Relative Abundances of Two Cladocerans,
W76-10125 2I

MASSACHUSETTS INST. OF TECHNOLOGY, CAMBRIDGE. DEPT. OF CHEMICAL ENGINEERING.
Sampling Errors in the Quantification of Petroleum in Boston Harbor Water,
W76-10387 5A

MASSACHUSETTS UNIV., AMHERST. DEPT. OF CIVIL ENGINEERING.
Design A River Basin Sampling System,
W76-10131 5A

MASSACHUSETTS UNIV., AMHERST. DEPT. OF ZOOLOGY.
Seasonal and Annual Variations in the Quantities of Nitrogen, Potassium, Phosphorus, Magnesium, Calcium, and Manganese Reaching the Forest Floor as Mast in Pennsylvania and Vermont Forests,
W76-10306 5B

MASSACHUSETTS UNIV., AMHERST. WATER RESOURCES RESEARCH CENTER.
Evaluation and Adaptation of Selected Computer Programs to Water Resource Problems in Massachusetts,
W76-10129 7C

Strengthening Lake-Shoreland Management in Massachusetts,
W76-10264 6E

MCMASTER UNIVERSITY, HAMILTON (ONTARIO). DEPT. OF CHEMICAL ENGINEERING.
Assessment of Polyelectrolytes for Phosphorus Removal,
W76-10492 5D

METCALF AND EDDY, INC., BOSTON, MASS.
Nitrogen Removal Depends on Form Nutrient Takes,
W76-10174 5D

MIAMI UNIV., FLA. DEPT. OF ANESTHESIOLOGY.
Effects of Hyperbaric Pressure on Oxygen Concentration in the Swim Bladder of Poecilia Latipinna,
W76-10066 5C

MICHIGAN UNIV., ANN ARBOR. SCHOOL OF NATURAL RESOURCES.
Effects of Clear-Cutting on Nutrient Losses in Aspen Forests on Three Soil Types in Michigan,
W76-10315 4C

MINNESOTA MINING AND MFG. CO., ST. PAUL. (ASSIGNEE).
Coalescing Unit for Gravity Separator,
W76-10484 5G

MINNESOTA UNIV., ST. PAUL. DEPT. OF ENTOMOLOGY, FISHERIES AND WILDLIFE.
Acute Toxicity of Sodium Chloride, Pentachlorophenol, Guthion(R), and Hexavalent Chromium to Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus),
W76-10335 5C

Fathead Minnows (Pimephales Promelas) and Goldfish (Carassius Auratus) as Standard Fish in Bioassays and Their Reaction to Potential Reference Toxicants,
W76-10336 5A

MITSUBISHI GAS CHEMICAL CO., LTD., TOKYO (JAPAN). (ASSIGNEE).
Method for Treating Fouled Water,
W76-10467 5D

MONTANA STATE UNIV., BOZEMAN. DEPT. OF BOTANY AND MICROBIOLOGY.
Microbiology and Chemistry Studies of Water Quality Factors in a Watershed Used for Municipal Supply and Waste Disposal,
W76-10263 5B

MOODY AND ASSOCIATES, INC., COLUMBUS, OHIO.
Well Field Maintenance Avoids Crises,
W76-10103 8G

MUNICIPAL ENVIRONMENTAL RESEARCH LAB., CINCINNATI, OHIO.
Models for Evaluation of Hazardous Wastes,
W76-10190 5B

Improving the Fuel Value of Sewage Sludge,
W76-10234 5E

Analyzing for Asbestos in Drinking Water,
W76-10240 5A

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, LANGLEY STATION, VA. LANGELY RESEARCH CENTER.
Analytical Notes--Electrochemical Method for Early Detection and Monitoring of Coliforms,
W76-10237 5A

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, LANGLEY STATION, VA. LANGLEY RESEARCH CENTER.
A Simulation of Water Pollution Model Parameter Estimation,
W76-10021 5B

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WALLOPS ISLAND, VA. WALLOPS STATION.
Mapping and Identification of Oil on Water by the Use of an Airborne Laser System,
W76-10384 5B

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.
An Instrument with Internal Calibration for Monitoring Chlorine Residuals in Natural Waters,
W76-10028 5A

Pollutant Analysis Cost Survey,
W76-10259 5A

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C., INST. FOR MATERIALS RESEARCH.
Determination of Aromatic Hydrocarbons in Sea Water using an Electrolytic Stripping Cell,
W76-10390 5A

NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INST., NAGPUR (INDIA).
Techniques for Power Measurement for Surface Aerator,
W76-10251 5D

NATIONAL ENVIRONMENTAL RESEARCH CENTER, COLLEGE, ALASKA. ARCTIC ENVIRONMENTAL RESEARCH LAB.
Effects of Large Scale Forest Fires on Water Quality in Interior Alaska,
W76-10045 5C

NATIONAL FERTILIZER DEVELOPMENT CENTER, MUSCLE SHOALS, ALA.
Yield-Nutrient Absorption Relationships as Affected by Environmental Growth Factors,
W76-10184 2I

NATIONAL INST. OF OCEANOGRAPHY, PANJIM (INDIA).
Oil Pollution Along the Indian Coastline,
W76-10386 5B

NATIONAL MARINE FISHERIES SERVICE, AUKE BAY, ALASKA. AUKE BAY FISHERIES LAB.
Sampling Marine Organisms and Sediments for High Precision Gas Chromatographic Analysis of Aromatic Hydrocarbons,
W76-10401 5A

NATIONAL MARINE FISHERIES SERVICE, BEAUFORT, N. C. ATLANTIC ESTUARINE FISHERIES CENTER.
Influence of Temperature and Salinity on Routine Metabolic Rate and Growth of Young Atlantic Menhaden,
W76-10063 5C

NATIONAL MARINE FISHERIES SERVICE, NARRAGANSETT, R. I. NARRAGANSETT LAB.
Distribution of Tar Balls and Neuston Sampling in the Gulf Stream System,
W76-10410 5B

NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WASH. NORTHWEST FISHERIES CENTER.
Methods for Establishing Levels of Petroleum Contamination in Organisms and Sediment as Related to Marine Pollution Monitoring,
W76-10403 5B

Analytical Techniques for Isolating and Quantifying Petroleum Paraffin Hydrocarbons in Marine Organisms,
W76-10406 5A

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ROCKVILLE, MD.
United Nations Environment Program Earthwatch and Marine Pollution,
W76-10371 5B

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SILVER SPRING, MD. ENVIRONMENTAL DATA SERVICE.
Marine Pollution Data Archiving and Exchange,
W76-10376 5A

NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION, ROCKVILLE, MD.
Marine Pollution Monitoring (Petroleum). Proceedings of a Symposium and Workshop,
W76-10370 5B

NATIONAL SWEDISH FOOD ADMINISTRATION, STOCKHOLM. FOOD LAB.
Changes in the Levels of Environmental Pollutants (HG, DDT, Dieldrin, PCB) in Some Swedish Foods,
W76-10368 5C

NATIONAL WATER WELL ASSOCIATION, WORTHINGTON, OHIO.
Guardians of Ground Water Quality,
W76-10096 5G

NATURAL ENVIRONMENT RESEARCH COUNCIL, ANGELSEY (WALES). UNIT OF MARINE INVERTEBRATE BIOLOGY; AND UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.
Tidally-Produced Internal Bands on the Shell of Elminius Modestus,
W76-10065 5A

NATURAL ENVIRONMENT RESEARCH COUNCIL, ANGLESEY (WALES). UNIT OF MARINE INVERTEBRATE BIOLOGY; AND UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.
Zinc Phosphate Granules in Tissue Surrounding the Midgut of the Barnacle Balanus Balanoides,
W76-10057 5C

NAUCHNO-ISSLEDOVATELSKII INSTITUT OVOSHCHNOGO KHOZYAISTVA, MOSCOW (USSR).
Change of Water Regime and Content of Mobile Forms of N, K, Mn and Fe in Meadow-Peat Soil of the Ramensk Floodplain of the Moscow River in Connection with Agricultural Use, (In Russian),
W76-10477 2G

NAVAL ENVIRONMENTAL PREDICTION RESEARCH FACILITY, MONTEREY, CALIF.
Multilayer Hydrodynamical-Numerical Models,
W76-10429 2L

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
Antifouling Coatings and their Influence on the Marine Environment,
W76-10365 5G

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF. DEPT. OF OCEANOGRAPHY.
Comparison of Hydraulic and Numerical Tidal Models,
W76-10446 2L

NAVAL RESEARCH LAB., WASHINGTON, D.C.
A Reliable Algal Assay Procedure Based on pH Measurements,
W76-10360 5A

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, ANNAPOLIS, MD.
The Fouling Community as a Field Monitoring Technique,
W76-10354 5C

Biological Consideration of a Bioassay System,
W76-10359 5C

Chemical Problems Encountered in Toxicity Studies,
W76-10364 5B

NAVAL UNDERSEA CENTER, KAILUA, HAWAII. HAWAII LAB.
The Need for More Intercomparable Field Data and Widely Applicable Short-Term Survey,
W76-10358 5G

NAVAL UNDERSEA CENTER, SAN DIEGO, CALIF.
Proceedings of the Conference on Marine Biology in Environmental Protection Held at San Clemente Island, California on 13-15 November, 1973.
W76-10353 5C

Byssal Thread Production as a Toxicity Test,
W76-10362 5A

Comparison of Toxicity Tests,
W76-10367 5C

NEDERLANDS INSTITUUT VOOR ONDERZOEK DER ZEE, TEXEL.
Influence of Temperature on Behaviour, Energy Metabolism and Growth of Macoma Balthica (L.),
W76-10080 5C

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF BOTANY.
Photosynthetic Studies of Chondrus Crispus,
W76-10060 5C

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF BIOLOGY.
Anomalous Diurnal Patterns of Stem Xylem Water Potentials in Larrea Tridentata,
W76-10172 2I

NEW MEXICO UNIV., ALBUQUERQUE. DEPT. OF BIOLOGY.
Leaching of Nutrients from Leaves of Selected Tree Species in New Hampshire,
W76-10312 5B

Nutrient Budgets for Undisturbed Ecosystems Along an Elevational Gradient in New Mexico,
W76-10325 5C

NEW ORLEANS UNIV., LA. DEPT. OF BIOLOGICAL SCIENCES.
Application of a Computer-Based Chromatograph for Automated Water Pollution Analyses,
W76-10038 5A

NEW YORK STATE COLL. OF AGRICULTURE AND LIFE SCIENCES, ITHACA. DEPT. OF AGRICULTURAL ECONOMICS.
Basin Governance,
W76-10130 6E

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY.
Computer-Aided Analysis of Environmental Data, Part I: Linear Regression, Precision and Accuracy,
W76-10022 5A

NL INDUSTRIES, INC., NEW YORK. (ASSIGNEE).
Pollution-Free Well Cuttings Disposal Apparatus,
W76-10464 5G

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF SOIL SCIENCE.
Puddling Tropical Rice Soils: 2. Effects of Water Losses,
W76-10118 3F

NORTHEAST LOUISIANA UNIV., MONROE. DEPT. OF BIOLOGY.
The Influence of Hardness Components (CA2+ and MG2+) in Water on the Uptake and Concentration of Cadmium in a Simulated Freshwater Ecosystem,
W76-10346 5C

OAK RIDGE NATIONAL LAB., TENN.
A Specific-Activity and Concentration Model Applied to Cesium Movement in an Oligotrophic Lake,
W76-10275 5C

The Identification of Phthalic Acid Esters in the Tissues of Cyprinodont Fish and Their Activity as Heartrate Depressors,
W76-10344 5A

OAK RIDGE NATIONAL LAB., TENN. ENVIRONMENTAL SCIENCES DIV.
A Theoretical Basis for Ecosystem Analysis with Particular Reference to Element Cycling,
W76-10268 5C

Radiocesium Cycling in Vegetation and Soil,
W76-10296 5B

Cerium and Cobalt Movement with Litter Leachate in a Forest Soil,
W76-10311 5B

Effects of Tree Species, Temperature, and Soil on Transfer of Manganese-54 from Litter to Roots in a Microcosm,
W76-10317 5C

FFICE OF THE CHIEF OF ENGINEERS RMY). WASHINGTON, D.C.
Finite Element Model for Backwater Computation,
W76-10452 8B

HIO DEPT. OF NATURAL RESOURCES, OLUMBUS. REGIONAL GEOLOGY SECTION.
Hydrogeologic and Other Considerations Related to the Selection of Sanitary-Landfill Sites in Ohio,
W76-10084 5D

HIO STATE UNIV., COLUMBUS. DEPT. OF IVIL ENGINEERING.
Coal Gasification in Southeastern Ohio: Water Supply and Demand,
W76-10002 3E

KLAHOMA STATE UNIV., STILLWATER.
Application of Activated Sludge Design and Operation,
W76-10221 5D

KLAHOMA STATE UNIV., STILLWATER. CHOOL OF CIVIL ENGINEERING.
Biological Treatment of Waste with High Ash Content Using a Hydrolytically Assisted Extended Aeration Process,
W76-10231 5D

NTARIO MINISTRY OF THE ENVIRONMENT TORONTO).
Pollution Effects on Surface Waters and Ground Waters, (Literature Review),
W76-10104 5C

NTARIO MINISTRY OF THE NVIRONMENT, TORONTO. WASTEWATER REATMENT SECTION.
General Considerations in Wastewater Disinfection,
W76-10220 5D

REGON STATE UNIV., CORVALLIS. DEPT. F CIVIL ENGINEERING.
Verification Studies of the Biofilm Model for Bacterial Substrate Utilization,
W76-10247 5D

REGON STATE UNIV., CORVALLIS. ANGELAND RESOURCES PROGRAM.
Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah,
W76-10171 5G

EABODY WELLES INC., ROSCOE, ILL. ESEARCH AND DEVELOPMENT DIV.
Important Considerations in Designing Activated Sludge Processes,
W76-10227 5D

ENNSYLVANIA STATE UNIV., UNIVERSITY ARK. DEPT. OF BIOLOGY.
Differences in Low PH Tolerance Among Strains of Brook Trout (Salvelinus Fontinalis),
W76-10074 5C

ENNSYLVANIA STATE UNIV., UNIVERSITY ARK. SCHOOL OF FOREST RESOURCES.
Reclamation of A Burned Anthracite Refuse Bank with Municipal Sludge,
W76-10249 5E

PHILLIPS PETROLEUM CO., BARTLESVILLE, OKLA.
Effect of Wastewater Composition and Cell Residence Time on Phosphorus Removal in Activated Sludge,
W76-10239 5D

PLUMMER AND MCDANNALD CO., GALENA, OHIO.
Corrosion,
W76-10095 8G

POLLUTECH POLLUTION ADVISORY SERVICES LTD., OAKVILLE, (ONTARIO).
Effluent Polishing by Filtration Through Activated Alumina, Volume I.
W76-10491 5D

PUERTO RICO NUCLEAR CENTER, MAYAGUEZ.
Organically Complexed Copper, Zinc, and Chelating Agents in Rivers of Western Puerto Rico,
W76-10292 5B

PUERTO RICO UNIV., RIO PIEDRAS. DEPT. OF BIOLOGY.
A Computer Simulation of Competition Among Five Sympatric Congeneric Species of Xanthid Crabs,
W76-10124 2L

QUEEN'S UNIV., KINGSTON, ONTARIO. DEPT. OF CIVIL ENGINEERING.
Time Growth of Tidal Dunes in a Physical Model,
W76-10424 2L

Coastal Mobile Bed Model - Does it Work,
W76-10428 2L

REED TOOL CO., HOUSTON, TEX.
How to Get the Most from Mud Pump Parts,
W76-10112 8G

RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Computer-Aided Analysis of Environmental Data, Part II: Biochemical Oxygen Demand Model,
W76-10023 5A

Computer-Aided Modelling of Stream Purification Capacity, Part I: Nonlinear DO Model,
W76-10024 5B

Computer-Aided Modelling of Stream Purification Capacity, Part II: Multiple Linear Correlation Method,
W76-10025 5B

RESOURCE ANALYSIS, INC., CAMBRIDGE, MASS.
FLOW2D: A Two-Dimensional Flow Model for Flood Plains and Estuaries,
W76-10454 2L

RHODE ISLAND UNIV., KINGSTON, DEPT. OF CHEMISTRY.
Sampling of Oil Spills and Fingerprinting by Infrared Spectroscopy,
W76-10383 5B

RHODE ISLAND UNIV., KINGSTON. DEPT. OF OCEAN ENGINEERING.
Finite Difference Approximation to the Convective Transport Equation,
W76-10441 5B

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Nitrogen Regeneration by the Ctenophore Mnemiopsis Leidyi,
W76-10284 5C

The Role of Benthic Communities in the Nitrogen and Phosphorus Cycles of an Estuary,
W76-10285 5C

RIJSINSTITUUT VOOR VISSERIJONDERZOEK, YMUIDEN (NETHERLANDS).
Autumn Migration and Vertical Distribution of the Brown Shrimp Crangon Crangon L. in Relation to Environmental Conditions,
W76-10073 5C

ROBERT S. KERR ENVIRONMENTAL RESEARCH LAB., ADA, OKLA.
Ground-Water Pollution Problems in the Northwestern United States,
W76-10083 5B

ROBERTSHAW CONTROLS CO., RICHMOND (AUSTRALIA). (ASSIGNEE).
Continuous Respirometer Apparatus for Monitoring Sewage Oxygen Content.
W76-10201 5A

ROCHESTER UNIV., N. Y. DEPT. OF BIOLOGY.
Population Characteristics of a Species Ensemble of Waterboatmen (Corixidae),
W76-10123 2H

ROSTOV-ON-DON STATE UNIV. (USSR).
Seasonal Dynamics of Suspended Matter in the Azov Sea, (In Russian),
W76-10126 2J

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J. COLL. OF ENGINEERING.
Treatment of Synthetic Urinous Wastewater Using Combined Reverse Osmosis, Immobilized Urease, and Ion Exchange Systems,
W76-10254 5D

RUTGERS-THE STATE UNIV., NEW BRUNSWICK, N. J. DEPT. OF ZOOLOGY.
Tube-Worm-Sediment Relationships in Populations of Pectinaria Gouldii (Polychaeta: Pectinariidae) from Barnegat Bay, New Jersey,
W76-10061 2L

SAGAMI CHEMICAL RESEARCH CENTER, TOKYO (JAPAN). (ASSIGNEE).
Thiuram Polysulfide Heavy Metal Remover,
W76-10466 5D

SAN DIEGO STATE UNIV., CALIF.
The Systems Concept and Pollution Control,
W76-10357 5G

The Activities of Enzymes as Pollution Indicators,
W76-10363 5A

SAN DIEGO STATE UNIV., CALIF. DEPT. OF BOTANY.
Irradiance Reduction: Effects on Standing Crops of the Eelgrass, Zostera Marina in a Coastal Lagoon,
W76-10067 5C

SAVANNAH RIVER ECOLOGY LAB., AIKEN, S.C.
Mineral Cycling in Southeastern Ecosystems.
W76-10266 5C

Frequency Distributions of Radiocesium Concentrations in Soil and Biota,
W76-10273 5B

SAVANNAH RIVER ECOLOGY LAB., AIKEN, S.C.

Radiocesium Levels in Vegetation Colonizing a Contaminated Flood Plain,
W76-10298 5C

Seasonal Variation in Radiocesium Concentrations in Three Tree Species,
W76-10299 5C

Distribution of Radiocesium in Vegetation Along a Contaminated Stream,
W76-10300 5B

Effects of Age, Sex, and Pelage Phenotype on the Elemental Composition of the Old-Field Mouse,
W76-10301 5A

Prediction of Elemental Content in the Old-Field Mouse,
W76-10302 5A

Chemical Composition of White-Tailed Deer: Whole-Body Concentrations of Macro- and Micronutrients,
W76-10303 5C

Radiocesium Concentrations in Whole-Body Homogenates and Several Body Compartments of Naturally Contaminated White-Tailed Deer,
W76-10304 5C

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.

Analytical Model of Duct-Flow Fluidization,
W76-10450 8B

Wave Induced Loads on Multi-Element Structures,
W76-10458 8B

SEPTIC TANK SYSTEMS, BERKELEY, CALIF.

Beneficial Effects of Baking Soda Added to Septic Tanks,
W76-10012 5D

SHELL DEVELOPMENT CO., HOUSTON, TEX.

Heavy Collars Aid Hole Control,
W76-10102 8G

SHELL OIL CO., NEW ORLEANS, LA.

Tubing-Casing Reclamation Saved Shell Over $3 Million,
W76-10101 8G

SHERBROOKE UNIV. (QUEBEC). DEPT. OF CIVIL ENGINEERING.

Design of a Stormwater Sewer by Nonlinear Programming--1,
W76-10034 5D

SIENA UNIV. (ITALY). INST. OF COMPARATIVE ANATOMY.

Bodily Distribution, Accumulation and Excretion of Mercury in a Fresh-Water Mussel,
W76-10081 5C

SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.

Effects of Environmental Levels of Mercury and Cadmium on Rates of Metal Uptake and Growth Physiology of Selected Genera of Marine Phytoplankton,
W76-10280 5C

The Role of Spartina Alterniflora in the Flow of Lead, Cadmium, and Copper Through the Salt-Marsh Ecosystem,
W76-10281 5C

Heavy-Metal Concentrations in Selected Georgia Estuarine Organisms with Comparative Food-Habit Data,
W76-10282 5C

Concentrations of Total Mercury and Methyl Mercury in Fish and Other Coastal Organisms: Implications to Mercury Cycling,
W76-10283 5B

River Input of Inorganic Phosphorus and Nitrogen to the Southeastern Salt-Marsh Estuarine Environment,
W76-10286 5C

SMITHSONIAN INSTITUTION, ROCKVILLE, MD. RADIATION BIOLOGY LAB.

Phosphorus Cycling in a Maryland Deciduous Forest Subjected to Various Levels of Mineral-Nutrient Loading,
W76-10313 5B

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF BIOLOGY.

The Santee Swamp as a Nutrient Sink,
W76-10288 5C

SOUTH CAROLINA UNIV., COLUMBIA. ELECTRON MICROSCOPE LAB.

Effects of Calcium, Strontium, and Magnesium on the Coccolithophorid Cricosphaera (Hymenomonas) Carterae. I. Calcification,
W76-10078 5C

SOUTHEASTERN FOREST EXPERIMENT STATION, RESEARCH TRIANGLE PARK, N.C. FORESTRY SCIENCES LAB.

Some Effects of Fertilization on Mineral Cycling in Loblolly Pine,
W76-10323 5C

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT, EL SEGUNDO.

Disease Responses in Southern California Coastal Fishes,
W76-10366 5C

SOUTHERN ILLINOIS UNIV., CARBONDALE, DEPT. OF FORESTRY.

The Quantity and Distribution of Four Nutrient Elements in High-Elevation Forest Ecosystems, Balsam Mountains, North Carolina,
W76-10319 5B

SOUTHERN WATER AUTHORITY, EAST SUSSEX, (ENGLAND). EAST SUSSEX WATER AND DRAINAGE DIV.

Small Sewage Works that Function Satisfactorily,
W76-10228 5D

STANFORD UNIV., PACIFIC GROVE, CALIF. HOPKINS MARINE STATION.

An Analysis of the Dynamics of DDT and Its Derivatives, DDD and DDE, in Marine Sediments
W76-10050 5C

STATE OCEANOGRAPHIC INST., MOSCOW (USSR).

Scientific Problems of the Systems for Global Monitoring and Investigation of Oil Pollution in the World Ocean,
W76-10372 5B

STAZIONE SPERIMENTALE OLI E DEI GRASSI, MILANO (ITALY).

Anionic and Non-Ionic Surfactant Biodegradation in a Purifying Plant using Activating Muds (Biodegradazione de Tensioattivi Anionici e Non-Ionici in un Impianto di Trattamento a Fanghi Attivati),
W76-10238 5A

STERLING DRUG INC., NEW YORK. (ASSIGNEE).

Treatment and Disposal of Sewage Sludge,
W76-10204 5D

STILSON (ALDEN E.) AND ASSOCIATES, COLUMBUS, OHIO.

Softening and Coagulation Sludge-Disposal for a Surface Water Supply,
W76-10252 5F

STUTTGART UNIV. (WEST GERMANY). INSTITUT FUER SIEDLUNGSWASSERBAU UND WASSERGUETEWIRTSCHAFT.

The Effect of Various Designs of Rain Catching Basins on the Pollution of the Receiving Water and the Economy of the Sewer System (Die Auswirkung Der Verschiedenen Bauarten Von Regenuberlaufbecken Auf Die Schmutzbelastung Des Vorfluters Und Die Wirtschaftlichkeit Des Kanalnetzes),
W76-10198 5D

SWAMI SHRADHA NAND COLL., ALIPUR (INDIA).

Seed Germination and Early Seedling Growth of Wheat (Triticum Aestivum Linn.) CV. 1553 Under the Influence of Salinity and Plant-Growth Hormones,
W76-10169 3C

SWECO, INC., LOS ANGELES, CALIF. (ASSIGNEE).

Method and Apparatus for the Activated Sludge Treatment of Wastewater,
W76-10208 5D

SWEDISH WATER AND AIR POLLUTION RESEARCH LAB., STUDSVIK (SWEDEN). BALTIC LAB.

Effects of Oils on Baltic Littoral Community, as Studied in an Outdoor Model Test System,
W76-10411 5C

SWIFT AND CO., CHICAGO, ILL. (ASSIGNEE).

Apparatus and Method for Removing Pollutants from Wastewater,
W76-10200 5D

TAYLOR (JOHN) AND SONS, LONDON (ENGLAND).

Disposal of Sewage from Coastal Towns: The Case for Sea Outfalls,
W76-10224 5E

TECHNICAL UNIV., OF DENMARK, LYNGBY. INSTITUTTET FOR KEMUNDUSTRI.

A Review on Decision Models in Economics of Regional Water Quality Management,
W76-10195 5G

TECHNICAL UNIV., OF DENMARK, LYNGBY. LAB., OF APPLIED MATHEMATICAL PHYSICS.

Computations of Harbor Oscillations by Ray Methods,
W76-10421 8B

TECHNISCHE HOGESCHOOL, DELFT(NETHERLANDS). DEPT. OF CIVIL ENGINEERING.

Modeling of Turbulence in the Surf Zone,
W76-10432 2L

TEHRAN UNIV. (IRAN).

Wave Response of Offshore Bottomless Harbors,
W76-10417 8B

TEL-AVIV UNIV., (ISRAEL). DEPT. OF ZOOLOGY.
Some Aspects of Recolonization of Coral Rocks in Eilat (Gulf of Aqaba) by Fish Populations After Poisoning,
W76-10058 5C

TENNESSEE VALLEY AUTHORITY, NORRIS. DIV. OF FORESTRY, FISHERIES, AND WILDLIFE DEVELOPMENT.
Accumulation and Mobility of Cesium in Roots of Tulip Poplar Seedlings,
W76-10297 5B

TETRA TECH, INC., PASADENA, CALIF.
Tests on the Equilibrium Probiles of Model Beaches and the Effects of Grain Shape and Size Distribution,
W76-10422 2L

TEXACO INC., NEW YORK. (ASSIGNEE).
Method for Controlling Scale,
W76-10469 5G

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF BIOLOGY.
Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile and Larval Stages of the Shrimp Palaemonetes Pugio,
W76-10075 5C

TEXAS A AND M UNIV. COLLEGE STATION, DEPT. OF OCEANOGRAPHY.
Use of Low Molecular-Weight-Hydrocarbon Concentrations as Indicators of Marine Pollution,
W76-10400 5B

Pelagic Tar in the Gulf of Mexico and Caribbean Sea,
W76-10409 5B

TEXAS AGRICULTURAL EXPERIMENT STATION, COLLEGE STATION. DEPT. OF SOIL AND CROP SCIENCES.
Solution Phosphorus Concentration and Growth of Rice (Oryza Sativa L.) in Flooded Soils,
W76-10122 3F

TEXAS UNIV. AT AUSTIN. DEPT. OF ELECTRICAL ENGINEERING.
Large-Scale Estuarine Water Quality Matrix Model.
W76-10191 5B

TEXAS UNIV. AT AUSTIN. DEPT. OF ZOOLOGY.
Ultrastructural Changes in the Hepatocytes of Green Sunfish, Lepomis Cyanellus Rafinesque, Exposed to Solutions of Sodium Arsenate,
W76-10062 5C

THAMES WATER AUTHORITY, LONDON (ENGLAND) METROPOLITAN PUBLIC HEALTH DIV.
A Method for Assessing Friction Losses for a Non-Newtonian Fluid, Such as Sewage Sludge, under Laminar Flow Conditions,
W76-10009 5B

TOKYO UNIV. (JAPAN).
Water Wells as Possible Indicators of Tectonic Strain,
W76-10105 8G

TRONDHEIM UNIV. (NORWAY). VASSDRAGS-OG HAVNELABORATORIET.
Comparison Between Physical and Mathematical Modelling of a Tidal Fjord System in Northern Norway,
W76-10445 2L

Modelling of Suspension Currents,
W76-10449 5B

UNIVERSAL OIL PRODUCTS COMPANY, DES PLAINES, ILL. (ASSIGNEE).
Composite Semipermeable Membranes Made from Polyethylenimine,
W76-10485 3A

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. ALLAN HANCOCK FOUNDATION.
Field Sampling Methods and Techniques for Marine Organisms and Sediments,
W76-10402 5A

UPPSALA UNIV., (SWEDEN). INST. OF ZOOLOGY.
Pikes (Esox Lucius L.) Shown to be Affected by Low pH Values During First Weeks After Hatching,
W76-10343 5C

UPPSALA UNIV. (SWEDEN). INST. OF ZOOPHYSIOLOGY.
Some Effects of Acidified Water on the Early Development of Roach (Rutilus Rutilus L.) and Perch (Perca Fluviatilis L.),
W76-10076 5C

URBAN WILDLIFE RESEARCH CENTER, INC., ELLICOTT CITY, MD.
Highway-Wildlife Relationships Volume 1. A State-of-the-Art Report,
W76-10003 4C

Highway-Wildlife Relationships Volume 2. An Annotated Bibliography,
W76-10004 4C

UTAH UNIV., SALT LAKE CITY. DEPT. OF BIOLOGY.
Acute Cadmium Toxicity Studies Upon Nine Species of Aquatic Insects,
W76-10342 5C

Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects,
W76-10345 5C

VIRGINIA COMMONWEALTH UNIV., RICHMOND. DEPT. OF BIOLOGY.
Uptake and Elimination of Radiotungsten in Black Bullheads,
W76-10293 5C

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
Distribution of Copper and Zinc in Oysters and Sediments from Three Coastal-Plain Estuaries,
W76-10279 5C

VIRGINIA INST. OF MARINE SCIENCES, GLOUCESTER POINT. DIV. OF ENVIRONMENTAL SCIENCE AND ENGINEERING.
Effect of an Oil Spill on Benthic Animals in the Lower York River, Virginia,
W76-10412 5C

VIRGINIA INST. OF MARINE SCIENCES, GLOUCESTER POINT. ENVIRONMENTAL CHEMISTRY SECTION.
Identification of Hydrocarbons in an Extract from Estuarine Water Accomodated No. 2 Fuel Oil,
W76-10397 5A

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF AGRONOMY.
Phosphorus Distribution from Septic Tank Effluent in Coastal Plain Soils,
W76-10015 5B

VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ENVIRONMENTAL SCIENCES.
Urban Service Pricing and Land Use: Some Preliminary Results,
W76-10193 6C

WAKE FOREST UNIV., WINSTON-SALEM, N. C.
Nitrogen Fixation by Lichens of the Northern Piedmont,
W76-10327 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF MECHANICAL ENGINEERING.
Analysis of Floating Breakwater Performance,
W76-10460 8B

WATER POLLUTION CONTROL CORP., MILWAUKEE, WIS.
Diffused Air in Deep Tank Aeration,
W76-10226 5D

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
Assessment of the Maximum Concentration of Heavy Metals in Crude Sewage Which Will Not Inhibit the Anaerobic Digestion of Sludge,
W76-10040 5D

WATER QUALITY RESEARCH COUNCIL, LOMBARD, ILL.
Water, Its Effects on Life Quality.
W76-10087 5F

WESTERN CAROLINA UNIV., CULLOWHEE, N.C. DEPT. OF BIOLOGY.
A Model of Water Content and Evaporation for Hardwood Leaf Litter,
W76-10270 2D

WESTINGHOUSE ELECTRIC CORP., MELBOURNE (AUSTRALIA).
Waste Water Treatment.
W76-10202 5D

WESTON (ROY F.), INC., WEST CHESTER, PA.
The Fate of Pollutants in Subsurface Environments,
W76-10253 5B

WISCONSIN UNIV., MADISON. DEPT. OF ENTOMOLOGY.
Incorporation of 203HG into Methylmercury in Fish Liver: Studies in Biochemical Mechanisms in Vitro,
W76-10347 5C

WISCONSIN UNIV., MADISON. LAB. OF LIMNOLOGY.
Low Thermal Responsiveness in the Bluegill, Lepomis Macrochirus,
W76-10369 5C

WISCONSIN UNIV., MILWAUKEE. DEPT. OF BOTANY,
The Role of Emergent Macrophytes in Mineral Cycling in a Freshwater Marsh,
W76-10289 5C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Analyses of Hydrocarbons in Marine Organisms: Results of Idoe Intercalibration Exercises,
W76-10398 5A

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS. DEPT. OF CHEMISTRY.
Idoe-5 Intercalibration Sample: Results of Analysis After Sixteen Months Storage, W76-10399 5A

LIBRARY U. OF I. URBANA-CHAMPAIGN

ACCESSION NUMBER INDEX

W76-10001 5G
W76-10002 3E
W76-10003 4C
W76-10004 4C
W76-10005 5G
W76-10006 5A
W76-10007 5G
W76-10008 5D
W76-10009 5B
W76-10010 5D
W76-10011 5D
W76-10012 5D
W76-10013 5B
W76-10014 5B
W76-10015 5B
W76-10016 5B
W76-10017 5A
W76-10018 5D
W76-10019 5D
W76-10020 5G
W76-10021 5B
W76-10022 5A
W76-10023 5A
W76-10024 5B
W76-10025 5B
W76-10026 5D
W76-10027 5A
W76-10028 5A
W76-10029 5A
W76-10030 5A
W76-10031 5B
W76-10032 5D
W76-10033 5D
W76-10034 5D
W76-10035 5D
W76-10036 5D
W76-10037 5D
W76-10038 5A
W76-10039 5B
W76-10040 5D
W76-10041 5C
W76-10042 5C
W76-10043 5C
W76-10044 5C
W76-10045 5C
W76-10046 6G
W76-10047 5A
W76-10048 5A
W76-10049 5C
W76-10050 5C
W76-10051 5C
W76-10052 5C
W76-10053 5C
W76-10054 5C
W76-10055 5C
W76-10056 5C
W76-10057 5C
W76-10058 5C
W76-10059 5C
W76-10060 5C
W76-10061 2L
W76-10062 5C
W76-10063 5C
W76-10064 2L
W76-10065 5A
W76-10066 5C
W76-10067 5C
W76-10068 5C
W76-10069 5A
W76-10070 5C
W76-10071 5C
W76-10072 5C
W76-10073 5C
W76-10074 5C
W76-10075 5C
W76-10076 5C
W76-10077 5C
W76-10078 5C
W76-10079 5C
W76-10080 5C
W76-10081 5C
W76-10082 5C
W76-10083 5B
W76-10084 5D
W76-10085 4B
W76-10086 8G
W76-10087 5F
W76-10088 4B
W76-10089 4B
W76-10090 4B
W76-10091 8G
W76-10092 8G
W76-10093 5G
W76-10094 8C
W76-10095 8G
W76-10096 5G
W76-10097 8G
W76-10098 8G
W76-10099 8G
W76-10100 8E
W76-10101 8G
W76-10102 8G
W76-10103 8G
W76-10104 5C
W76-10105 8G
W76-10106 5G
W76-10107 4B
W76-10108 8G
W76-10109 8G
W76-10110 8G
W76-10111 8G
W76-10112 8G
W76-10113 8G
W76-10114 8G
W76-10115 8G
W76-10116 8G
W76-10117 8G
W76-10118 3F
W76-10119 5D
W76-10120 5C
W76-10121 5C
W76-10122 3F
W76-10123 2H
W76-10124 2L
W76-10125 2I
W76-10126 2J
W76-10127 5C
W76-10128 5D
W76-10129 7C
W76-10130 6E
W76-10131 5A
W76-10132 7C
W76-10133 5A
W76-10134 8B
W76-10135 4C
W76-10136 2G
W76-10137 5B
W76-10138 7C
W76-10139 7C
W76-10140 4B
W76-10141 7C
W76-10142 7C
W76-10143 7C
W76-10144 7C
W76-10145 7C
W76-10146 7C
W76-10147 7C
W76-10148 10D
W76-10149 7C
W76-10150 7C
W76-10151 4A
W76-10152 4A
W76-10153 4A
W76-10154 4A
W76-10155 4A
W76-10156 4A
W76-10157 4A
W76-10158 4A
W76-10159 4A
W76-10160 4A
W76-10161 4A
W76-10162 4A
W76-10163 4A
W76-10164 4A
W76-10165 4A
W76-10166 4A
W76-10167 4A
W76-10168 3C
W76-10169 3C
W76-10170 3F
W76-10171 5G
W76-10172 2I
W76-10173 3F
W76-10174 5D
W76-10175 2I
W76-10176 3F
W76-10177 3F
W76-10178 2I
W76-10179 3F
W76-10180 5G
W76-10181 4C
W76-10182 2G
W76-10183 4A
W76-10184 2I
W76-10185 2I
W76-10186 3F
W76-10187 3F
W76-10188 5B
W76-10189 3F
W76-10190 5B
W76-10191 5B
W76-10192 6A
W76-10193 6C
W76-10194 4B
W76-10195 5G
W76-10196 4A
W76-10197 5D
W76-10198 5D
W76-10199 8C
W76-10200 5D
W76-10201 5A
W76-10202 5D
W76-10203 5D
W76-10204 5D
W76-10205 5D
W76-10206 5D
W76-10207 5D
W76-10208 5D
W76-10209 5D
W76-10210 5D
W76-10211 5D
W76-10212 5D
W76-10213 5D
W76-10214 5D
W76-10215 5D
W76-10216 5D
W76-10217 5D
W76-10218 5D
W76-10219 5D
W76-10220 5D
W76-10221 5D
W76-10222 5D
W76-10223 5D
W76-10224 5E
W76-10225 5D
W76-10226 5D
W76-10227 5D
W76-10228 5D
W76-10229 5D
W76-10230 5D
W76-10231 5D
W76-10232 5D
W76-10233 5D
W76-10234 5E
W76-10235 5A
W76-10236 5A
W76-10237 5A
W76-10238 5A
W76-10239 5D
W76-10240 5A
W76-10241 5A
W76-10242 5D
W76-10243 2E
W76-10244 2J
W76-10245 5D
W76-10246 5D
W76-10247 5D
W76-10248 5D
W76-10249 5E
W76-10250 5G
W76-10251 5D
W76-10252 5F
W76-10253 5B
W76-10254 5D
W76-10255 5D
W76-10256 5D
W76-10257 5D
W76-10258 5E
W76-10259 5A
W76-10260 5D
W76-10261 5A
W76-10262 2G
W76-10263 5B
W76-10264 6E
W76-10265 5B
W76-10266 5C
W76-10267 5C
W76-10268 5C
W76-10269 5B
W76-10270 2D
W76-10271 5B
W76-10272 5C
W76-10273 5B
W76-10274 5B
W76-10275 5C
W76-10276 5B
W76-10277 5C
W76-10278 5C
W76-10279 5C
W76-10280 5C
W76-10281 5C
W76-10282 5C
W76-10283 5B
W76-10284 5C
W76-10285 5C
W76-10286 5C
W76-10287 5C
W76-10288 5C
W76-10289 5C
W76-10290 5C
W76-10291 5B
W76-10292 5B
W76-10293 5C
W76-10294 5C
W76-10295 5B
W76-10296 5B
W76-10297 5B
W76-10298 5C
W76-10299 5C
W76-10300 5B
W76-10301 5A
W76-10302 5A
W76-10303 5C
W76-10304 5C
W76-10305 5C
W76-10306 5B
W76-10307 5B
W76-10308 5B
W76-10309 5B
W76-10310 5B
W76-10311 5B
W76-10312 5B

W76-10313

W76-10313	5B
W76-10314	5C
W76-10315	4C
W76-10316	5B
W76-10317	5C
W76-10318	5B
W76-10319	5B
W76-10320	5B
W76-10321	5C
W76-10322	4C
W76-10323	5C
W76-10324	5C
W76-10325	5C
W76-10326	5B
W76-10327	5C
W76-10328	4C
W76-10329	5B
W76-10330	5C
W76-10331	4C
W76-10332	5G
W76-10333	5C
W76-10334	5C
W76-10335	5C
W76-10336	5A
W76-10337	5C
W76-10338	5C
W76-10339	5C
W76-10340	5C
W76-10341	2D
W76-10342	5C
W76-10343	5C
W76-10344	5A
W76-10345	5C
W76-10346	5C
W76-10347	5C
W76-10348	5C
W76-10349	5B
W76-10350	5B
W76-10351	5C
W76-10352	5C
W76-10353	5C
W76-10354	5C
W76-10355	5C
W76-10356	5G
W76-10357	5G
W76-10358	5G
W76-10359	5C
W76-10360	5A
W76-10361	2L
W76-10362	5A
W76-10363	5A
W76-10364	5B
W76-10365	5G
W76-10366	5C
W76-10367	5C
W76-10368	5C
W76-10369	5C
W76-10370	5B
W76-10371	5B
W76-10372	5B
W76-10373	5B
W76-10374	5B
W76-10375	5G
W76-10376	5A
W76-10377	5G
W76-10378	5B
W76-10379	5B
W76-10380	5B
W76-10381	5A
W76-10382	5B
W76-10383	5B
W76-10384	5B
W76-10385	5B
W76-10386	5B
W76-10387	5A
W76-10388	5A
W76-10389	5B
W76-10390	5A
W76-10391	5A
W76-10392	5A
W76-10393	5A
W76-10394	5B
W76-10395	5B
W76-10396	5A
W76-10397	5A
W76-10398	5A
W76-10399	5A
W76-10400	5B
W76-10401	5A
W76-10402	5A
W76-10403	5B
W76-10404	5A
W76-10405	5B
W76-10406	5A
W76-10407	5A
W76-10408	5B
W76-10409	5B
W76-10410	5B
W76-10411	5C
W76-10412	5C
W76-10413	5C
W76-10414	5C
W76-10415	8B
W76-10416	8B
W76-10417	8B
W76-10418	8B
W76-10419	8B
W76-10420	8B
W76-10421	8B
W76-10422	2L
W76-10423	2L
W76-10424	2L
W76-10425	2L
W76-10426	2L
W76-10427	2L
W76-10428	2L
W76-10429	2L
W76-10430	2L
W76-10431	2L
W76-10432	2L
W76-10433	2L
W76-10434	2L
W76-10435	8B
W76-10436	5B
W76-10437	5B
W76-10438	5B
W76-10439	5B
W76-10440	5B
W76-10441	5B
W76-10442	2L
W76-10443	5B
W76-10444	2L
W76-10445	2L
W76-10446	2L
W76-10447	2L
W76-10448	2L
W76-10449	5B
W76-10450	8B
W76-10451	8B
W76-10452	8B
W76-10453	5B
W76-10454	2L
W76-10455	2L
W76-10456	2L
W76-10457	2L
W76-10458	8B
W76-10459	8B
W76-10460	8B
W76-10461	8B
W76-10462	2L
W76-10463	2L
W76-10464	5G
W76-10465	8A
W76-10466	5D
W76-10467	5D
W76-10468	5D
W76-10469	5G
W76-10470	3C
W76-10471	5D
W76-10472	5D
W76-10473	5D
W76-10474	5D
W76-10475	5F
W76-10476	2H
W76-10477	2G
W76-10478	5G
W76-10479	5F
W76-10480	5F
W76-10481	5D
W76-10482	5G
W76-10483	5D
W76-10484	5G
W76-10485	3A
W76-10486	5D
W76-10487	2G
W76-10488	5D
W76-10489	2A
W76-10490	5D
W76-10491	5D
W76-10492	5D
W76-10493	5A
W76-10494	2C
W76-10495	5A
W76-10496	5B
W76-10497	5A
W76-10498	7C
W76-10499	2C
W76-10500	5G

LIBRARY U. OF A. ARCHIVES-SPECIAL USE

ABSTRACT SOURCES

OURCE	ACCESSION NUMBER	TOTAL
. CENTERS OF COMPETENCE		
Cornell University, Policy Models for Water Resources Systems	W76-10190--10196 10519, 10523	9
East Central Oklahoma State University, Agricultural Livestock Wastes	W76-10530--10540 10542--10550	20
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W76-10005--10040 10197--10261 10511--10516	107
Illinois State Water Survey, Hydrology	W76-10415--10463	49
National Water Well Association, Water Well Construction Technology	W76-10083--10117	35
University of Arizona, Arid Land Water Resources	W76-10168--10187	20
University of North Carolina, Metropolitan Water resources Planning and Management	W76-10151--10167 10502--10506 10508--10510	25
University of Wisconsin, Eutrophication	W76-10266--10331 10525--10529	71
. STATE WATER RESOURCES RESEARCH INSTITUTES	W76-10001--10002 10128--10131 10262--10265	10

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
BioSciences Information Service	W76-10118--10127 10188--10189 10341, 10351 10361 10476--10477 10487, 10507 10520--10522 10524, 10541	24
Biological Consultant and Information Services (Effects of Pollutants on Aquatic Life)	W76-10041--10082 10333--10340 10342--10350 10352--10360 10362--10414 10517--10518	123
Environment Canada	W76-10489--10501	13
Ocean Engineering Information Service (Patents)	W76-10464--10475 10478--10486 10488	22
U. S. Geological Survey	W76-10132--10150 10332	20

LIBRARY U. OF I. URBANA-CHAMPAIGN

☆U.S. GOVERNMENT PRINTING OFFICE: 1976-210-951/31

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

OFFICIAL BUSINESS

PRINTED MATTER

U.S. MAIL

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE

AN EQUAL OPPORTUNITY EMPLOYER

John Littlewood
Documents Division
220 D Library
Champaign, Ill.

LIBRARY U. OF I. URBANA-CHAMPAIGN

6.33391
e48

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 20
OCTOBER 15, 1976

The Library of the
NOV 18 1976
University of Illinois
at Urbana-Champaign

W76-10501 -- W76-11100
CODEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

SELECTED WATER RESOURCES ABSTRACTS (SWRA) is available to Federal agencies and their contractors or grantees in water resources research upon request, citing contract or grant number and sponsoring agency. Write: Manager, Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior, Washington, DC 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from NTIS, 5285 Port Royal Road, Springfield, VA 22161. Annual subscription rates for the North American Continent are: SWRA Journal only, $75; Journal and Annual Indexes, $100; Indexes only, $50. Other addressees, write for prices.

Some documents abstracted in this journal can be purchased from NTIS at prices shown in the entry; prices subject to change. Other documents are available from originating organizations or authors as indicated in the citation.

LIBRARY U. OF I. URBANA-CHAMPAIGN

SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 20
OCTOBER 15, 1976

W76-10501 -- W76-11100

he Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the ansaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

LIBRARY U. OF I. URBANA-CHAMP.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities. Watershed Protection

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning, Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand, Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development

07 RESOURCES DATA
Includes the following Groups: Network Design, Data Acquisition; Evaluation, Processing and Publication

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

LIBRARY U. OF A. ENGINEERING CENTER

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

STRUCTURE OF WATER IN THE CELL: REVIEW OF THE LITERATURE, (IN RUSSIAN),
Leningrad Inst. of Hematology and Blood Transfusion (USSR).
P. M. Medvedev, and T. I. Fisanovich.
Probl Gematol Pereliv Krovi 20(4), p 38-43. 1975.

Descriptors: *Reviews, *Water structure, *Cytological studies, Water properties, *Molecular structure, Polymers.
Identifiers: *Literature, Reviews, *Biopolymers.

The diversity of interactions of molecules of piopolymers with water, molecules of biopolymers with each other in the presence of water and of water molecules in the presence of biopolymers, is reviewed.--Copyright 1976, Biological Abstracts, Inc.
W76-10974

1B. Aqueous Solutions and Suspensions

WATER TRANSPORT ACROSS CATION-EXCHANGE MEMBRANE. I. EXPERIMENTAL TECHNIQUE. INFLUENCE OF THE CONCENTRATION AND TEMPERATURE ON THE WATER TRANSPORT NUMBER,
Rouen Univ. (France). Lab. of Macromolecular Chemistry.
For primary bibliographic entry see Field 3A.
W76-10620

STRUCTURE OF WATER IN THE CELL: REVIEW OF THE LITERATURE, (IN RUSSIAN),
Leningrad Inst. of Hematology and Blood Transfusion (USSR).
For primary bibliographic entry see Field 1A.
W76-10974

2. WATER CYCLE

2A. General

LINEAR AND NONLINEAR APPROACHES FOR SHORT-TERM RUNOFF ESTIMATIONS IN TIME-INVARIANT OPEN HYDROLOGIC SYSTEMS,
Thessaloniki Univ., Salonika (Greece). Hydraulics and Land Reclamation Lab.
For primary bibliographic entry see Field 2E.
W76-10699

THE INFLUENCE OF SLOPE AND RAIN INTENSITY ON RUNOFF AND INFILTRATION.
SLETCO, Beirut (Lebanon).
S. H. Nassif, and E. M. Wilson.
Hydrological Sciences Bulletin, Vol. 20, No. 4, p 539-553, December 1975. 11 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Infiltration, *Rainfall simulators, *Slopes, *Rainfall intensity, *Runoff, Laboratory tests, Instrumentation, Soils, Drops(Fluids), Raindrops, Drains, Watersheds(Basins).
Identifiers: *Soil catchment area, Drop size distribution.

The design and construction of a special-purpose laboratory catchment and rainfall simulator was described. The equipment consisted of a soil catchment area that could be inclined at various angles. Additional instrumentation then measured athe flow of water across the surface of, and through, the soil bed. Precipitation was provided by a unit that simulated rainfall at particular rates with uniform distribution. The equipment was used to examine infiltration, runoff and other hydrological properties of a number of soils under different rainfall intensities and with different catchment slopes. Correlations were obtained for these variables. Some experiments were carried out with differing initial soil conditions classified as dry damp, medium wet, wet, and very wet. The various effects of increasing initial wetness confirmed what was already known that runoff started earlier and was obtained earlier. (Roberts - ISWS)
W76-10702

SELECTION OF TYPICAL SMALL DRAINAGE BASINS FOR INVESTIGATING AND COMPUTING SPRING RUNOFF FROM LARGE RIVER BASINS,
For primary bibliographic entry see Field 4A.
W76-10705

INVESTIGATION OF THE HYDROLOGIC CHARACTERISTICS OF TALUS,
For primary bibliographic entry see Field 2F.
W76-10706

FLOW RESISTANCE IN BROAD SHALLOW GRASSED CHANNELS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2E.
W76-10710

SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS: FINAL REPORT,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W76-10813

AN ANALOG MODEL OF THE CHIPUXET AQUIFER, RHODE ISLAND,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W76-10814

DEVELOPMENT OF A WATER QUAITY SIMULATION MODEL APPLICABLE TO GREAT SALT LAKE, UTAH,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5B.
W76-10815

SOURCES OF INFORMATION IN WATER RESOURCES, AN ANNOTATED GUIDE TO PRINTED MATERIALS,
California Univ., Berkeley. Water Resources Center Archives.
For primary bibliographic entry see Field 10C.
W76-10881

ENTROPY PRINCIPLE APPLIED TO THE RAINFALL-RUNOFF PROCESS,
Lagos Univ. (Nigeria).
J. O. Sonuga.
Journal of Hydrology, Vol. 30, No. 1/2, p 81-94, May 1976. 1 fig, 3 tab, 5 ref.

Descriptors: *Entropy, *Rainfall-runoff relationships, *Hydrology, *Model studies, Rainfall, Runoff, Probability, Graphical analysis, Watersheds(Basins).
Identifiers: *Conditional entropy, *Variates, Graphs, Covariance.

An application of the entropy principle to the rainfall-runoff process was described. The expression for conditional entropy was maximized subject to certain constraints to obtain the conditional distribution of a variate y, representing runoff, given the occurrence of a variate x, representing rainfall. The distribution that resulted from the maximizing procedure was the 'minimally prejudiced assignment of probabilities on the basis of the given information'. The parameters of the distribution were based on prior information about the estimated means and covariance of the rainfall and the runoff series. The distribution was presented in a tabular form making it possible to prepare useful tables and graphs for ease of application. Although the expression for the distribution appears cumbersome, the charts could be prepared by computer. The preparation of the tables is of particular value to the hydrologist/engineer in remote environments where improved processing facilities such as electronic computers are not readily available. (Roberts - ISWS)
W76-10918

APPLICATION OF THE STANFORD WATERSHED MODEL TO NIGERIAN WATERSHEDS,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
N. Egbuniwe, and D. K. Todd.
Water Resources Bulletin, Vol. 12, No. 3, p 449-460, June 1976. 5 fig, 2 tab, 11 ref.

Descriptors: *Watershed management, *Model studies, *Streams, *Africa, Digital computers, Watersheds(Basins), Water management(Applied), Computer programs, Simulation analysis, Water resources development, Hydrologic data.
Identifiers: *Stanford Watershed Model, *Nigeria(Kontagora watershed), Gaged streams, Model parameters, Ungaged streams, *Nigeria(Malendo watershed).

The Nigerian version of the Stanford Watershed Model was tested on two Nigerian watersheds - the Malendo and the Kontagora. The annual water yield estimates seemed to be good, but monthly and daily estimates showed some discrepancies caused by the convective nature of the storms and the large sizes of the watersheds being considered. The Malendo watershed was treated as ungaged, and model parameters were extrapolated from the adjacent Kontagora watershed; the results were encouraging. Considerable familiarity with the model was achieved so that further work with it in Nigeria would be possible. The model appeared to simulate the hydrologic processes (streamflow, soil moisture, and evapotranspiration) with the accuracy of the basic input data. Application of the model for drought study appears possible. (Roberts - ISWS)
W76-10923

A NOTE ON THE CONTRIBUTION OF FOG DRIP TO STREAMFLOW,
Southampton Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W76-10927

SOIL WATER MODELING I: A GENERALIZED SIMULATOR OF STEADY, TWO-DIMENSIONAL FLOW,
Agricultural Research Service, Columbia, Mo. North Central Region Watershed Research Center.
For primary bibliographic entry see Field 2G.
W76-10933

APPLICATION OF A RESIDENCE TIME MODEL TO DILUTION GAUGING, WITH PARTICULAR REFERENCE TO THE PROBLEM OF CHANGING DISCHARGE,
Institute of Hydrology, Wallingford (England).

For primary bibliographic entry see Field 2E.
W76-10935

LOESS DISTRIBUTION BY VARIABLE WINDS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 2J.
W76-10941

ROLE OF PRECIPITATION IN THE CHEMISTRY OF SUBSURFACE WATERS IN THE WESTERN PART OF THE TURGAY TROUGH,
For primary bibliographic entry see Field 2F.
W76-10942

A DISCRETE LINEAR CASCADE MODEL FOR HYDROLOGY,
University Coll., Galway (Ireland).
For primary bibliographic entry see Field 2E.
W76-10946

A TWO-DIMENSIONAL NUMERICAL MODEL OF ESTUARINE CIRCULATION: THE EFFECTS OF ALTERING DEPTH AND RIVER DISCHARGE,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
For primary bibliographic entry see Field 2L.
W76-10948

2B. Precipitation

USE OF LOG-NORMAL DISTRIBUTIONS FOR NUMERICAL CALCULATIONS OF CONDENSATION AND COLLECTION,
Atmospheric Environment Service, Downsview (Ontario).
T. L. Clark.
Journal of the Atmospheric Sciences, Vol. 33, No. 5, p 810-821, May 1976. 10 fig, 1 tab, 10 ref.

Descriptors: *Model studies, *Condensation, *Coalescence, Mathematical models, Numerical analysis, Mathematical studies, Cloud physics, Clouds, Precipitation(Atmospheric), Meteorology.
Identifiers: Finite-difference models, Lagrangian parcel calculations.

Lagrangian parcel calculations of condensation and coalescence theory were presented where both a distribution function approach as well as a conventional finite-difference approach were compared. The comparisons suggested that the use of series of log-normal distributions to represent the water droplet spectra may be a practical approach to treating cloud physical processes in multi-dimensional cloud models. (Sims - ISWS)
W76-10694

SUPERSATURATION AND TIME DEPENDENCE OF ICE NUCLEATION FROM THE VAPOR ON SINGLE CRYSTAL SUBSTRATES,
Nevada Univ., Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W76-10695

IDENTIFICATION OF NUCLEI AND CONCENTRATIONS OF CHEMICAL SPECIES IN SNOW CRYSTALS SAMPLED AT THE SOUTH POLE,
Cold Regions Research and Engineering Laboratory, Hanover, N. H.
For primary bibliographic entry see Field 2C.
W76-10696

THE GROWTH RATES AND DENSITIES OF ICE CRYSTALS BETWEEN -3C AND -21C,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). Div. of Cloud Physics.
B. F. Ryan, E. R. Wishart, and D. E. Shaw.
Journal of the Atmospheric Sciences, Vol. 33, No. 5, p 842-850, May 1976. 13 fig, 2 tab, 18 ref, 1 append.

Descriptors: *Crystals, *Growth rates, *Ice, Laboratory tests, Microscopy, Density, Snow, Clouds, Cloud physics, Time, Temperature, Supersaturation, Meteorology.
Identifiers: *Ice crystal growth.

Ice crystals were grown in a supercooled cloud at temperatures ranging from -3C to -21C for periods from 30-40 s to 150-180 s. When the axial dimensions at a given time were examined as a function of temperature, there was a marked maximum along the a axis at -15C and a secondary broader maximum along the c axis at -6C. The growth of the axial dimensions can be adequately represented by a linear function of time. A power function of time was fitted to the crystal mass growth measurements; these show a sharp maximum at -15C and a secondary broader maximum at -7C. Crystal bulk densities estimated from the masses and axial dimensions vary with temperature in a complicated way, with a minimum of about 0.4 Mg/cu m at -5 and -17C, and a maximum of 0.92 Mg/cu m (pure ice) at -3C, and appear to be independent of time. (Sims-ISWS)
W76-10697

THE INFLUENCE OF SLOPE AND RAIN INTENSITY ON RUNOFF AND INFILTRATION.
SLETCO, Beirut (Lebanon).
For primary bibliographic entry see Field 2A.
W76-10702

A NORMAL MODE METHOD FOR PREDICTING STORM SURGES ON A LAKE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W76-10715

HETEROGENEOUS ICE NUCLEATION IN THE PRESENCE OF ALIPHATIC AMINES AND AMMONIA,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W76-10716

METEOROLOGICAL ASPECTS OF THE OAHU FLOOD OF 19 APRIL 1974,
Hawaii Univ., Honolulu. Water Resources Research Center.
T. A. Schroeder.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 719, $4.50 in paper copy, $3.00 in microfiche. OWRT A-062-HI(1) 14-34-0001-6012. Technical Report No. 97, February 1976. 62p, 35 fig, 7 tab, 24 ref, append.

Descriptors: *Flash floods, *Rainfall, *Rain gages, *Synoptic analysis, *Hawaii, *Flood forecasting, Meteorology, *Meteoro logical data, Rainfall intensity, Model studies, Network, *Thunderstorms.
Identifiers: *Conceptual models(Meteorology), Mesoscale analysis, Mesoscale structure, *Oahu(HI).

A detailed study has been made of the severe Oahu rainstorm of 19 April 1974 and its implications for the Hawaii flood forecast problem. Conventional meteorological analyses were performed, using standard surface observations, aircraft reports, and satellite photography. Data from Oahu's extensive recording rain gage network were analyzed to determine the mesoscale structure of precipitating cloud systems. Conceptual models of the flood-producing convective elements were then constructed. It was found that the synoptic scale situation was one which has historically generated flooding. Fresh trade winds in the lower troposphere were combined with a trough in the upper troposphere to produce thunderstorms over Oahu. Hourly rainfall analysis revealed two centers of high rainfall. One of these centers was produced by a continuous thunderstorm. A conceptual model of a continuous thunderstorm over Oahu was then formulated. Study of the special rain and stream gage network in Moanalua Valley showed that the current monitoring scheme of one telemetered rain gage per valley is inadequate. Finally, the current state-of-the-art in Hawaiian flood forecasting and monitoring is discussed. It is proposed that the installation of a meteorological radar is the only viable solution to the problem of early detection of flash flood potential.
W76-10807

WSSI FINAL REPORT FOR THE COLORADO RIVER BASIN PILOT PROJECT,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W76-10818

SOUTH DAKOTA WEATHER MODIFICATION PROGRAM, RESEARCH COOPERATIVE STUDIES UNDER PROJECT SKYWATER,
South Dakota Dept. of Natural Resources Development, Pierre. Div. of Weather Modification.
For primary bibliographic entry see Field 3B.
W76-10819

PROCEEDINGS FROM A WORKSHOP ON INADVERTENT WEATHER MODIFICATION.
For primary bibliographic entry see Field 3B.
W76-10901

ATMOSPHERIC EFFECTS OF POLLUTANTS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5A.
W76-10903

URBAN-INDUSTRIAL EFFECTS ON CLOUDS AND PRECIPITATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4C.
W76-10905

SOME CHARACTERISTICS OF A DUSTY RAIN IN YUGOSLAVIA,
Yugoslavic Academy of Science and Arts, Zagreb. Inst. for Physics of the Atmosphere.
For primary bibliographic entry see Field 5A.
W76-10906

WIND-TUNNEL SIMULATION OF ATMOSPHERIC FLOW AND DISPERSION,
Colorado State Univ., Fort Collins. Fluid Mechanics Program.
For primary bibliographic entry see Field 5A.
W76-10908

INADVERTENT EFFECTS IN WEATHER MODIFICATION,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 3B.
W76-10909

INTRODUCTION TO THE ATMOSPHERIC AEROSOL SYSTEM,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 5A.
W76-10911

ENTROPY PRINCIPLE APPLIED TO THE RAINFALL-RUNOFF PROCESS,
Lagos Univ. (Nigeria).
For primary bibliographic entry see Field 2A.
W76-10918

A NOTE ON THE CONTRIBUTION OF FOG DRIP TO STREAMFLOW,
Southampton Univ. (England). Dept. of Geography.
A. M. Gurnell.
Weather, Vol. 31, No. 4, p 121-126, April 1976. 3 fig, 3 tab, 3 ref.

Descriptors: *Fog, *Streamflow, *Drainage, Mist, Rain gages, Precipitation(Atmospheric), Vegetation, Marshes, Soil moisture, Water supply, Grasses, Weather, Hydrographs, Watersheds(Basins).
Identifiers: *Fog drip, *Horizontal interception, *Arboreal interception, New Forest(Hampshire), Heathland, Woodland.

Fog drip from grasses and heather, in addition to direct fog precipitation on to the water surface, causes fluctuations in streamflow. Interception of precipitation by vegetation is usually considered to constitute a water loss. Little attention has been given to horizontal interception and fog drip. Consideration of this topic has been confined to arboreal interception rather than to that by shorter vegetation. Three references were quoted to indicate that work on fog drip has emanated from a few areas of the world where fog has provided the dominant form of precipitation. This paper considered the impact of fog drip on streamflow during one week in February 1975 in a small catchment in the New Forest, Hampshire, part of England, where fog is rare. Although the predominant vegetation within the watershed is heathland and a few patches of mixed woodland, streamflow peaks were recognized as a catchment response to fog precipitation via translatory flow from marshy areas after an approximate lag of 6 hours. (Roberts-ISWS)
W76-10927

SOME OBSERVATIONS ON THE JOSS-WALDVOGEL RAINFALL DISDROMETER,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
P. I. A. Kinnell.
Journal of Applied Meteorology, Vol. 15, No. 5, p 499-502, May 1976. 3 fig, 9 ref.

Descriptors: *Raindrops, *Instrumentation, *Rainfall, Size, Particle size, Measurement, Rain gages, Velocity, Drops(Fluids), Laboratory tests, Equipment, Meteorology.
Identifiers: *Raindrop size, Disdrometers.

Laboratory experiments showed that the response of the Joss-Waldvogel rainfall disdrometer, a device designed to measure raindrop size from drop impact, was influenced not only by the size and vertical velocity of the drop but also by the shape of the drop. The results also suggested that a discontinuity exists in the response of the transducer between drops travelling at terminal velocity and drop travelling at an appreciably lower velocity. This discontinuity appears to be associated with the time taken for the drop to collapse. (Sims-ISWS)
W76-10928

POSSIBLE URBAN EFFECTS ON MAXIMUM DAILY RAINFALL AT PARIS, ST. LOUIS AND CHICAGO,
Meteorologie Nationale, Paris (France).
For primary bibliographic entry see Field 4C.
W76-10929

NUMERICAL SIMULATION OF JAPAN SEA EFFECT SNOWFALL,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2C.
W76-10930

MONSOONAL DEPOSITION OF SEA SALT AND AIR POLLUTANTS OVER BOMBAY,
Bhabha Atomic Research Centre, Trombay, Bombay (India). Air Monitoring Section.
For primary bibliographic entry see Field 5B.
W76-10932

HYDROLOGIC EFFECTS OF STORMS OF JUNE 24-28, 1974 IN LEE AND COLLIER COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-11077

2C. Snow, Ice, and Frost

SUPERSATURATION AND TIME DEPENDENCE OF ICE NUCLEATION FROM THE VAPOR ON SINGLE CRYSTAL SUBSTRATES,
Nevada Univ., Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W76-10695

IDENTIFICATION OF NUCLEI AND CONCENTRATIONS OF CHEMICAL SPECIES IN SNOW CRYSTALS SAMPLED AT THE SOUTH POLE,
Cold Regions Research and Engineering Laboratory, Hanover, N. H.
M. Kumai.
Journal of the Atmospheric Sciences, Vol. 33, No. 5, p 833-841, May 1976. 11 fig, 4 tab, 16 ref.

Descriptors: *Snow, *Antarctic, *Chemistry, Crystals, Ice, Snow cover, Nucleation, Sodium chloride, Salts, Clays, Clay minerals, Laboratory tests, Electron microscopy, Cloud physics, Precipitation(Atmospheric), Meteorology.
Identifiers: *Snow crystals, Snow nuclei, Nuclei.

A total of 380 electron micrographs and electron diffraction patterns of 93 snow crystal nuclei were analyzed. The nuclei were identified as mainly clay minerals and sodium chloride particles. The clay mineral nuclei were illite 20%, kaoline 8%, halloysite 4%, vermiculite 3%, and related minerals 24%. For the other nuclei, sodium chloride accounted for 20%, and unidentified nuclei accounted for 5%. Fifteen percent of the snow crystals did not appear to have nuclei. Therefore, all nuclei found in snow crystals were terrestrial substances from oceans and continents. The mass of nuclei was from 0.0001 to 1 picogram for both clay minerals and sodium chloride. The shapes of snow crystals were single bullets, combinations of bullets, and hexagonal hollow columns. The snow crystals formed at temperatures from -30 to -35C. The snow crystal diameters were from 0.1 to 1.0 mm, and the crystal mass was from 0.01 to 10 micrograms. The mean mass concentration of sodium chloride in snow crystals was 40.6 ppb and that of clay minerals was 15.4 ppb. The sodium chloride nucleus concentration coincided within the experimental error with data taken from the chemical analysis of the South Pole snow cover made by several workers. It was concluded that most of the sodium chloride contained in the South Pole snow cover was due to the sodium chloride nuclei of snow crystals. (Sims-ISWS)
W76-10696

THE GROWTH RATES AND DENSITIES OF ICE CRYSTALS BETWEEN -3C AND -21C,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia), Div. of Cloud Physics.
For primary bibliographic entry see Field 2B.
W76-10697

TRANSPORT OF WATER AND HEAT IN A FROZEN PERMEAMETER,
Cornell Univ., Ithaca, N. Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-10713

A LABORATORY INVESTIGATION OF THE MECHANICS AND HYDRAULICS OF RIVER ICE JAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
J. C. Tatinclaux, C. L. Lee, T. P. Wang, T. Nakato, and J. F. Kennedy.
IIHR Report No. 186, March 1976. 97 p, 22 fig, 1 tab, 7 ref, 4 append. Army DAAK03- 75-C-0030, NSF ENG-72-04118A02.

Descriptors: *Ice jams, *Rivers, *Hydraulic models, *Model studies, Ice flow, Floating, Streamflow, Froude number, Compressive strength, Ice cover, Laboratory tests, Mechanical properties, Hydraulics.
Identifiers: *Ice floes.

Experimental results are presented on the conditions of initiation of an ice jam by a simple surface obstruction, on the equilibrium thickness of an ice jam formed by accumulation and submergence of ice floes, and on the compression strength of floating, fragmented ice cover. In the study on ice jam initiation, it was found that the minimum concentration of floes in the opening of the obstruction at which a jam occurs is nearly independent of the ratio of width of constricted passage to channel width, and is proportional to a negative power of the ratio of floe length to width of constricted passage. From energy analysis of floe submergence, a relationship relating the thickness of a jam formed by accumulation and submergence of floes to the approach flow characteristics was derived and found to fit satisfactorily the experimental data. In both studies on jam initiation and development, it was found that surface tension, and therefore the wetting properties of the material used for small laboratory floes, has a significant effect on the submergence velocity of small floes, and should be taken into consideration when small scale laboratory investigations of ice jam phenomena are to be conducted using floes made of artificial material. Experiments on compression strength of floating, fragmented ice cover were conducted for ranges of cover length and cover thickness, using three different floe shapes and sizes. It was found that the compressive strength is inversely proportional to compression velocity and independent of cover length. (Sims - ISWS)
W76-10714

HETEROGENEOUS ICE NUCLEATION IN THE PRESENCE OF ALIPHATIC AMINES AND AMMONIA,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W76-10716

NUMERICAL SIMULATION OF JAPAN SEA EFFECT SNOWFALL,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
M. A. Estoque, and K. Ninomiya.
Tellus, Vol. 28, No. 3, p 243-253, 1976. 18 fig, 1 tab, 7 ref. NAS GA32202A

Descriptors: *Model studies, *Snowfall, *Orography, Mathematical models, Precipitation(Atmospheric), Monsoons, Winter, Mountains, Temperature, Air temperature, Winds, Humidity, Distribution, Simulation analysis, Bodies of water, Climatology, Meteorology.
Identifiers: *Japan Sea, Japan.

Snowfall associated with the modification of cold air-mass outbreaks by the Sea of Japan was simulated with a simple numerical model. The model incorporates the effects of momentum, heat, and moisture fluxes across the air-sea interface as well as the effects of orography. The simulated distributions of snowfall, temperature, wind, and moisture were compared with observations and reasonable agreement was found. Numerical experiments were made in order to determine the dependence of the snowfall distribution on the large scale prevailing conditions. The results indicated that the occurrence of snowfall is controlled primarily by orographic lifting. An unexpected finding was that the snowfall distribution is not very sensitive to the dryness of the prevailing flow. (Sims-ISWS)
W76-10930

EFFECT OF VEGETATION ON LATERAL MIGRATION OF ANASTOMOSED CHANNELS OF A GLACIER MELTWATER RIVER,
Calgary Univ., Alberta. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-10940

MILANKOVITCH SOLAR RADIATION VARIATIONS AND ICE AGE ICE SHEET SIZES,
Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering; and Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
J. Weertman.
Nature, Vol. 261, No. 5555, p 17-20, May 6, 1976. 6 fig, 7 ref.

Descriptors: *Model studies, *Ice, *Solar radiation, *Arctic, Mathematical models, Ablation, Snowfall, Radiation, Cold regions, Glaciers, Climatology, Ice cover.
Identifiers: *Ice sheets, *Ice age, Ice accumulation, Milankovitch solar radiation variations.

The fluctuations in the size of ice age ice sheets were calculated using glacier mechanics and the Milankovitch solar radiation variations. The calculations were greatly simplified by considering only two-dimensional ice sheets with profiles that would be appropriate if ice obeyed the flow law of a perfectly plastic solid. The solar radiation variations seem to be large enough to account for ice ages. (Sims - ISWS)
W76-10949

METHOD OF MAKING SNOW,
For primary bibliographic entry see Field 3B.
W76-10958

BOG STRATIGRAPHY, RADIOCARBON DATES, AND PINEDALE TO HOLOCENE GLACIAL HISTORY IN THE FRONT RANGE, COLORADO,
Geological Survey, Denver, Colo.
R. F. Madole.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 163-169, March-April 1976. 4 fig, 1 tab, 9 ref.

Descriptors: *Glaciology, *Radioactive dating, *Geologic time, *Geologic formations, *Colorado, Revegetation, Bogs, Glaciohydrology, Ponds, Lakes.
Identifiers: *Front Range area(Colo).

Radiocarbon dates and stratigraphic cores from bogs, kettle ponds, and former ice-marginal lakes on the east and west sides of the Front Range, Colo., suggest that (1) valley glaciers of Pinedale age began to recede from their terminal positions between about 14,600 and 13,000 yr ago, (2) revegetation of glaciated areas at altitudes of 2,600-2,900 m (8,600-9,500 ft) was complete by 11,000-10,000 yr ago, (3) at one site, 3,500+1,000 yr elapsed before peat began to form after deglaciation, (4) the formation of bogs within the glaciated areas kept pace with glacier recession in a general way, beginning at progressively later times as deglaciation proceeded upward, (5) Pinedale glaciers had disappeared or were reduced to small remnants by about 8,000 yr ago, (6) moraines that have been mapped as belonging to the early stade of Pinedale Glaciation are no younger than 13,000 yr B.P. and may be older than 14,600 yr, and those de-limiting what has been mapped as late stade are no younger than about 7,600 yr B.P. and are probably older than 7,800 yr, and (7) most of the till mapped as Pinedale was deposited between about 14,600 and 8,000 yr ago. (Woodard-USGS)
W76-11071

OIL IN SEA ICE,
Department of the Environment, Victoria (British Columbia). Frozen Sea Research Group.
For primary bibliographic entry see Field 5B.
W76-11098

2D. Evaporation and Transpiration

STUDIES ON EVAPOTRANSPIRATION OF SOME AQUATIC WEEDS,
United Nations Development Program, Kota (India). Chambal Land and Water Use and Management Project.
O. Brezny, I. Mehta, and R. K. Sharma.
Weed Sci. 21(3), p 197-204, 1973.

Descriptors: *Evapotranspiration, *Aquatic weeds, Water loss, Winds, Temperature.
Identifiers: Cyperus-rotundus, Eichhornia-crassipes, Ipomoea-aquatica, Pistia-stratiotes, Trapa-natans-var-bispinosa, Typha-angustifolia.

The evapotranspiration of 6 dominant emersed and floating weeds was studied. Evapotranspiration of water-chestnut (Trapa natans L. var. bispinosa Roxb.), waterlettuce (Pistia stratiotes L.), and swamp morningglory (Ipomea aquatica Forsk.) did not increase water losses significantly. Evapotranspiration of water hyacinth (Eichhornia crassipes (Mart) Solms.) was 30-40% higher, that of narrowleaf cattail (Typha angustifolia L.) was 60-70% higher, and that of purple nutsedge (Cyperus rotundus L.) was 130-150% higher than evaporation from a free water surface under equivalent conditions. Positive correlations (significant at the 1% level) were found between some meterological factors (daily maximum air temperature and daily average wind velocity), evaporation from free water surface, and evapotranspiration from aquatic plants studied.--Copyright 1973, Biological Abstracts, Inc.
W76-10554

THE EVAPORATION AND SEDIMENTATION IN MAN-MADE ARADE LAKE, SOUTHERN PORTUGAL,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
G. K. Brouwer, and H. Ryckborst.
Hydrological Sciences Bulletin, Vol. 20, No. 4, p 555-574, December 1975. 10 fig, 6 tab, 6 ref.

Descriptors: *Evaporation, *Sedimentation, *Lakes, Rainfall, Intermittent streams, Flash floods, Subtropic, Citrus fruits, Leakage, Storage capacity, Dams, Rivers, Erosion, Artificial lakes, Lake sediments.
Identifiers: *Portugal(Arade Lake), The Algarve, *Man-made lakes, Arade Dam, *Mediterranean, Syphon.

Only four lakes exist in the dry subtropical part of southern Portugal. They are all man-made to satisfy the irrigation requirements of the citrus producers. The evaporation rate of one of the lakes, Arade Lake (91.9 sq km) averaged 4.1 mm/d (1500 mm/year) during 1970, compared with a rainfall of 680 mm. The sediment accumulation in the lake since the construction of the Arade Dam amounted to 300,000 cu m over the period 1965-1973 or 200,000 tons per year. This was equivalent to a decrease of 10% in the original lake storage capacity. By the year 2030, about one half of the lake would be filled by sediments. The risks associated with the storage of flash floods would then increase to unacceptable levels. The Portuguese Government is now considering a new and higher dam 4 km upstream from the present Arade Dam. (Roberts - ISWS)
W76-10703

PREDICTING CONSUMPTIVE USE WITH CLIMATOLOGICAL DATA,
New Mexico State Univ., University Park. Dept. of Agronomy.
E. J. Gregory, and E. G. Hanson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 791, $4.00 in paper copy, $3.00 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 066, April 1976, 43 p, 2 fig., 31 tab., 9 ref., append. OWRT A-043-N Mex(1).

Descriptors: *Consumptive use, *Evaporation, *Evapotranspiration, *Lysimeters, Crop production, Crop response, Irrigation effects, Irrigation efficiency, Irrigation programs, Moisture content, Soil moisture, Soil water, Climatic data, Efficiencies, New Mexico, Cotton, *Forecasting, *Climatic data, Alfalfa, Corn(Field), Barley, Potatoes, Onions, Lettuce.
Identifiers: *Neutron probe, *Blaney-Criddle Method, Jensen method, Irrigation scheduling, Elephant Butte Irrigation District(NM), Dona Ana County(NM), San Juan County(NM), Sweet corn.

Consumptive-use coefficients currently used for determining irrigation requirements and water rights in New Mexico have been imported from other states for most crops because of the lack of measurements made in the state. Consumptive-use measurements for selected crops were made and consumptive-use data from earlier irrigation research projects in which soil moisture depletion measurements had been made were evaluated. Computed consumptive-use coefficients and ratios of measured consumptive use to measured pan evaporation are presented with climatological data and moisture depletion measurements for various crops, including alfalfa, sweet corn, cotton, onions, potatoes, lettuce and spring barley. Data are tabulated to separate the frost-free seasonal coefficients from the coefficients in the frost season. The seasonal consumptive-use coefficients are computed, tabulated and summarized for seasonal measurements. These coefficients are compared with coefficients in current use in New Mexico. The monthly coefficients are highly variable as compared to the seasonal coefficients. Ratios of consumptive use to evaporation are tabulated and summaries of seasonal ratios are presented. The variability of these data appear to be similar to the variability among consumptive-use coefficients. The practical use of the monthly consumptive-use coefficients data for the Blaney-Criddle formula is limited due to the excessive variability. The seasonal values are more stable but measurements should be continued for several more years to evaluate their reliability. The high variability is caused in part by not including weather factors other than temperature and length of daylight hours.
W76-10873

THE INADVERTENT IMPACTS OF AGRICULTURE ON WEATHER AND CLIMATE AND

AGRICULTURAL METHODS FOR AMELIORATION OF CLIMATIC STRESS,
Nebraska Univ., Lincoln. Dept. of Agricultural Climatology.
For primary bibliographic entry see Field 3B.
W76-10902

2E. Streamflow and Runoff

THE RELATIONSHIP OF SLOPE AND STREAM CHANNEL FORM IN THE RIVER DART, DEVON,
Exeter Univ. (England), Dept. of Geography.
C. C. Park.
Journal of Hydrology, Vol. 29, No. 1/2, p 139-147, March 1976. 3 fig, 1 tab, 26 ref.

Descriptors: *Channel morphology, Hydraulic properties, *Open channel flow, Regression analysis, Hydraulics, Streamflow, Channels, On-site investigations, Slopes.
Identifiers: *Stream geometry, *Channel geometry, Channel capacity, *River Dart(England), *Channel slope, Channel network, Hydraulic geometry, Bed slope.

Three methods of relating channel slope and channel capacity were presented for studies of channel geometry. The methods were illustrated by analysis of field measurements from 50 sites in the River Dart of mid-Devon, England. The first method was an inverse relationship between channel capacity and slope. In the second method, the relation between net channel slope and the rate of increase of channel capacity relative to drainage area for six individual tributaries within the overall channel network showed that the rate of increase of channel capacity is least where relief ratios are highest. Finally a regression relationship between channel capacity and slope was presented. (Terstriep-ISWS)
W76-10698

LINEAR AND NONLINEAR APPROACHES FOR SHORT-TERM RUNOFF ESTIMATIONS IN TIME-INVARIANT OPEN HYDROLOGIC SYSTEMS,
Thessaloniki Univ., Salonika (Greece). Hydraulics and Land Reclamation Lab.
Z. G. Papazafiriou.
Journal of Hydrology, Vol. 30, No. 1/2, p 63-80, May 1976. 4 fig, 2 tab, 16 ref.

Descriptors: *Linear programming, *Runoff, *Time, *Hydrologic systems, Non-uniform flow, Hydraulics, Rainfall, Discharge(Water), Estimating.
Identifiers: *Nonlinear programming, *Short-term runoff, *Time-invariant, Open hydrologic systems.

Open time-invariant linear and second-order nonlinear hydrologic systems with memory can be evaluated by the development of a method of expanding the kernels in sequences of unit-weighted orthonormal polynomials. The method was applied to the total rainfall-total discharge relationship. The watershed responses derived by the second-order nonlinear system demonstrated high sensitivity to input variations and predicted the runoff closely. The first-order system provided rather insensitive responses to input variations different from those encountered during the test period. Only hourly rainfall and runoff rates were used in order to study the short-term watershed reactions. Due to the limitations of the computer system available, the length of the studied periods was limited. The length of these periods could be expanded using longer time intervals such as 3-hour, 6-hour, or one-day intervals. (Roberts-ISWS)
W76-10699

SELECTION OF TYPICAL SMALL DRAINAGE BASINS FOR INVESTIGATING AND COMPUTING SPRING RUNOFF FROM LARGE RIVER BASINS,
For primary bibliographic entry see Field 4A.
W76-10705

FLOW RESISTANCE IN BROAD SHALLOW GRASSED CHANNELS,
Utah Water Research Lab., Logan.
C-L. Chen.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11994, p 307-322, March 1976. 2 fig, 32 ref, append. FHA DOT-FH-11-7806.

Descriptors: *Flow friction, *Flow resistance, *Roughness(Hydraulic), Fluid mechanics, *Grassed waterways, Friction, Hydraulics, Roughness coefficient, Sheet flow, Channel flow, Mannings equation, Darcy-Weisbach equation, Reynolds number, Hydraulic models, Laboratory tests, Surface runoff, Turf, Kentucky bluegrass, Bermudagrass, Retardance.
Identifiers: *Manning's roughness, *Shallow channels, Retardance coefficient.

Resistance to sheet flows over natural turf surface was investigated experimentally. The formulation of a functional relationship between the resistance coefficient and controlling parameters for shallow flows over various turf surfaces is essential to the mathematical modeling of the rainfall-runoff process and sediment yield from a watershed which may consist of various vegetated surfaces. An analysis of results obtained from laboratory experiments for laminar flow on Kentucky Blue grass and Bermuda grass surfaces revealed that a relationship exists between the Darcy-Weisbach friction coefficient, Reynolds number, and bed slope. A further analysis of previous investigators' experimental results for flow on various smooth and rough surfaces with or without rainfall led to the qualitative determination of a general trend of the resistance relationship for shallow flows over such dense turf surfaces as affected by bed slope, raindrop impact, and roughness size. (Terstriep - ISWS)
W76-10710

A LABORATORY INVESTIGATION OF THE MECHANICS AND HYDRAULICS OF RIVER ICE JAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2C.
W76-10714

EXPERIMENTAL AND THEORETICAL INVESTIGATIONS IN AN OSCILLATORY TURBULENT BOUNDARY LAYER,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W76-10916

ON ROLLING-GRAIN RIPPLES,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 2J.
W76-10917

LONGITUDINAL DISPERSION FOR FLOW OVER ROUGH BEDS,
New Brunswick University, Fredericton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-10921

CHANNEL WIDTH AND THE RIFFLE-POOL SEQUENCE,
Lanchester Polytechnic, Coventry(England).
K. S. Richards.
Geological Society of America Bulletin, Vol. 87, No. 6, p 883-890, June 1976. 8 fig, 37 ref.

Descriptors: *Geomorphology, *Channels, *Europe, Channel morphology, Meanders, Topography, Streams, Geology, On-site investigations, Fourier analysis.
Identifiers: *Riffle pool, *Channel width, England, Series analysis.

Investigations of channel geometry in a headwater stream in Cornwall, England, revealed that systematic variations of channel width occur in conjunction with the oscillations of bed topography in the riffle-pool sequence. The channel tends to be about 15% wider in the riffle section, where central bars of coarse bed material divert the flow against the banks. This is reflected in the occurrence of distinct downstream trends of width as a function of bankfull discharge in riffle and pool sections. There is some evidence that the widest channel occur just downstream from the summit of the riffle, which indicates that the width oscillation lags behind the profile oscillation, presumably because it is related to flow characteristics induced by bed topography. (Lee - ISWS)
W76-10924

APPLICATION OF A RESIDENCE TIME MODEL TO DILUTION GAUGING, WITH PARTICULAR REFERENCE TO THE PROBLEM OF CHANGING DISCHARGE,
Institute of Hydrology, Wallingford (England).
K. Gilman.
Hydrological Sciences Bulletin, Vol. 20, No. 4, p 523-537, December 1975. 8 fig, 3 tab, 9 ref.

Descriptors: *Flow, *Flow measurement, *Runoff, Stream gages, *Discharge measurement, Storm runoff, Simulation analysis, Tracers, Hydrographs, Model studies, Discharge(Water).
Identifiers: *Dilution gaging, *Changing discharges, Continuous injection, Digital simulation, Gaging accuracy.

The theory of the continuous injection method of dilution gaging requires that the stream discharge remains constant during the gaging. In this paper the effect of changing discharge was studied using a model based on the residence time of fluid elements in the gaging reach, and digital simulation showed that the systematic error caused by changing discharge is greatest at the start of storm runoff where the error, which is negative in sign, may be in excess of 60% of the discharge for steeply rising hydrographs. Dilution gaging is accurate when performed on the recession limb of a hydrograph, less so when performed late on the rising limb, and most unreliable immediately after the start of a storm hydrograph. (Morris-ISWS)
W76-10935

APPLICATION OF FINITE ELEMENT METHOD TO OPEN CHANNEL FLOW,
Agricultural Univ., Wageningen (Netherlands). Dept. of Hydraulics and Catchment Hydrology.
For primary bibliographic entry see Field 8B.
W76-10939

EFFECT OF VEGETATION ON LATERAL MIGRATION OF ANASTOMOSED CHANNELS OF A GLACIER MELTWATER RIVER,
Calgary Univ., Alberta. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-10940

A DISCRETE LINEAR CASCADE MODEL FOR HYDROLOGY,
University Coll., Galway (Ireland).
K. M. O'Connor.
Journal of Hydrology, Vol. 29, No. 3/4, p 203-241, April 1976. 6 fig, 13 ref.

Descriptors: *Model studies, *Unit hydrographs, *Flood routing, *Synthetic hydrology, *Time series analysis, Hydrologic data, Analytical techniques, Parametric hydrology, Mathematical studies, Hydrology, Reservoirs.

Identifiers: *Linear cascade model, White noise, ARMA-type model.

The discrete analogies of the classical Muskingum and the equal-reservoir cascade models were compared with the ARMA-type models used in the generation of synthetic time series. Applying the cascade concept to the ARMA-type difference equation and including a pure translation parameter, a family of discrete linear parametric models were developed. Expressions were derived for the direct estimation of model parameters by cumulants for the general input-out case and for the special case of a white-noise input. The family of models can be applied in unit-hydrograph analysis, in flood routing, and in the generation of synthetic time series. The general ARMA-type cascade model was shown to be flexible, parsimonious, and applicable to the three areas of hydrology where linear models are used. (Singh - ISWS)
W76-10946

STEADY LAMINAR FLOW IN A STATIONARY TANK WITH A SPINNING BOTTOM,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 8B.
W76-11062

TECHNIQUES FOR ESTIMATING FLOOD DEPTHS FOR OKLAHOMA STREAMS,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 4A.
W76-11075

HYDROLOGIC EFFECTS OF STORMS OF JUNE 24-28, 1974 IN LEE AND COLLIER COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-11077

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON MOHAWK RIVER IN TOWNS OF FRANKFORT AND SCHUYLER, HERKIMER COUNTY, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 4A.
W76-11079

FLOOD FREQUENCY OF MISSISSIPPI STREAMS,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 4A.
W76-11083

APPLICATION OF SIMPLE DAM BREAK ROUTING MODEL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-11084

SIMPLIFIED ROUTING OF DAM BREAK WAVES,
Geological Survey, Bay St. Louis, Miss., and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-11085

2F. Groundwater

AN EMPIRICAL NA-K-CA GEOTHERMOMETER FOR NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W76-10598

CONFORMITY OF GROUNDWATER RECHARGE RATE BY TRITIUM METHOD AND MATHEMATICAL MODELLING,
National Geophysical Research Inst., Hyderabad (India).
B. S. Sukhija, and C. R. Shah.
Journal of Hydrology, Vol. 30, No. 1/2, p 167-178, May 1976. 4 fig, 2 tab, 16 ref.

Descriptors: *Groundwater recharge, *Tritium, *Mathematical models, Aquifers, Hydrologic data, Hydrologic budget, Isotope studies, Diffusion, Hydrogeology, Groundwater, Evapotranspiration, Equations.
Identifiers: *India(Gujarat).

Environmental tritium profiles studied over an interval of two years in a semi-arid region of western India (Gujarat) have been utilized to evaluate groundwater recharge to unconfined and confined aquifers. The recharge rate (11% of local rainfall) determined for confined aquifers for a part of the selected area using a diffusion-type unsteady groundwater flow model was in fair agreement with that determined using the tritium method. The tritium method wherever applicable has the advantages of being direct, fast, economical and does not require much hydrological data. (Visocky - ISWS)
W76-10700

WATER TRACING IN TROPICAL REGIONS, THE USE OF FLUOROMETRIC TECHNIQUES IN JAMAICA,
Bristol Univ. (England). Dept. of Geography.
P. L. Smart, and D. I. Smith.
Journal of Hydrology, Vol. 30, No. 1/2, p 179-195, May 1976. 3 fig, 5 tab, 26 ref.

Descriptors: *Tracers, *Fluorescent dye, *Dyes, *Tracking techniques, Tropical regions, Rhodamine, Dye dispersion, Fluorescence, Indicators, Water properties, *Groundwater movement, Karst, Water sources, Analytical techniques, Analysis, Organic compounds, Suspended solids, Path of pollutants.
Identifiers: *Water tracing, *Fluorometric techniques, *Jamaica, Spore tracing techniques, Optical brighteners.

Fluorescent dyes have been widely used in temperate latitudes for the tracing of karst groundwater. These tracers have been much less satisfactory in tropical karst areas, and are far less successful than Lycopodium spore tracing techniques. Quantitative tests were carried out on six fluorescent tracers in a surface stream in central Jamaica. Tracer concentrations were used in conjunction with discharge measurements to determine tracer losses under field conditions. Rhodamine WT and Lissamine FF proved to be the most successful dyes but Fluorescein also proved satisfactory under conditions with little direct sunlight. The optical brighteners Photine CU and Photine CSP showed large losses in the study reach. An underground test along a previously proven connection supported the findings of the surface tests. Two successful groundwater traces were completed in the North St. Catherine Basin, the first 30 km long using Rhodamine WT and the second over 14 km using Photine CU. The latter indicated that Photine CU was useful for the establishment of flow paths despite its relatively poor persistence. The conclusions were that selected fluorescent dyes are suitable for water tracing in tropical limestone regions provided a sensitive fluorometer is used for the analysis. The use of activated charcoal detectors is not recommended but the effects of suspended sediment and bacteria in the stream water are not thought to be limiting factors. A detailed comparison, including costings, of dye tracing and spore methods was given. (Henley - ISWS)
W76-10701

INVESTIGATION OF THE HYDROLOGIC CHARACTERISTICS OF TALUS,
I. S. Sosedov.
Soviet Hydrology: Selected Papers, No. 6, p 414-424, 1974. 3 fig, 2 tab, 5 ref. Translated from Transactions of the Kazakh Hydrometeorological Scientific Research Institute, (Trudy Kaz-NIGMI), No. 50, p 3-19, 1973.

Descriptors: *Talus, *Hydrology, *Geomorphology, Asia, Erosion, Rocks, Weathering, Degradation(Slope), Particle size, Mountains, Slopes, Hygroscopic water, Elevation, Avalanches, Albedo, Mudflows, Subsurface runoff, Thermal radiation, Porosity, Moisture content, Snowpacks.
Identifiers: Hygrothermal regimes, USSR.

An investigation of the hydrologic effect of talus was conducted between 1968 and 1971 on the northern slope of the Trans-Ili Ala-Tau in Soviet Central Asia. Particle-size distribution and morphology of taluses, the accumulation and movement of water, radiation condition, and the annual and daily cycles of hydrothermal conditions above and inside a talus were studied. The results of the investigations showed that taluses, which are widespread in many mountain regions, have some significant water exchange characteristics that depend on petrographic composition, origin, rock size, and regional climatic conditions. Taluses prevent water erosion and wind transport of snow, the formation of snow avalanches, floods and mudflows, regulate runoff by changing it into subsurface runoff, and considerably reduce evaporation losses. The hydrophysical and hydrologic properties of taluses vary regularly and substantially with absolute elevation and slope exposure. (Visocky - ISWS)
W76-10706

GROUNDWATER AVAILABILITY IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-10718

PUBLIC GROUNDWATER SUPPLIES IN MCHENRY COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-10719

AN ANALOG MODEL OF THE CHIPUXET AQUIFER, RHODE ISLAND,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
W. E. Kelly.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 767, $3.50 in paper copy, $3.00 in microfiche. Completion Report, (1976). 21 p, 6 fig, 13 ref. OWRT A-056-RI(2), 14-31-0001-6041.

Descriptors: *Computer models, Streambeds, Infiltration, Analog computers, Digital computers, *Model studies, *Groundwater, *Analog models, *Aquifers, *Rhode illsland, Streamflow, *Surface-groundwater relationships.
Identifiers: *Chipuxet aquifer(RI).

Analog and digital models of the Chipuxet aquifer were designed, constructed and verified. Steady-state response was matched both to the late summer (1959) water table and the observed baseflow-(recharge) water level relation on a monthly basis; the observed and predicted baseflow-water level relation are in good agreement for the drier months. The model was then applied to test a typical development scheme. The model performed satisfactorily but more study is needed to establish criteria for evaluating effects on streamflow. For evaluating stream depletion pl-reliminary results are presented which show that an evaluation of the response of the aquifer to a

step change in stream stage, which is easily done with the analog model, also gives the stream depletion response to a step change in pumping rate. This result if it is substantiated by further study greatly simplifies analog model measurements.
W76-10814

FIELD AND LABORATORY EVALUATION OF BI-LEVEL DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W76-10934

ROLE OF PRECIPITATION IN THE CHEMISTRY OF SUBSURFACE WATERS IN THE WESTERN PART OF THE TURGAY TROUGH,
R. M. Kurmangaliyev.
Soviet Hydrology, Selected Papers, No. 6, p 396-400, 1974. 2 tab, 11 ref. Translated from Transactions of the Institute of Hydrogeology and Hydrophysics, Academy of Sciences of the Kazakh SSR, Vol. 5, p 146-151, 1974.

Descriptors: *Subsurface waters, *Groundwater basins, *Water chemistry, *Precipitation(Atmospheric), *Fissures(Geologic), Groundwater movement, Geologic control, Infiltration, Groundwater recharge, Seepage, Leaching, Salts, Base flow, Zone of aeration Bicarbonates, Sodium, Chlorides, Melt water, Quaternary period.
Identifiers: *Russia, Troughs, Mantle.

The study area is on the western edge of the Turgay trough, at its boundary with the folded region of the Eastern Trans-Ural. The hydrogeological conditions are very complex, but most commonly the subsurface waters are associated with the upper fissured zone of metamorphic, sedimentary, effusive-sedimentary, and intrusive rock complexes of pre-Paleozoic to middle Palezoic age. These waters are of the fissure, fissure-karst, and fissure-vein type. Their main source of reharge is precipitation, especially in winter , but seepage of surface waters during high stages is also important. The fissure waters of Paleozoic and pre-Paleozoic rocks are mostly of the sodium chloride and chloride-hydrocarbonate sodium class, while the pore waters of the middle Oligocene and Quaternary deposits vary greatly in mineral content. The leaching of salts from the unconsolidated Quaternary mantle and from the weathering crust, as well as their supply with precipitation, are the main sources of salts in the fissured waters. (Visocky - ISWS)
W76-10942

SUBSURFACE WATERS OF EROSION TROUGHS IN THE AKTYUBA REGION OF THE URAL - A SOURCE OF DRINKING WATER SUPPLY,
Zh. S. Sydykov, I. B. Dal'yan, N. E. Zeyberlikh, and M. A. Mukhamedzhanov.
Soviet Hydrology, Selected Papers, No. 6, p 389-396, 1974. 3 fig, 2 tab, 11 ref. Translated from Transactions of the Institute of Hydrogeology and Hydrophysics, Academy of Sciences of the Kazakh SSR, Vol. 5, p 113-120, 1974.

Descriptors: *Subsurface waters, *Aquifers, *Mesozoic era, Water resources, Water supply, Geologic investigations, Porosity, Permeability, Geologic units, Structural geology, Electrical well logging, Water chemistry, Water quality, Water wells, Groundwater basins.
Identifiers: *Erosion troughs, *Russia, *Ural Anticlines.

Erosion troughs in Mesozoic deposits are very common in the Aktyuba region of the Ural. They are confined to the roofs of Paleozoic salt anticlines, and their formation is associated with the dissolution of halogenic-sulfate rocks of the Kungur formation by subsurface waters and the gradual subsidence of the overlying rocks. They developed particularly rapidly in the Lower and Middle Jurassic and Albian, and, therefore, these deposits are thickest in the central parts of the troughs. Recent geological-geophysical investigations have established that large aquifers are widespread in the Middle Jurassic and Albian sand deposits. These aquifers contain confined water suitable for drinking, agriculture, and large industrial enterprises. Preliminary computations suggest that these subsurface waters can be extensively used for water supply. (Visocky - ISWS)
W76-10943

GROUNDWATER,
Geological Survey, Reston, Va.
A. I. Johnson, and G. Meyer.
Review of Geophysics and Space Physics, Vol 13, No 3, p 455-458, p. 505-517, July 1975.

Descriptors: *Reviews, *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Bibliography, Surface-groundwater relationships, Pumping, Water pollution sources, Groundwater movement, Land subsidence, Zone of saturation, Water demand, Water supply.

Ground water resources are reviewed for the period 1971-1974. The attitude toward ground water changed during that time, with all phases of the water-interested community seeing ground water from new perspectives. Ground water became recognized more fully as an important natural resource worthy of formal management, regulation, and realistic conservation. Emphasis on predictive ground-water management and protection has resulted in greater need for quantitative data and understanding. Data acquisition and research activity has concentrated on aquifer storage and yield, artificial and natural recharge and discharge, and effects of development on the hydrology of urban and urbanizing areas. The expansion of water management practice has created greater attention on conjunctive development of surface and ground-water supplies and on multidisciplinary studies. Future trends in groundwater data-acquisition and research studies are expected to increase toward problems related to ground-water pollution, deep waste-disposal, and solid-waste or landfill operations. Studies will become increasingly interdisciplinary, with more concern with social, economic, and legal aspects of water planning and management. A selected list of about 500 important books and papers published on ground water during 1971-1974 is included with the paper. (Woodard-USGS)
W76-11066

THE SPARTA AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-11067

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-11068

CONSTRUCTION AND TESTING OF TWO WASTE-INJECTION MONITOR WELLS IN NORTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-11070

GROUND-WATER LEVELS IN NEW MEXICO, 1974,
Geological Survey, Albuquerque, N. Mex.
J. D. Hudson.
New Mexico State Engineer Basic-Data Report, Santa Fe, 1976. 112 p, 34 fig, 64 tab.

Descriptors: *Water levels, *Groundwater, *Observation wells, *Basic data collectiions, *New Mexico, Aquifers, Water level fluctuations, Hydrographs, Bibliographies, Publications.

Water levels are measured periodically in a network of about 1,400 observation wells in New Mexico to record changes in ground-water storage. The areas of water-level observation are within seven of the nine major surface-water drainage basins; most are in areas where ground water is used in large quantities for irrigation, municipal, or industrial purposes. Measurements tabulated in this report were made in January or February 1975 and reflect water-level changes during 1974 when compared with measurements made in January or February 1974. Included is a bibliography of papers and publications pertaining to ground water in New Mexico published or released to the open file in 1974, with additions from 1948-73, authored by R. L. Borton. (Woodard-USGS)
W76-11073

GEOHYDROLOGY OF THE ANZA-TERWILLIGER AREA, RIVERSIDE COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W76-11074

2G. Water In Soils

EFFECT OF CATTLE FEEDYARD RUNOFF ON SOIL INFILTRATION RATES,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 5B.
W76-10538

EFFECT OF SOIL-INCORPORATED DAIRY CATTLE MANURE ON RUNOFF WATER QUALITY AND SOIL PROPERTIES,
Agricultural Research Service, Auburn, Ala.
For primary bibliographic entry see Field 5B.
W76-10539

SORPTION CAPABILITIES OF SOILS FOR PHOSPHATE REMOVAL,
Ontario Ministry of the Environment, Toronto. Applied Science Section.
For primary bibliographic entry see Field 5D.
W76-10673

INVESTIGATION OF THE HYDROLOGIC CHARACTERISTICS OF TALUS,
For primary bibliographic entry see Field 2F.
W76-10706

TRANSPORT OF WATER AND HEAT IN A FROZEN PERMEAMETER,
Cornell Univ., Ithaca, N. Y. Dept. of Agronomy.
R. D. Miller, J. P. G. Loch, and E. Bresler.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1029-1036, November-December 1975. 4 fig, 1 tab, 16 ref. NSF GK-42050, Army DA-ENG-27021-72-G32.

Descriptors: *Frozen soils, *Permeameters, *Instrumentation, *Mass transfer, *Groundwater movement, *Soil water, Equations, Frozen ground, Ice, Convection, Heat transfer, Mathematical studies, Flow, Saturated flow.
Identifiers: *Water transport, *Heat transport, Mass transport, Frozen water, Ice sandwich, Claypeyron equation.

Transport of water in frozen soils is probably not restricted to fluid phases. In a frozen permeameter a series-parallel mode of transport should exist in which the ice phase may move with uniform translational velocity in a stationary pore system

formed by particles having adsorbed films of unfrozen water. A microscopic model for coupled mass and heat transport would be complex, but foundations for such a model were laid in an exercise which derives direct and cross coefficients for coupled transport equations applicable to a permeameter containing a simplified (nontortuous) 'soil' with uniform cylindrical channels, ice-filled except for films adsorbed at channel walls. Temperature dependence of coefficients, assuming Newtonian shear in the film, can be modeled using standard double-layer theory. It was shown that the resultant coefficients are relatively insensitive to temperature (film thickness) but are highly dependent on thermal conductivities of components. Identity of cross-coefficients in this mechanical model was demonstrated. Expressions for computing phenomenological soil coefficients from coefficients measured in a practical permeameter were given and a workable permeameter for such studies was postulated. (Prickett - ISWS)
W76-10713

LAND APPLICATION OF SEWAGE SLUDGE, III. NITRATE ACCUMULATION AND WHEAT GROWTH RESULTING FROM ADDITION OF SEWAGE SLUDGE AND WOOD WASTES TO SOILS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5E.
W76-10841

PREDICTING CONSUMPTIVE USE WITH CLIMATOLOGICAL DATA,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W76-10873

CAPILLARY HYSTERESIS AND THE RELATIONSHIP BETWEEN DRYING AND WETTING CURVES,
Connecticut Agricultural Experiment Station, New Haven.
J-Y. Parlange.
Water Resources Research, Vol. 12, No. 2, p 224-228, April 1976. 5 fig, 24 ref.

Descriptors: *Hysteresis, *Soil moisture, *Mathematical models, Theoretical analysis, Equations, Wetting, Drying, Pore water, Capillary action, Pores, Groundwater potential, Air-water interfaces, Boundary processes, Saturation, Sands, Silts, Loam, Soils, Microenvironment, Infiltration.
Identifiers: *Wetting scanning curve, *Drying scanning curve, Rubicon sandy loam, Caribou silt loam, Experimental results.

A simple microscopic model predicted the wetting and drying scanning curves from only one boundary of the main hysteresis loop. Comparison with experiments showed that if the shape of the drying scanning curves varies smoothly, then the drying boundary of the loop is indeed sufficient to predict all scanning curves. However, if the shape of the drying curves changes abruptly, the model is still applicable, but the drying boundary yields only the wetting scanning curves, and the wetting boundary yields only the drying scanning curves. For this case the model seems more reliable for predicting the scanning curves than for the application of interpolation techniques between the two boundaries. (Visocky - ISWS)
W76-10914

PULSED DISPERSION OF TRACE CHEMICAL CONCENTRATIONS IN A SATURATED SORBING POROUS MEDIUM,
Oregon State Univ., Corvallis. Dept. of Statistics; and Oregon State Univ., Corvallis. Dept.of Mathematics.
For primary bibliographic entry see Field 5B.
W76-10915

SEEPAGE FLOW THROUGH HOMOGENEOUS SOIL INTO A ROW OF DRAIN PIPES,
Waikato Univ., Hamilton (New Zealand). Dept. f Mathematics.
For primary bibliographic entry see Field 4A.
W76-10919

SOIL WATER MODELING I: A GENERALIZED SIMULATOR OF STEADY, TWO-DIMENSIONAL FLOW,
Agricultural Research Service, Columbia, Mo. North Central Region Watershed Research Center.
C. R. Amerman.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 3, p 466-470, May-June 1976. 6 fig, 21 ref.

Descriptors: *Soil water, *Model studies, *Computer models, *Soil water movement, Boundaries(Surfaces), Hydraulic conductivity, Pressure head, Numerical analysis, Darcys law, Unsaturated flow, Equations, Porous media, Theoretical analysis, Steady flow.
Identifiers: *Richards equation, Successive over-relaxation, Subsectioning, Finite-difference approximation.

A computational scheme was developed for solving the steady-state, two-dimensional form of Richards' equation using finite differencing. The successive over-relaxation method was used. The computer model developed for implementing the computational scheme was generalized using a technique called subsectioning, which allows application of the model, without internal modification, to a wide range of geometric shapes, hydraulic boundary conditions, and soil distributions. Unsaturated or saturated flow regions or those containing phreatic surfaces may be modeled. The nonlinear nature of Richard's equation was reflected in the overrelaxation coefficient which had a maximum rather than an optimum value. Values higher than maximum caused instability. (Visocky-ISWS)
W76-10933

WASTE APPLICATION TO SOILS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11042

BEEF CATTLE FEEDLOTS: IMPACT ON UNDERLYING SOIL,
Agricultural Research Service, Ft. Collins, Colo.
For primary bibliographic entry see Field 5B.
W76-11047

2H. Lakes

ECOLOGICAL VARIABILITY OF BREAM IN LITHUANIAN WATERS: 2. AGE AND GROWTH RATE, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parizitologii.
For primary bibliographic entry see Field 5C.
W76-10519

SOME DATA ON ZOOPLANKTON OF RESERVOIRS IN THE MARY AND CHARDZHOU REGIONS OF THE TURKMEN SSR, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Zoologii i Parazitologii.
Z. M. Zamaimuradova.
Izv Akad Nauk Turkm SSR Ser Biol Nauk. 6, p 74-75, 1974.

Descriptors: *Reservoirs, *Zooplankton, Biomass, *Analysis, Plankton, Copepoda, Crustaceans.
Identifiers: Alona-Rectangula, Asplanchna-Brightwelli, Brachionus-Bennini, Brachionus-Calyciflorus, Brachionus-Capsuliflorus, Brachionus-Quadridentatus, Euchlanis-Dilatata, Filinia-Longiseta, Keratella-Quadrata, Lecane-Luna, Monostyla-Bulla, Nitocra-Sp., Turkmen SSR, USSR, Rotatoria.

In the Mary and Chardzhou Reservoirs (USSR) 12 spp. of zooplankdton (Asplanchna brightwelli, Brachious calyciflorus, B. capsuliflorus, C. quadridentatus, C. bennini, Euchlanis dilatata, Keratella quadrata, Lecaneluna, Alona rectangula, Monostyla bulla, Filinia longiseta, Nitocra sp.) were recorded. Included were 10 spp. of Rotatoria; 1, Cladocera; and 1, Copepoda. The former predominate in zooplankton in quality and quantity. Their number varies from 40-10,000/m3, biomass from 0.08-33 mg/m3. Low rates of zooplankton development were recorded in the reservoirs of the Mary region during the spring-summer period.--Copyright 1976, Biological Abstracts, Inc.
W76-10520

SOME CHARACTERISTICS OF SPLEEN GROWTH IN THE LAKE MINNOW, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 2I.
W76-10521

REPORT OF KELLY'S FALLS POND, HILLSBOROUGH COUNTY, NEW HAMPSHIRE,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-10525

REPORT ON POWDER MILL POND, HILLSBOROUGH COUNTY, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-10526

REPORT ON GLEN LAKE, HILLSBOROUGH COUNTY, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-10527

REPORT ON SEBASTICOOK LAKE, PENOBSCOT COUNTY, MAINE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-10528

REPORT ON LAKE WINNEPESAUKEE, CARROLL AND BELKNAP COUNTIES, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-10529

ON THE CALCULATION OF THE MEAN RESIDENCE TIME IN MONOMICTIC LAKES,
Commission of the European Communities, Ispra (Italy). Joint Nuclear Research Center.
G. Rossi, V. Ardente, F. Beonio-Brocchieri, and E. Diana.
Hydrological Sciences Bulletin, Vol. 20, No. 4, p 575-580, December 1975. 1 fig, 1 tab, 6 ref.

Descriptors: *Lake morphology, Numerical analysis, *Thermocline, Epilimnion, Inflow, Stratified flow, Homogeneity, Basins, Oligotrophy, Lakes, Thermal properties.

LIBRARY U. OF L. UNIVERSITY CAMPUS

Identifiers: *Residence time(Lake water), *Monomictic lakes, *Lake Maggiore(Italy), *Lake Lugano(Italy), Dilution coefficient, Pluriannual cycle.

A general method for the calculation of the mean residence time of water in monomictic lakes of simple morphometry was worked out on the same physical assumptions as those made by Piontelli and Tonelli (1964). After a short outline of the mathematical foundation of the method, the numerical procedure was presented on which the computer code for the determination of the mean residence time was based. Finally some examples of the application of the method to Lake Maggiore and to a lake of complex morphometry (Lake of Lugano) were presented and discussed. (Roberts - ISWS)
W76-10704

DISTRIBUTION OF STREAM POLLUTION IN LAKE WATER,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W76-10712

A NORMAL MODE METHOD FOR PREDICTING STORM SURGES ON A LAKE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
D. J. Schwab.
Special Report No. 20, November 1975. 63 p, 15 fig, 3 tab, 19 ref, 2 append. NSF GA-32204.

Descriptors: *Storm surge, *Forecasting, *Tidal energy, Mathematical studies, *Lake Ontario, *Energy dissipation, *Great Lakes, Numerical analysis, Energy equation, Lakes, Surface waters, Waves(Water), Flow, Hydraulics, Mathematics, Equations, Winds, Atmospheric pressure, Water levels.
Identifiers: *Normal mode method, Lake energy, Finite difference method, Tidal forcing, Grid-disperson, Lake oscillations, Dynamical equations.

A mathematical procedure for determining the two-dimensional time-dependent response of a rotating lake with arbitrary topography was presented. The procedure depends on prior knowledge of the normal modes of oscillation of the lake. These may be found numerically for an arbitrary lake by the method of Rao and Schwab (1974). The space-dependent part of the forced solution is represented by an expansion in terms of the spectrum of normal modes. This results in a system of uncoupled first-order inhomogeneous differential equations which depend only on time and can be solved simply and efficiently by implicit numerical integration. The normal mode method avoids the problem of grid-dispersion inherent in the traditional approach of direct finite difference integration of the governing equations on a numerical space-time grid. It is also more economical in terms of computation time than the finite difference method, and provides physical insight by determining exactly how the total energy of the lake is distributed among the individual modes. Results of the application of this technique to an ideal rectangular basin compared well with the solution by a finite difference technique. Favorable comparisons were also obtained for a natural basin, Lake Ontario, subjected to a uniform wind stress and a natural wind stress. The computational efficiency of the normal mode technique is evident in all cases. An appendix compares the results of these two-dimensional methods to the solution of the channel equations for Lake Ontario with uniform wind stress. (Henley - ISWS)
W76-10715

TROPIC STATUS OF SELECTED NORTHERN NEW MEXICO LAKES,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10808

A SIMULATION MODEL OF TRITIUM KINETICS IN A FRESHWATER MARSH,
Ohio Cooperative Wildlife Research Univ, Columbus.
For primary bibliographic entry see Field 5B.
W76-10812

SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS: FINAL REPORT,
Stanford Univ., Calif. Dept. of Civil Engineering.
R. L. Street.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 764, $4.50 in paper copy, $3.00 in microfiche. Technical Report No. 203, January 1976, 44 p, 18 fig, 25 ref. OWRT C-3033(No 3675)(3).

Descriptors: Path of pollutants, Themocline, *Thermal pollution, *Lakes, *Computer models, *Reservoirs, Numerical analysis, Digital computers, *Simulation analysis, Circulation, Thermal stratification, Model studies, Mathematical models, Hydrodynamics, Reviews, *Hydraulic models, Dimensional analysis.
Identifiers: Hydrostatic models.

The work led to development of (i) a time-dependent, three-dimensional numerical model which simulates the hydrodynamic and thermal regime of lakes and reservoirs and (ii) a two-dimensional (horizontal-vertical) hydrostatic numerical model for simulation of hydrodynamics and thermal regimes(e.g., thermocline development) in long and narrow reservoirs and lakes. Both models employ MAC space-staggered grids, explicit time-stepping, the Boussinesq approximation, and a spatially-and time-variant eddy viscosity model. A literature review establishes the range of successful, numerical finite-difference, three-dimensional models that are available. The conclusions suggest that three-dimensional hydrostatic models and laterally-averaged two-dimensional models provide the best opportunities for economic and quantitatively accurate simulations.
W76-10813

DEVELOPMENT OF A WATER QUAITY SIMULATION MODEL APPLICABLE TO GREAT SALT LAKE, UTAH,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5B.
W76-10815

SOME WATER QUALITY ASPECTS IN A NASCENT IMPOUNDMENT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5B.
W76-10950

BACTERIOPLANKTON AND ITS SIGNIFICANCE IN THE BIOPRODUCTIVITY OF THE RESERVOIRS, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-10969

MARKED DIMINUTION OF DISSOLVED OXYGEN IN THE HYPOLIMNION OF LAKE BIWA IN AUGUST, 1973, (IN JAPANESE),
Nara Women's Univ. (Japan). Zoological Inst.
For primary bibliographic entry see Field 5C.
W76-10976

ZOOPLANKTON OF LAKES OF THE BOL'SHEZEMEL-SKAYA TUNDRA, (IN RUSSIAN),
Ministerstvo Selskogo Khozyaistva, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W76-11056

BOG STRATIGRAPHY, RADIOCARBON DATES, AND PINEDALE TO HOLOCENE GLACIAL HISTORY IN THE FRONT RANGE, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2C.
W76-11071

2I. Water In Plants

SOME CHARACTERISTICS OF SPLEEN GROWTH IN THE LAKE MINNOW, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
I. N. Brusynina.
Ekologiya. 6(2), p 86-88, 1975.

Descriptors: *Lakes, *Fish genetics, *Fish populations, *Fish physiology, *Minnows, Growth rates.
Identifiers: Minnow, Phoxinus-Percnurus, *Spleen(Fish).

The Lake minnow Phoxinus percnurus was investigated in the foothills of the Polar Urals. The relative weight of the spleen decreases with age. The minnow responds to unfavorable environmental conditions by an increase of weight of the spleen. Sexual dimorphism with respect to relative spleen weight was not displayed clearly. Differences in the weight of the spleen of minnows of the same age and sex in different years can be attributed to the population density.--Copyright 1976, Biological Abstracts, Inc.
W76-10521

PRODUCTION RESPONSE OF THE BLUEGILL SUNFISH, LEPOMIS MACROCHIRUS RAFINESQUE, TO ADDED ATTACHMENT SURFACE FOR FISH-FOOD ORGANISMS,
North Carolina Cooperative Sport Fishery Unit, Raleigh.
G. B. Pardue.
Trans Am Fish Soc. 102(3), p 622-626, 1973.

Descriptors: *Sunfishes, *Fish food organisms, Fertilization, Fish reproduction, Nitrogen, Potassium, Phosphorus, Fish diets.

Bluegill sunfish, L. macrochirus, were stocked at a rate of 20,000/ha into 40 plastic pools, each 3 m in diameter, containing water to a depth of 76 cm. Added attachment surfaces (yellow pine boards) for fish-food organisms were placed in 36 plastic pools in amounts corresponding to 20, 40, 60, 80, and 100% of the water surface area. Fertilizers with 8-8.2 (N-P-K), 0-8-0 (N-P-K) and a control with no fertilizer were used throughout the study. The addition of pine boards resulted in linear increases in both fish food and fish production. Significant increases occurred when additions of attachment surface equal to the surface area of the pool were added. Complete (8-8-2, N-P-KO fertilization produced the greatest weight of macroinvertebrates and bluegills.--Copyright 1974, Biological Abstracts, Inc.
W76-10522

UPSTREAM CHANGES IN FISH POPULATIONS FOLLOWING IMPOUNDMENT OF SAGEHEN CREEK, CALIFORNIA,
California Univ., Berkeley. School of Forestry and Conservation.
D. C. Erman.
Trans Am Fish Soc. 102(3), p 626-629, 1973.

Descriptors: *Fish populations, *California, Impoundments, Streams, Trout, Rainbow trout, Fish physiology.
Identifiers: Brook, Brown, California, Catostomus-platyrhynchus, Catostomus-tahoenis, Creek, Fish, Impoundment, Populations, Rainbow, Sagehen, Trout, Upstream, USA, Whitefish, Sagehen Creek(Calif).

Fish populations were compared before (1952-1961) and after (1970-1972) construction of Stampede Reservoir in a mile of Sagehen Creek (California USA) above the reservoir. Relative abundance and species composition were quite different after reservoir construction. Suckers (Catostomus platyrhynchus and C. tahoensis) are now numerically dominant (79% of all fish); whereas, formerly they made up 18% (by numbers) of the fish composition. Rainbow trout have increased, but brown trout and whitefish have decreased; brook trout have not been collected since impoundment. Reservoir construction is the only major change in the Sagehen Creek watershed.--Copyright 1974, Biological Abstracts, Inc.
W76-10619

PLANT MEASUREMENTS AS INDICATORS OF CROP WATER DEFICIT,
Southwestern Great Plains Research Center Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-10622

DIEL CHANGES IN THE FEEDING ACTIVITY AND FOOD HABITS OF THE SPOTFIN SHINER, NOTROPIS SPILOPTERUS (COPE),
Eastern Michigan Univ., Ypsilanti. Dept. of Biology.
S. T. White, and D. C. Wallace.
Am Midl Nat. 90(1), p 200-205, 1973.

Descriptors: Shiners, Dill migration, Fish diets, Diptera, Michigan, Fish food organisms.
Identifiers: Notropis-spilopterus, Spotfin shiner, Trichoptera.

A study of the diel changes in the feeding activity of N. spilopterus in the Huron River near Ann Arbor, Michigan, was based on samples taken at 3-h intervals for 24 h. The food in the stomachs of 263 spotfin shiners was examined. Based on stomachs with food, Trichoptera larvae, represented mainly by hydropsychids, accounted for the greatest volume (33%). Diptera larvae, represented by simulids and chironomids, were most frequent (50%). Both of these food items occurred in a high percentage of stomachs (54%). The major peak in stomach fullness occurred at 9:00 PM when 74% of all stomachs were 50% full. Most stomachs from fish collected at midnight were empty (85%). Feeding activity increased by 6:00 AM, but at a relatively low intensity. Fewer fish were feeding at noon than at 6:00 AM. However, at noon the feeding intensity was somewhat greater. During the day, especially at noon, smaller fish were feeding more intensely than larger fish. Both Trichoptera and Diptera larvae constituted an important proportion of the food through most of the daylight hours. Trichoptera larvae were much less important at dusk than Diptera larvae.--Copyright 1973, Biological Abstracts, Inc.
W76-10816

LIFE HISTORY AND ECOLOGY OF MEGARCYS SIGNATA (PLECOPTERA: PERLODIDAE), MILL CREEK, WASATCH MOUNTAINS, UTAH,
Utah Univ., Salt Lake City. Dept. of Biology.
M. R. Cather, and A. R. Gaufin.
Great Basin Naturalist, Vol. 35, No. 1, March 1975, p 39-48, 7 fig, 1 tab, 20 ref. EPA-5T2-WP-542-03.

Descriptors: Ecology, *Life history studies, *Stoneflies, *Growth rates, Feeds, Temperature, Utah, Diptera.
Identifiers: *Megarcys signata.

Nymphs of Megarcys signata were collected at least monthly from June 1971 to December 1972 at each of 6 stations. A comparison of the cumulative growth at all stations showed that the most rapid growth occurred at the warmest stations. Periods of maximum absolute growth corresponded to maximum carnivorous feeding. Chironomids seemed to be the preferred food item. Significant seasonal differences in food items were found in the guts of samples taken. Emergence began in early May and lasted until late June with peak emergence occurring in June. (Chilton-ORNL)
W76-10887

YIELD AND REMOVAL OF NUTRIENTS BY OAT PLANTS DEPENDING ON FERTILIZER RATES AND SOIL MOISTURE CONTENT, (IN BELORUSSIAN),
For primary bibliographic entry see Field 3F.
W76-10962

GERMINATION OF WEED SEEDS DEPENDING ON SOIL MOISTURE AND DENSITY, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W76-10965

2J. Erosion and Sedimentation

TRANSPORT OF CHLORINATED HYDROCARBONS IN SEDIMENTS OF THE UPPER CHESAPEAKE BAY,
Westinghouse Oceanic Div., Annapolis, Md.
For primary bibliographic entry see Field 5B.
W76-10607

POLLUTIONAL EFFECTS OF SUSPENDED, SEDIMENTED AND ERODED PARTICULATE MATERIAL IN THE AQUEOUS ENVIRONMENT,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5C.
W76-10663

THE EVAPORATION AND SEDIMENTATION IN MAN-MADE ARADE LAKE, SOUTHERN PORTUGAL,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 2D.
W76-10703

THE ABILITY OF DEBRIS, HEAVILY FREIGHTED WITH COARSE CLASTIC MATERIALS, TO FLOW ON GENTLE SLOPES,
Stanford Univ., Calif. Dept. of Geology.
J. D. Rodine, and A. M. Johnson.
Sedimentology, Vol. 23, No. 2, p 213-234, April 1976. 12 fig, 1 tab, 34 ref. USGS 14-08-001-10884, Army DA-ARA-D-31-124-71-G158.

Descriptors: *Sediment transport, *Debris avalanches, Sediments, Sedimentology, Coarse sediments, Particle size, Alluvial fans, Slopes, Fine aggregates, Sands, Friction, Detritus, Model studies, Laboratory tests, Strength, Density.
Identifiers: *Debris flow, Particle interlocking, Debris strength, Spherical particle model.

The paper described how debris charged with coarse granular material can transport large blocks, yet flow on gentle slopes. Experimental results of mixing sand-sized particles with a slurry of clay plus water indicated that 45-55 vol. % of a single size, and up to 64% of two selected sizes, can be added before interlocking occurs. Theoretical analysis of multi-size classes suggested that 89 to more than 95 vol. % debris can be clastic materials without significant particle interlocking. The clay fraction plays a critical role in determining strength properties of debris. The mixture of clay plus water provides a cohesive slurry that supports fine-grained particles within the debris and reduces the effective normal stresses between the particles. The increased unit weight of the clay plus water plus fine-grained particles allows the support of coarser grained particles. The pyramiding upon the clay-water slurry continues until the entire debris mass is supported in a virtually frictionless position because of the reduced effective normal stress and the lack of particle interlocking. The ability of debris flows to support large blocks can be understood in terms of the high unit weight of the displaced debris plus the strength of the fluid phase. Also, the ability of coarse clastic debris to flow on gentle slopes probably is a result of poor sorting of debris-flow materials which contain minor amounts of clay. (Lee - ISWS)
W76-10711

ON ROLLING-GRAIN RIPPLES,
Cambridge Univ. (England). Dept. of Engineering.
J. F. A. Sleath.
Journal of Hydraulic Research, Vol. 14, No. 1, p 69-81, 1976. 6 fig, 1 tab, 10 ref.

Descriptors: *Sediment transport, *Waves(Water), River beds, Laboratory tests, Boundary layers, Hydraulics, Fluid mechanics, Wavelengths.
Identifiers: *Rolling-grain ripples, Vortex ripples.

Analytical relations were derived for the wavelength of rolling-grain ripples formed by the action of water waves. Experiments with a tray of sediment oscillated in a tank of still water were reported. A theoretical investigation which was based on potential flow and the additional account of the variation of velocity in viscous boundary layer was also reported. Based on the experimental data, the relationship between ripple wavelength and median grain diameter of sediment, Reynolds number, water and sediment specific gravity and wave period were established. A regression equation was developed. The results indicated that, as the intensity of flow increases, sediment exchange between adjacent crests ceases to be neglible and ripple steepness decreases. At sufficiently high values of Reynolds number the vortex mechanism breaks down and the points should then follow the curve for rolling-grain ripples. (Lee - ISWS)
W76-10917

CHANNEL WIDTH AND THE RIFFLE-POOL SEQUENCE,
Lanchester Polytechnic, Coventry(England).
For primary bibliographic entry see Field 2E.
W76-10924

DEPOSITION IN UPPER PATUXENT ESTUARY, MARYLAND, 1968-1969,
Madison Coll., Harrisonburg, Va. Dept. of Geology.
For primary bibliographic entry see Field 4C.
W76-10925

EFFECT OF VEGETATION ON LATERAL MIGRATION OF ANASTOMOSED CHANNELS OF A GLACIER MELTWATER RIVER,
Calgary Univ., Alberta. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-10940

LOESS DISTRIBUTION BY VARIABLE WINDS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
R. L. Handy.

Geological Society of America Bulletin, Vol. 87, No. 6, p 915-927, June 1976. 12 fig, 3 tab, 35 ref, append.

Descriptors: *Soils, *Sedimentation, *Loess, *Winds, Wind erosion, Wind velocity, Dusts, Dust storms, Distribution patterns, Equations, Variability, Sampling, On-site data collections, Model studies, Mathematical models.
Identifiers: *Loess distribution, *Variable winds, Loess thickness, Settling rate, Dust deposits.

Systematic decreases in loess thickness with distance from the source, usually considered to reflect a prevailing wind direction, may relate to variable wind directions. If winds blowing transverse to a linear source carry their load to a farthest distance, winds blowing at an angle to the source will distribute their load over a reduced distance, leading to a proportionate increase in thickness by a factor of the cosecant of wind blowing angle. Thus where wind blowing angle is small, for winds nearly parallel to the source, deposition should be limited to a narrow corridor adjacent to the source, leading to greater accumulations in this area. Representation of random wind directions by integration of the thickness equation gave a liner relationship between thickness and the logarithm of distance, as observed empirically along loess traverses and in sampling near dusty roads. Addition of a moderate prevailing wind to the variable wind model preserved the semilogarithmic thickness relation on the downwind side of the source but reduced thicknesses on the upwind side and substituted a nearly linear relationship between thickness and distance from the source. Loess thickness contours should be approximately parallel to the source regardless of the prevailing wind direction. The contours bulge outward adjacent to wider source areas, probably because of increased dust concentrations in the air. The variable wind hypothesis does not fully account for extraordinary thicknesses of loess within a few miles of the source. These extraordinary thicknesses appear to relate in part to a still-rising dust cloud and increased low-level dust concentrations in air close to the source. (Lee - ISWS)
W76-10941

SUBSURFACE WATERS OF EROSION TROUGHS IN THE AKTYUBA REGION OF THE URAL - A SOURCE OF DRINKING WATER SUPPLY,
For primary bibliographic entry see Field 2F.
W76-10943

THE IMPACT OF HIGHWAY CONSTRUCTION ON A NORTH FLORIDA WATERSHED,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5B.
W76-10945

TIDE-INDUCED MASS TRANSPORT; A FLUSHING MECHANISM FOR SHALLOW LAGOONS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2L.
W76-10947

ESTIMATED EROSION RATES ON MOUNT RAINIER, WASHINGTON,
Washington Univ., Seattle. Dept. of Geological Sciences.
H. H. Mills.
Geology, Vol. 4, No. 7, p 401-406, July 1976. 3 fig, 2 tab, 20 ref.

Descriptors: *Erosion, *Sedimentation rates, *Washington, *Erosion rates, Sediment yield, Reservoir silting, Suspended load, Mountains, Rockslides, Melt water, Streams, Mudflows, Volcanoes.
Identifiers: *Mount Rainier(Wash), Debris loads, Lahars.

Denudation rates on Mount Rainier, Washington, were determined by estimating dissection of the original landform, volumes of glacial and lahar deposits, present sediment loads of meltwater streams, reservoir sedimentation rates, and superglacial debris loads. Rates are generally as great or greater than rates in other glaciated basins. The highest rates (3000 to 8000 mm/1000 yr) were indicated by stream-sediment loads and reservoir sedimentation; however, modern stream-sediment loads may be abnormally great because of the exposure of large amounts of unstable debris by twentieth-century glacier retreat. Catastrophic events, including lahars and large rockfalls, account for a substantial part of the total erosion. (Lee - ISWS)
W76-10951

SEDIMENTATION PROCESSES INVOLVING HYDROCARBONS IN THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5B.
W76-11012

2K. Chemical Processes

AN EMPIRICAL NA-K-CA GEOTHERMOMETER FOR NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
R. O. Fournier, and A. H. Truesdell.
Geochim Cosmochim Acta. 37(5), p 1255-1275, 1973.

Descriptors: *Sodium, *Potassium, *Calcium, *Thermometer, Instrumentation, Natural water, Temperature, Energy, *Geothermal studies, Water analysis, Analytical techniques.
Identifiers: *Geothermometers, Water-rock interaction(Temperature).

An empirical method of estimating the last temperature of water-rock interaction was devised. It is based upon molar Na, K, and Ca concentrations in natural waters from temperature environments, ranging from 4-340C. The data for most geothermal waters cluster near a straight line when plotted as the function log (Na/K) + beta log ((Ca)/Na) vs. reciprocal of absolute temperature, where beta is either 1/3 of 4/3 depending upon whether the water equilibrated above or below 100C. For most waters tested, the method gives better results than the Na/K methods suggested by other workers. The ratio Na/K methods suggested by other workers. The ratio Na/K should not be used to estimate temperature if (MCa)/MNa is greater than 1. The Na/K values of such waters generally yield calculated temperatures much higher than the actual temperature at which water interacted with the rock. A comparison of the composition of boiling hot-spring water with that obtained from a nearby well (170C) in Yellowstone Park shows that continued water-rock reactions may occur during ascent of water even though that ascent is so rapid that little or no beat is lost to the country rock, i.e., the water cools adiabatically. As a result of such continued reaction, waters which dissolve additional Ca as they ascend from the aquifer to the surface will yield estimated aquifer temperatures that are too low. On the other hand, waters initially having enough Ca to deposit calcium carbonate during ascent may yield estimated aquifer temperatures that are too high if aqueous Na and K are prevented from further reaction with country rock owing to armoring by calcite or silica minerals. The Na-K-Ca geothermometer is of particular interest to those prospecting for geothermal energy. The method also may be of use in interpreting compositions of fluid inclusions.--Copyright 1974, Biological Abstracts, Inc.
W76-10598

ADVANCES IN INTERFACIAL PHENOMENA OF PARTICULATE/SOLUTION/GAS SYSTEMS; APPLICATIONS TO FLOTATION RESEARCH,
American Inst. of Chemical Engineers, N.Y.
For primary bibliographic entry see Field 5D.
W76-10627

IDENTIFICATION OF NUCLEI AND CONCENTRATIONS OF CHEMICAL SPECIES IN SNOW CRYSTALS SAMPLED AT THE SOUTH POLE,
Cold Regions Research and Engineering Laboratory, Hanover, N. H.
For primary bibliographic entry see Field 2C.
W76-10696

WATER RESOURCES DATA FOR WISCONSIN. PART 1. SURFACE WATER RECORDS. PART 2. WATER QUALITY RECORDS.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 7C.
W76-10832

RECENT DEVELOPMENTS IN CHEMICAL AEROSOL ANALYSIS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 5A.
W76-10910

WATER QUALITY CHARACTERISTICS OF THE ILLINOIS RIVER AT PEORIA,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5A.
W76-10922

AUTOMATED DETERMINATION OF CARBON IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-10936

MODIFIED CURCUMIN AND DIANTHRIMIDE METHODS FOR THE DETERMINATION OF BORON IN THE PRESENCE OF HIGH LEVELS OF NITRATE AND ORGANICS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-10937

ROLE OF PRECIPITATION IN THE CHEMISTRY OF SUBSURFACE WATERS IN THE WESTERN PART OF THE TURGAY TROUGH,
For primary bibliographic entry see Field 2F.
W76-10942

SUBSURFACE WATERS OF EROSION TROUGHS IN THE AKTYUBA REGION OF THE URAL - A SOURCE OF DRINKING WATER SUPPLY,
For primary bibliographic entry see Field 2F.
W76-10943

SOME WATER QUALITY ASPECTS IN A NASCENT IMPOUNDMENT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5B.
W76-10950

GROUND WATER QUALITY MONITORING FOR CALIFORNIA'S NEEDS,
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5A.
W76-11065

WATER-QUALITY INVESTIGATION, EEL RIVER, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-11069

VARIATION IN CONCENTRATION OF SELECTED WATER-QUALITY CONSTITUENTS IN THE SACRAMENTO RIVER AT BEND BRIDGE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-11078

U.S. GEOLOGICAL SURVEY WATER QUALITY MONITOR, OPERATIONS MANUAL,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 5A.
W76-11080

2L. Estuaries

PERIPHYTIC AND PLANKTONIC ALGAE OF THE LOWER FRASER RIVER IN RELATION TO WATER QUALITY CONDITIONS,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5C.
W76-10504

CHLORINATED HYDROCARBON RESIDUES IN FISHES FROM THE LOWER FRASER RIVER,
British Columbia, Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5C.
W76-10505

A FIN ROT DISEASE OF MARINE AND EURYHALINE FISHES IN THE NEW YORK BIGHT,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Sport Fisheries Marine Lab.; and National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-10524

ANNUAL CYCLE OF SPORTFISHING ACTIVITY AT A WARMWATER DISCHARGE INTO GALVESTON BAY, TEXAS,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
For primary bibliographic entry see Field 5G.
W76-10541

NATIONAL OCEAN POLICY: PRIORITIES FOR THE FUTURE,
Committee on Commerce (U. S. Senate). Committee on Commerce National Ocean Policy Study.
For primary bibliographic entry see Field 6E.
W76-10591

TRANSPORT OF CHLORINATED HYDROCARBONS IN SEDIMENTS OF THE UPPER CHESAPEAKE BAY,
Westinghouse Oceanic Div., Annapolis, Md.
For primary bibliographic entry see Field 5B.
W76-10607

POLYCHLORINATED BIPHENYLS OFF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W76-10647

SOME CONSIDERATIONS ON MONITORING OF TRACE METALS IN ESTUARIES AND OCEANS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5A.
W76-10653

MONITORING ESTUARINE CIRCULATION AND OCEAN WASTE DISPERSION USING AN INTEGRATED SATELLITE-AIRCRAFT-DROGUE APPROACH,
IIT Electro-Physics Lab., Inc., Columbia, Md.
For primary bibliographic entry see Field 5A.
W76-10671

EVALUATION OF WATER SAMPLES COLLECTED DURING LANDSAT-1 OVERPASSES OF THE LOWER CHESAPEAKE BAY AREA,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 5A.
W76-10672

DUMPING SEWAGE SLUDGE IN THE OCEAN.
For primary bibliographic entry see Field 5E.
W76-10674

HORIZONTAL RANDOM TEMPERATURE STRUCTURE OF THE OCEAN,
Naval Research Lab., Washington, D. C.
W. B. Moseley, and D. R. Del Balzo.
Journal of Physical Oceanography, Vol. 6, No. 3, p 267-280, May 1976. 15 fig, 5 tab, 27 ref.

Descriptors: *Oceans, *Temperature, *Mathematical studies, *On-site investigations, Least squares method, Correlation analysis, Buoyancy, Convection, Water temperature, Internal waves, Oceanography.

A theoretical model of the spatial spectrum of horizontally distributed thermal microstructure was developed for anisotropic turbulence. A two-term power law representation was obtained for the horizontal temperature spectrum which includes the influence of buoyancy and convective forces and which applies in a wavenumber range between internal waves and dissipation. The classical -5/3 power law due to inertial turbulence was combined with a -3 power law attributed to buoyancy forces. The spectral range was shown in perspective with the total temperature spectrum and explanations were given for the wide variety of single-term power laws measured in the field. Companion experimental data from 54 long horizontal tows at depths between 97.5 and 1454 m at two widely separated stations near Bermuda supported the predictions. Both the -5/3 and -3 predicted power laws were observed; the mean values were -1.68 and -2.94, respectively. (Sims - ISWS)
W76-10691

REPEATED PROFILING OF MICROSTRUCTURE LENSES WITH A MIDWATER FLOAT,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
G. O. Williams.
Journal of Physical Oceanography, Vol. 6, No. 3, p 281-292, May 1976. 14 fig, 1 tab, 20 ref.

Descriptors: *Oceans, *Temperature, *On-site data collections, *Pacific Ocean, On-site investigations, Instrumentation, Equipment, Surveys, Measurement, Internal waves, Oceanography.
Identifiers: *Temperature microstructure, Thermal structure.

A freely drifting, midwater float equipped with a buoyancy controller has been developed and used to obtain 20 m profiles of temperature gradient (about 0.02 m resolution) and temperature (about 0.5 m resolution) at about 6 min intervals. Thermal structure and internal wave motions from a 20 h record obtained at 550 m depth and 500 km offshore from Southern California were analyzed. Intense microstructure activity is episodic and concentrated into microstructure 'lenses.' Two of three lenses of increased microstructure activity found were associated with intrusions of about 5 m vertical and about 100 m horizontal scale. A third, much smaller and weaker lens was associated with a temperature step. A hint that microstructure intensity is modulated by low-frequency internal wave shear was also found. (Sims - ISWS)
W76-10692

BAROCLINIC INSTABILITY IN THE DENMARK STRAIT OVERFLOW,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
P. C. Smith.
Journal of Physical Oceanography, Vol. 6, No. 3, p 355-371, May 1976. 16 fig, 1 tab, 18 ref, 1 append.

Descriptors: *Model studies, *Overflow, *Straits, *Atlantic Ocean, Oceans, Flow, Temperature, Water temperature, Salinity, Density, Variability, On-site data collections, Current meters, On-site investigations, Circulation, Water circulation, Currents(Water), Mathematical models, Oceanography.
Identifiers: *Denmark Strait.

Current meter records and hydrographic data taken in the Denmark Strait overflow during a one-month experiment in August-September 1973 were analyzed. Mean conditions indicated that strong, cold overflow current existed throughout the experiment. The most outstanding feature of the velocity and temperature spectra was a strong peak at a period of 1.8 days. These oscillations appeared to amplify in the downstream direction and were highly correlated over the entire flow at the southern end of the Strait. Phase estimates indicated that velocity components are in quadrature, while the cross-stream perturbation heat flux acts to reduce the mean potential energy associated with the sloping isotherms. To explain the low-frequency variability, a quasi-geostrophic two-layer model for channel flow with a sloping bottom was developed. Using measured values of shear and other physical parameters, the model was found to be unstable over a limited range of wavelengths and frequencies. The most unstable wave is 80 km long and has a period of 2.1 days in close agreement with peaks in the current meter spectra. Furthermore, phase differences measured across the stream were found to be consistent with the propagation in the direction of the mean flow. The study concluded with a discussion of finite-amplitude aspects of the instabilities. (Sims - ISWS)
W76-10693

NUTRIENT TRANSPORTS THROUGH LANCASTER SOUND IN RELATION TO THE ARCTIC OCEAN'S REACTIVE SILICATE BUDGET AND THE OUTFLOW OF BERING STRAIT WATERS.
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W76-10717

ROOKERY BAY: ECOLOGICAL CONSTRAINTS ON COASTAL DEVELOPMENT,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10741

ABUNDANCE AND BIOMASS OF ZOOPLANKTON DURING THE SYNOPTIC INVESTIGATION OF THE SHALLOW INLETS TO THE SOUTH OF THE ZINGST PENINSULA (SOUTH

BALTIC) DURING MAY/JUNE, 1972. (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10817

MARINE MOLYSMOLOGY: THE PRIMARY PRODUCTION OF EXPERIMENTAL ECOSYSTEMS SET UP IN THE RANCE RIVER ESTUARY. EFFECT OF CRUDE OIL,
Marine Laboratory of General and Comparative Physiology, Paris, France.
For primary bibliographic entry see Field 5C.
W76-10830

EFFECTS OF THREE EMULSIFYING AGENTS AGAINST CRUDE OIL ON THE PRIMARY PRODUCTIVITY OF AN EXPERIMENTAL COMMUNITY OF BENTHIC DIATOMS,
Laboratoire de Physiologie des Etres Marins de l'Institut Oceanographique, Paris, France.
For primary bibliographic entry see Field 5C.
W76-10831

ENVIRONMENTAL REGULATION OF THE ANNUAL REPRODUCTIVE SEASON OF STRONGYLOCENTROTUS PURPURATUS (STIMPSON),
California Univ., Los Angeles. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10888

SURVIVAL OF HUMAN PATHOGENS IN THE MARINE ENVIRONMENT,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-10890

TRACE ELEMENT INTERACTIONS IN THE ESTUARINE ZONE OF THE ANASCO RIVER, PUERTO RICO,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-10892

METABOLISM OF MERCURY COMPOUNDS IN MICROORGANISMS,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5C.
W76-10894

PARTIAL DEPLETION OF SALINE GROUNDWATER BY SEEPAGE,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
J. C. Van Dam.
Journal of Hydrology, Vol. 29, No. 3/4, p 315-339, April 1976. 14 fig, 3 tab, 4 ref.

Descriptors: *Saline water intrusion, *Encroachment, *Saline water systems, *Hydrogeology, *Seepage, *Model studies, Land reclamation, Water table, Pumping, Freshwater, Recharge, Saline water, Groundwater.
Identifiers: *Netherlands, *Polders.

The geohydrologic conditions prevailing in the western part of the Netherlands, particularly the numerous so-called polders, were analyzed with respect to seepage of saline water. The polders are reclaimed lakes or parts thereof and have a land elevation of up to several meters below mean sea level. The groundwater levels in the polders are artificially controlled at depths of about 0.3 to 2 meters below land surface by means of embankments, sluices, and pumping stations. A highly schematized, one-dimensional model was developed to investigate the effects of reclamation of the deep polders. Seepage of saline water induced by reclamation of these polders was found to be of temporary nature. This temporary seepage comes from diminution of the volume of saline water present in the aquifer. The permanent seepage of saline water, currently recharged by sea water, increases with lower polder levels. The results of this model study indicated interesting tendencies, but more complicated models and study of transient effects are needed to interpret the actual field conditions. (Singh - ISWS)
W76-10920

DEPOSITION IN UPPER PATUXENT ESTUARY, MARYLAND, 1968-1969,
Madison Coll., Harrisonburg, Va. Dept. of Geology.
For primary bibliographic entry see Field 4C.
W76-10925

AN EXAMPLE OF THE MODIFICATION OF OCEAN CURRENTS BY BOTTOM TOPOGRAPHY,
New South Wales Univ., Kensington (Australia), School of Mathematics.
N. G. Barton.
Tellus, Vol. 28, No. 3, p 261-265, 1976. 3 fig, 12 ref.

Descriptors: *Model studies, *Ocean currents, *Topography, Mathematical models, Mathematics, Equations, Boundary layers, Circulation, Water circulation, Currents(Water), Oceans, Beds, Fluid mechanics, Oceanography.

A mathematical model was presented for steady currents in ocean basins which become deeper towards the poles. Relatively large currents occur in an interior layer at the line where d/(dy) (f/h) changes sign, (f is the Coriolis parameter, h the depth and y a northward co-ordinate). The flow in the interior layer was described quantitatively and the work thus complements some recent studies. (Sims-ISWS)
W76-10931

USE OF A TROPHODYNAMIC CHAIN OF THE BENTHIC TYPE FOR THE STUDY OF TRANSFERS OF METALLIC POLLUTANTS, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 5C.
W76-10944

TIDE-INDUCED MASS TRANSPORT; A FLUSHING MECHANISM FOR SHALLOW LAGOONS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
J. van de Kreeke.
Journal of Hydraulic Research, Vol. 14, No. 1, p 61-67, 1976. 1 tab, 5 ref, 1 append. NSF GK-32654.

Descriptors: *Sediment transport, *Coasts, *Lagoons, *Channels, *Tides, *Florida, Flow characteristics, Stress, Hydraulics, Ocean waves, Inlets(Waterways), Equations.
Identifiers: Mass transport, Flushing mechanism.

The mass transport accompanying tidal waves was investigated as a flushing agent for coastal channels and lagoons. Along the Florida coast, many coastal channels and lagoons have an elongated shape and nearly one-dimensional flow pattern. It follows from the dynamic equation that bottom stress associated with the mass transport serves to balance the gradient of the radiation stress and the net bottom stress associated with the tidal waves. The mass transport is a function of tidal amplitude and depth. It was shown that inlets can play an important role in the mass transport and that by properly selecting the inlet dimensions, the mass transport can be considerably increased. The tide-induced mass transport was shown to be an important mechanism in renewing the waters of shallow lagoons. (Singh - ISWS)
W76-10947

A TWO-DIMENSIONAL NUMERICAL MODEL OF ESTUARINE CIRCULATION: THE EFFECTS OF ALTERING DEPTH AND RIVER DISCHARGE,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
J. F. Festa, and D. V. Hansen.
Estuarine and Coastal Marine Science, Vol. 4, No. 3, p 309-323, May 1976. 12 fig, 14 ref.

Descriptors: *Model studies, *Estuaries, *Flow, Rivers, Streamflow, Mathematical models, Salinity, Discharge(Water), Equations, Analytical techniques, Circulation, Water circulation, Coasts, Tidal waters, Depth, Bays, Oceans, Hydrodynamics.
Identifiers: Two-dimensional models.

Steady-state numerical solutions were obtained for a two-dimensional, vertically stratified model of a partially mixed estuary. The boundary at the seaward end of the estuary was considered to be open, with the profiles of salinity, vorticity, and streamfunction obtained by extrapolating interior dynamics out to the boundary. A salinity source was maintained at the bottom at the mouth. Zero salt flux was required at a free-slip top and no-slip bottom boundary. Zero salinity and a parabolic velocity profile were maintained at the head of the estuary. A number of cases were run for various estuarine parameters, the river transport and Rayleigh number being the two parameters that have the most pronounced effect. The river transport was varied by adjusting the mean freshwater velocity, U sub f. Decreasing U sub f allows salt as well as the stagnation or null point to penetrate upstream. The estuarine circulation weakened, but expanded over a larger portion of the estuary. The position of the stagnation point, with respect to the seaward boundary, varied as U sub f to the (-5/8) power for U sub f greater than 1 cm/s and as U sub f to the (-5/6) power for U sub f less than 1 cm/s. Increasing the Rayleigh number, by deepening the estuarine channel, H, resulted in an increased circulation as well as strong intrusion of salinity and inward migration of the stagnation point. The horizontal location of the stagnation point was found to be proportional to Ra and therefore, varies as H cubed. (Sims- ISWS)
W76-10948

A MODEL FOR WATER AND PHOSPHORUS DISTRIBUTION ON THE ISLAND OF GOETEBORG, (IN SWEDISH),
Uppsala Univ. (Sweden).
For primary bibliographic entry see Field 5B.
W76-10963

OUTER CONTINENTAL SHELF RESOURCE DEVELOPMENT SAFETY: A REVIEW OF TECHNOLOGY AND REGULATION FOR THE SYSTEMATIC MINIMIZATION OF ENVIRONMENTAL INTRUSION FROM PETROLEUM PRODUCTS.
Assembly of Engineering Marine Board, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11001

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME II.
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-11007

DISPERSION OF DYED SEA-WATER DISCHARGED FROM MOVING VESSELS IN COASTAL WATERS,
Dobrocky Seatech Ltd., Victoria (British Columbia).
For primary bibliographic entry see Field 5B.
W76-11086

IDENTIFICATION AND POTENTIAL BIOLOGICAL EFFECTS OF THE MAJOR COMPONENTS IN THE SEAWATER EXTRACT OF A BUNKER FUEL,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5A.
W76-11099

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

FINAL REPORT, MATERIAL EVALUATION AND DEVELOPMENT PROGRAM, OSW SAN DIEGO TEST FACILITY,
Burns and Roe Construction Corp., Paramus, N. J.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 500, $7.75 in paper copy, $3.00 in microfiche. OWRT/S--76/50 May 1973. 215 p, 15 fig, 20 tab. DOI 14-30-3014.

Descriptors: *Desalination plants, *Flash distillation, Desalination apparatus, Corrosion, *Corrosion control, Treatment facilities, *Materials testing, *Measurement, Testing, Quality control, Steel, Alloys, Construction materials, Electrochemistry, Ultrasonics, Conductivity.
Identifiers: Corrosion measurement, Corrosometer, Corrator, Ultrasonic wall thickness measurement, Coupon weight loss.

Four plants at the San Diego Test Facility (SDTF) were studied for corrosion effects during 1972. The Clair Engle Plant (CEP) was the principal plant for corrosion and coatings testing. The methods of corrosion testing were ultrasonic wall thickness measurements, coupons, Corrater, and Corrosometer (these last two are electro-chemical devices). The results correlated well between the different techniques. Intensive corrosion data obtained in the CEP, Effect 1-A plant (E1A) multistage flash module (Module), and Vertical Tube Evaporator (VTEX) showed high carbon steel corrosion in all areas, particularly in the E1A and VTEX. From the results of observations and tests on materials at the SDTF, a list of recommended materials of construction for future distillation plants has been compiled.
W76-10552

FINAL REPORT, HORIZONTAL SPRAY FILM (HTEX) AND VERTICAL TUBE (VTEX) EVAPORATOR, OSW SAN DIEGO TEST FACILITY,
Burns and Roe Construction Corp., Paramus, N. J.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 501, $8.00 in paper copy, $3.00 in microfiche. OWRT/S--76/49 May 1973. 224 p, 54 fig, 21 tab, 5 append. DOI 14-30-3014.

Descriptors: *Desalination plants, Treatment facilities, *Evaporators, *Desalination apparatus, *Performance, Evaporation, *Thin films, Films, Heat transfer, Cost comparisons.
Identifiers: *Horizontal tube evaporators, *Vertical tube evaporators, *Horizontal spray films.

To investigate and verify horizontal tube evaporation (HTME) performance, construction was begun on the horizontal tube evaporator test vehicle (HTEX) at the San Diego Test Facility. The plant was designed and built by Aqua-Chem, Inc. This report summarizes the work carried out at the HTEX, since completion of the unit in October 1972. As a result of the phaseout of the San Diego Test Facility, performance testing was carried out on a 7-day, 3-shift basis to permit maximum data recovery. All performance data were obtained during the month of February 1973. HTEX operations ceased on March 2, 1973. The overall evaluation of the HTEX indicates the horizontal tube spray film process for seawater evaporation is very stable, feasible, and has a greater potential than the multistage flash distillation (MSF) process because the overall heat transfer coefficients for smooth tubes are about twice those of the MSF process and it suffers no submergence or nonequilibrium losses. The shell cost and therefore coating costs in the HTME are lower, and smaller pumps are required compared to the large recycle pumps in the MSF process. The HTME process is superior to the vertical tube multiple effect process if the premium price for the double fluted tube in the VTE is high. The HTME process still has however some problems, such as uniformly distributing the brine spray over large bundles, and uniformly distributing the vapor over the tubesheet in a large bundle.
W76-10553

WATER TRANSPORT ACROSS CATION-EXCHANGE MEMBRANE. I. EXPERIMENTAL TECHNIQUE. INFLUENCE OF THE CONCENTRATION AND TEMPERATURE ON THE WATER TRANSPORT NUMBER,
Rouen Univ. (France). Lab. of Macromolecular Chemistry.
M. Demarty, A. Maurel, and E. Selegny.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-16648, $3.50 in paper copy, $3.00 in microfiche. March, 1975. 24 p, 5 fig, 10 tab, 24 ref. Technical Translation NASA F-16, 169. Translated from Journal de Chimie Physique, Vol. 71, No. 6, p 811-818, 1974.

Descriptors: *Analytical techniques, *Cation exchange, *Electro-osmosis, *Water chemistry, Water temperature, Capillary action, Flow, Membrane processes, Ion exchange, Desalination.
Identifiers: *Water transport number.

An automatic method for measuring electro-osmotic flows was developed, derived from the capillary technique. A photoelectric system is used to observe the change of position of the meniscus in the capillary, and an electric voltage proportional to it is provided. Extremely small flows can be measured because the movements of the fluids can be amplified about 100-fold. The method was used to measure the water transport numbers of two cation-exchange membranes while varying the concentration of the solutions, the nature of the electrolytes, and the temperature. Current density did not influence the electro-osmotic flows when the solutions flooding the surface were sufficiently agitated. The water transport number increased at low current densities when there was no agitation. There was a strong dependence between water transport number and concentration between 0.01 and one N. The nature of the ion is important; smaller ions have a weaker effect. Increasing the concentration causes a considerable penetration of salt inside the membrane, which diminishes the effective charge of the membrane. The membrane also deflates, decreasing the hydraulic permeability. Measured water transport numbers were compared with those calculated with Manning's model for sodium chloride at different concentrations. A satisfactory semiquantitative agreement between the experimental and calculated values was obtained. However, the model cannot explain the polarization effects observed while measuring the water transport number as a function of current density under natural convection. (Snyder-FIRL)
W76-10620

OWRT INTEREST IN NEW TECHNOLOGIES FOR WATER TREATMENT,
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10677

MATERIALS FAILURE IDENTIFICATION MANUAL FOR SEA WATER DESALINATION PLANTS.
Aqua-Chem, Inc., Milwaukee, Wis.
Oak Ridge National Laboratory, Tennessee. Report ORNL/TM-5001, April 1976. 133 p. 92 fig. OWRT-ERDA 40-224-70.

Descriptors: *Desalination plants, *Corrosion, *Corrosion control, Materials, Materials engineering, *Failures, *Failure(Mechanics), Equipment, Pitting(Corrosion), Quality control, Cavitation, Fatigue(Mechanics), *Desalination apparatus.
Identifiers: *Materials failure.

Materials failure problems are presented as they relate to specific areas of desalination systems, especially corrosion problems. Photographs show examples of both normal conditions and failures as they might exist in desalination plants. The generic types of corrosion as characterized by a metallurgist or materials expert are discussed. Some commonly accepted mechanisms and terminology are used to give insight into how classical materials treatment and study may relate to problems of desalination systems. A complete photographic comparison section, showing actual desalting plant materials in many forms and conditions, is given. A variety of artist's sketches of typical parts of desalination plants is presented. The manual is a reporting form which provides for the description of the appearance and location of the materials failure, through the use of a coding system. The manual also provides both a discussion of field problems and commonly used repair techniques. Finally, it provides a convenient, consistent communications vehicle for description and discussion of materials failure problems. (OWRT)
W76-10880

GEOTHERMAL ENERGY RECOVERY PROCESS,
Bechtel International Corp., San Francisco, Calif.
L. Awerbuch, and C. T. Draney.
U. S. Patent No. 3,953,972, 6 p, 2 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 42, May 4, 1976.

Descriptors: *Patents, *Geothermal studies, *Thermal properties, *Thermal conductivity, Flash distillation, Multi-stage flash distillation, *Desalination, Desalination processes, Potable water, Brines, Separation techniques, Evaporators, Condensers, Heat exchangers.
Identifiers: Metal recovery.

A system and method is disclosed for utilizing the heat energy of the effluent from a geothermal well. The system includes a surface evaporator which allows a preheated distillate, freed of impurities, to be vaporized by the heat energy of the steam and/or brine from the geothermal well. The resulting vapor is used to drive a power unit such as a multi-stage turbine. The vapor exhausted from the power unit is condensed by any of a number of conventional means. A portion of the condensate is then recycled through the system, where it becomes the direct contact condensing medium for the vapor produced by flashing hot geothermal brine in a multi-stage flash evaporator through which the brine and the condensate are passing countercurrently. The vapor thus condensed augments the recycled condensate and, together, they constitute the distillate entering the surface evaporator and carrying with it the heat energy extracted from the brine in the flash evaporator. The remainder of the condensate from the condenser may be withdrawn from the system and constitutes a product resulting from the practice of the desalination process of the invention. Residual brine is carried off from the multi-stage flash evaporator and contains retrievable salts and other valuable minerals. (Sinha-OEIS)
W76-10967

3B. Water Yield Improvement

SUPERSATURATION AND TIME DEPENDENCE OF ICE NUCLEATION FROM THE VAPOR ON SINGLE CRYSTAL SUBSTRATES,
Nevada Univ., Reno. Lab. of Atmospheric Physics.
B. J. Anderson, and J. Hallett.
Journal of the Atmospheric Sciences, Vol. 33, No. 5, p 822-832, May 1976. 12 fig, 26 ref.

Descriptors: *Nucleation, *Crystals, *Silver iodide, Ice, Cloud physics, Weather modification, Supersaturation, Saturation, Laboratory tests, Equipment, Meteorology.
Identifiers: *Ice crystal nucleation, Covellite.

Nucleation of individual ice crystals on large (3.0 mm) cleaved crystals of solution-grown silver iodide and covellite was investigated by microscopy. The environmental vapor pressure was controlled by saturating two air streams by passage through ice labyrinths at different temperatures and mixing them in known proportion. This enabled the vapor pressure to be changed over a period of about 10 s. Ice crystals do not usually appear immediately when a supersaturation is imposed. Nucleation, defined as the appearance of crystals of 1 micrometer radius, is delayed between zero and 70 s near water saturation and between 20 and 400 s at a few percent ice supersaturation, the longer times occurring at higher temperature. This time decreases only marginally when the crystal is exposed to a period of higher supersaturation which ends a few seconds prior to the time crystals would appear at this higher value. The number of crystals per unit area increases with ice supersaturation at a given temperature; for CuS at -16 C, it increases by a factor of 3 between 3% and water saturation. Number concentrations on silver iodide are comparable, but increase with time when the surface is exposed to light. Results were applied to crystal nucleation in the atmosphere and the characterization of ice nuclei in laboratory instruments. (Sims - ISWS)
W76-10695

HETEROGENEOUS ICE NUCLEATION IN THE PRESENCE OF ALIPHATIC AMINES AND AMMONIA,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
R. Schnell, and G. Vali.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-009 959, $4.00 in paper copy, $3.00 in microfiche. Report No. AS113, December 1974. 28 p, 8 fig, 2 tab, 21 ref. ONR N00123-72-C-0911.

Descriptors: *Weather modification, *Chemistry of precipitation, *Nitrogen compounds, *Nucleation, *Cloud seeding, *Inhibitors, Climatology, Meteorology, Rainfall, Weather, Air temperature, Clouds, Ice, Condensation, *Ammonia, Cloud physics, Precipitation(Atmospheric) Crystals, Laboratory tests, Onsite investigations, *Wyoming.
Identifiers: *Ice crystal formation, *Nucleating inhibitors, Aliphatic amines, Elk Mountain(Wyo), Artificial nuclei, *Amines, Methylamine, Ethylmine, Propylamine.

There is fairly extensive evidence, mostly from laboratory experiments, that certain vapors can significantly reduce the nucleating abilities of varieties of nucleating materials. The work described in this report was undertaken to expand the background knowledge about such inhibiting processes and to explore the possibilities of applying inhibitors to natural clouds. Three major experimental approaches were employed: (1) the freezing of water droplets containing known amounts of nucleants ('freezing nuclie') and additives, (2) the activation of 'deposition nuclei' in a static diffusion chamber, and (3) field tests. Based on the work reported in this paper and on re-analysis of similar earlier work, it was concluded that the inherent nucleating abilities of most materials are affected to only small extents by exposures to aliphatic amine gases or to ammonia. It thus appears that there are no strong interactions of these gases with the types of nucleating materials tested. In the case of nuclei suspended in liquid water, large apparent changes can occur due to depressions of the equilibrium melting point of the water by dissolution of the gases. (Henley - ISWS)
W76-10716

ANTITRANSPIRANT SPRAYS AFFECTING FRUIT SIZE OF EARLY AMBER PEACHES,
Agricultural Research and Education Center, Lake Alfred, Fla.
For primary bibliographic entry see Field 3F.
W76-10725

TEXT AND COMMENTARY FOR WEATHER MODIFICATION CONTROL LAW,
Arizona Univ., Tucson. Coll. of Law.
R. J. Davis.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 717, $4.00 in paper copy, $3.00 in microfiche. OWRT A-064-ARIZ(Z) 14-34-0001-6003. Completion Report, June 1976. 43 p, 31 ref.

Descriptors: Environment, *Legislation, Water rights, *Weather modification, *Arizona, Regulation, Water law.
Identifiers: Liabilities.

The weather modification control law was prepared as (1) a substitute for the present weather control chapter of the Arizona Water Code, and (2) a suggested state law which could be used to improve weather control laws of other jurisdictions. Sections of the text of the proposal are accompanied by commentary on opposite pages explaining their effects. Review of weather modification developments and legal regulations indicated that the three key provisions of successful weather control laws require: (1) professional licenses of weather modifiers, (2) operational permits for projects, and (3) record keeping and reporting by licensees operating projects. Statutes also contain general, administrative, and judicial provisions. A tentative draft of the statue and commentary was prepared incorporating these provisions and explaining them. The draft was circulated for comment by experts in weather modification, water resources management, water law, and the political processes. Responses were considered during preparation of the final draft which is contained in this report. It has been presented to interest groups, circulated among weather control agencies, and considered by legislatures.
W76-10809

WSSI FINAL REPORT FOR THE COLORADO RIVER BASIN PILOT PROJECT,
Western Scientific Services, Inc., Fort Collins, Colo.
C. L. Hartzell, and L. W. Crow.
Report FR-359-46, March 1976, to Bureau of Reclamation, Denver, Colorado, Div. of Atmospheric Water Resources Management. 235 p, 45 fig, 27 tab, 23 ref, 3 append. 14-06-D-6644.

Descriptors: *Colorado River Basin, *Weather modification, Meteorological data, Networks, *Data processing, Data collections, Meteorology, Cloud seeding, *Data collections.
Identifiers: San Juan Mountains(Colo).

The data collection project of the Colorado River Basin Pilot Project had as its major objective the design, installation, and operation of a hydrometeorological instrument and observation network which would subsequently furnish detailed records, both in time and space, from which the effects of winter orographic cloud seeding operations could be evaluated. This data collection project was conducted over the six year period 1969-1975. Sufficient personnel and equipment were committed to the project assignment in order to show hourly, three-hourly, and daily comparisons of precipitation amounts received at the network of sampling stations. Physical measurements of air temperature, wind speed and direction, ice nucleus concentrations, and snow crystal characteristics helped document the meteorological conditions which were coincident with the precipitation processes within each winter season. The data sets collected each year were processed using routine procedures and were carefully screened for accuracy. These finalized data sets are of high quality and can be confidently used for analysis purposes. (Bureau of Reclamation)
W76-10818

SOUTH DAKOTA WEATHER MODIFICATION PROGRAM, RESEARCH COOPERATIVE STUDIES UNDER PROJECT SKYWATER,
South Dakota Dept. of Natural Resources Development, Pierre. Div. of Weather Modification.
J. A. Donnan, J. L. Pellett, and R. S. Leblang.
Final Report, DWM Report-76-3, to Bureau of Reclamation, Denver, Colorado, Division of Atmospheric Water Resources Management, June 1976. 200 p, 3 ref, 9 append. 14-06-D-7240.

Descriptors: Climatic data, Clouds, Cloud seeding, Hail, Meteorology, Ice nuclei, Precipitation(Atmospheric), Rainfall, Silver iodide, *South Dakota, Statistics, *Weather modification.
Identifiers: Cumulus clouds.

An analysis of gridded monthly rainfall data indicates that South Dakota seeded counties received, overall, 6.7% more rainfall during the four program seasons than would be expected on the basis of unseeded county rainfall. The Bureau of Reclamation Environmental Network provided useful and timely input to the seeding decision process. A simple program was developed to reduce the forecaster's time in the interactive mode with the computer. A 'Decision Ladder' was developed and found to be useful in streamlining the transfer of weather modification technology to program operations. The Colorado State University Statistics Department used the principal components technique to identify and combine related stations' precipitation time series into a less variable series. A time series model was found to fit the observed precipitation series reasonably well and with good regularity. North American Weather Consultants found serial rawinsonde data useful in identifying subtle mechanisms governing nocturnal thunderstorm activity. The dominant mechanisms seem to be fields of vertical motion and thermal advection associated with a diurnally oscillating circulation between the plains and the Rocky Mountains. (Bureau of Reclamation)
W76-10819

PROCEEDINGS FROM A WORKSHOP ON INADVERTENT WEATHER MODIFICATION.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 158, $9.75 in paper copy, $3.00 in microfiche. Proceedings of a workshop held August 13-31, 1973, Utah State University, Logan, August 1973. 320 p. Wooldridge, G. L., and Peterson, D. F., editors. NSF-RA-E-73-188. NSF GI 38505.

Descriptors: *Weather modification, *Air pollution, *Cloud physics, *Aerosols, Nucleation, Measurement, Sampling, Weather, Legal aspects, Pollutants, Path of pollutants, Dispersion, Industries, Agriculture, Cities, Powerplants, Instrumentation, Cooling towers, Rainfall, Precipitation(Atmospheric), Atmosphere, Winds, Meteorology.
Identifiers: *Inadvertent weather modification.

For several years a group of meteorologists and engineers have been concerned about improving

the planning and design process in order to reduce side effects of development on weather and climate. Reported here are the results of a first workshop on inadvertent weather modification. Three groups participated: scientists having the latest relevant scientific information; professionals performing at the planning, design, and analytical level; and executives having responsibility for decisions in industry and government. Papers discussed the effects of agriculture, industry, powerplants, and urban areas on clouds, precipitation, and other weather parameters. The dispersion and movement of pollutants were also discussed. Sources and fates of aerosols in the atmosphere were described. One paper on the legal requirements for the assessment of inadvertent weather modification stressed the problems of preparing environmental impact statements and related documents. (See W76-10902 thru W76-10913) (Sims-ISWS)
W76-10901

THE INADVERTENT IMPACTS OF AGRICULTURE ON WEATHER AND CLIMATE AND AGRICULTURAL METHODS FOR AMELIORATION OF CLIMATIC STRESS,
Nebraska Univ., Lincoln. Dept. of Agricultural Climatology.
N. J. Rosenberg.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 5-32. 7 fig, 3 tab, 41 ref.

Descriptors: *Agriculture, *Weather, *Weather modification, Climates, Radiation, Solar radiation, Albedo, Crops, Rainfall, Precipitation(Atmospheric), Evaporation, Evapotranspiration, Evapotranspiration control, Turbidity, Water vapor, Carbon dioxide, Irrigation, Farm management, Winds, Windbreaks, Meteorology.
Identifiers: Inadvertent weather modification.

Agriculture modifies the environment and is affected by it. Perhaps there is no other industry or endeavor so closely linked and dependent on the vagaries of weather and climate as is agriculture. The land which is manipulated in agricultural operations and the condition of the world's forested lands have great impact on the environment. Agriculturalists and horticulturalists, probably from primitive times, have attempted to find ways to protect their plantings from the hazards of the natural environment. Soil manipulation offers one good way to alter microclimate. Irrigation is another fairly obvious method of modifying the environment. Protection from excessively strong winds offers yet another means of beneficially modifying microclimate. Other methods for water use efficiency improvement have been proposed and subjected to some critical theoretical and field testing. These include both antitransparent and reflectant materials which are intended to reduce evapotranspiration, but which work in very different ways. Another method, that of C02 enrichment or 'fertilization' of the air is intended to directly increase the rate of photosynthesis. (See also W76-10901) (Sims-ISWS)
W76-10902

ATMOSPHERIC EFFECTS OF POLLUTANTS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5A.
W76-10903

PARTICLE EMISSIONS FROM A LARGE KRAFT PAPER MILL AND THEIR EFFECTS ON THE MICROSTRUCTURE OF WARM CLOUDS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5A.
W76-10904

URBAN-INDUSTRIAL EFFECTS ON CLOUDS AND PRECIPITATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4C.
W76-10905

SOME CHARACTERISTICS OF A DUSTY RAIN IN YUGOSLAVIA,
Yugoslavic Academy of Science and Arts, Zagreb. Inst. for Physics of the Atmosphere.
For primary bibliographic entry see Field 5A.
W76-10906

DISPERSION OF POLLUTANTS,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5B.
W76-10907

WIND-TUNNEL SIMULATION OF ATMOSPHERIC FLOW AND DISPERSION,
Colorado State Univ., Fort Collins. Fluid Mechanics Program.
For primary bibliographic entry see Field 5A.
W76-10908

INADVERTENT EFFECTS IN WEATHER MODIFICATION,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
V. J. Schaefer.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 227-235. 1 tab, 14 ref.

Descriptors: *Nucleation, *Lead, *Clouds, *Fog, Laboratory tests, On-site investigations, Air pollution, Path of pollutants, Pollutants, Weather, Cloud physics, Weather modification, Crystals, Ice, Particle size, Measurement, Sampling, Meteorology.
Identifiers: *Inadvertent weather modification.

Observations of particles of lead in the atmosphere were reported. It was shown that these particles react with iodine vapor to produce an effective ice nucleus. These lead particles were found to be derived from automobile exhaust. Numbers of particles were much less in locations where automobiles are not present, such as aboard ships at sea. The reaction of the lead particles with iodine provides a method of detecting these submicroscopic particles of lead which is very sensitive. The effects of these lead particles on clouds and fogs were observed. (See also W76-10901) (Sims-ISWS)
W76-10909

RECENT DEVELOPMENTS IN CHEMICAL AEROSOL ANALYSIS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 5A.
W76-10910

INTRODUCTION TO THE ATMOSPHERIC AEROSOL SYSTEM,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 5A.
W76-10911

THE LEGAL REQUIREMENT FOR THE ASSESSMENT OF INADVERTENT WEATHER MODIFICATION - AN ENGINEERING VIEWPOINT,
Dames and Moore, Atlanta, Ga.
H. B. Visscher.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 289-306. 8 fig, 1 ref.

Descriptors: *Weather modification, *Legal aspects, *Air pollution, Governments, Pollutants, Environment, Legislation, Economics, Benefits, Environmental effects, Cost-benefit ratio, Atmosphere, Meteorology.
Identifiers: Inadvertent weather modification, *Environmental impact statements.

Federal and state legislation has defined the requirement for assessment of, and responsibility for, actions by government or by industry which have potential for inadvertent weather modification. These assessments are part of the overall requirement for the evaluation of the environmental impact of contemplated actions. The legislative mandates have been stated in broad terms which cover the full scope of potential modifications, from the local effects to general effects on weather and climate. The content of the regulations and the philosophy of the agencies which implement this legislation have limited the current scope of the assessment to effects on health of humans and other life, and to effects on local weather. The regulatory process which has been established includes, however, the potential for the full scope of assessment of actions which may affect weather and climate. A review of the current environmental assessments being made shows that the definition of the human environment being applied in the regulatory process is much narrower than that intended by the authors of the federal legislation. (See also W76-10901) (Sims - ISWS)
W76-10912

URBAN AEROSOLS AND INADVERTENT WEATHER MODIFICATION,
Rockwell International, Thousand Oaks, Calif. Science Center.
For primary bibliographic entry see Field 4C.
W76-10913

POSSIBLE URBAN EFFECTS ON MAXIMUM DAILY RAINFALL AT PARIS, ST. LOUIS AND CHICAGO,
Meteorologie Nationale, Paris (France).
For primary bibliographic entry see Field 4C.
W76-10929

METHOD OF MAKING SNOW,
H. K. Dupre.
U. S. Patent No. 3,952,949, 6 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1728, April 27, 1976.

Descriptors: *Patents, *Snow, *Crystals, *Skiing, Snow cover, Temperature, Freezing, Sprays.
Identifiers: Artificial snow, Compressed air.

Artificial snow is formed from seed crystals. These seed crystals are formed from the expansion of air expelled into the atmosphere around which minute water particles freeze and form snow. The air, being compressed, is at a higher temperature than normal ambient winter conditions and when expelled will expand to atmospheric pressure while reducing a great deal in temperature. Because of the pressure reduction, the high level of moisture present in the compressed air upon expansion will condense, immediately forming the seed crystals necessary for snow. These seed crystals are immediately formed because of the extremely low temperature condition obtained through the expansion of the air together with freezing atmospheric conditions of winter, that is, temperatures below 32 deg F. The seed crystal thus formed can be combined with atomized water in a manner to form more snow. In this invention a compressed air nozzle adjacent and above a water atomizing nozzle at the top of a snow tower is provided. The optimum area of snow coverage is ob-

LIBRARY U. OF I. URBANA-CHAMPAIGN

tained as well as maximum dwell time in which the seed crystals and tiny atomized water particles may completely commingle and unite to form snow prior to reaching the ground. The compressed air upon expanding shreds the atomized water particles from the spray nozzle into finer water particles; implants seed crystals in the atomized water spray or fog; and cools the entire discharge zone to an extremely cold condition highly desirable for snow making. (Sinha-OEIS)
W76-10958

3D. Conservation In Domestic and Municipal Use

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE - 1970 (1974 SUPPLEMENT),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley Pa.
For primary bibliographic entry see Field 5G.
W76-10508

SAMPLING TECHNIQUES IN URBAN RUNOFF QUALITY STUDIES,
Canada Centre for Inland Waters, Burlington, Ontario, Hydraulic Div.
For primary bibliographic entry see Field 5A.
W76-10509

ENVIRONMENTAL INVESTIGATION OF EDEN ISLES,
Burk and Associates, Inc. (New Orleans).
For primary bibliographic entry see Field 5G.
W76-10510

WATER POLLUTION CONTROL ACT OF 1972, MUNICIPAL OPTIONS.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-10568

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: THEORY AND APPLICATIONS, (VOL I),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10604

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: APPENDICES, (VOL. 2),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10605

QUALITY OF WATER CONSIDERATIONS IN ARID AREA WATER MANAGEMENT,
Nevada Univ., Reno. Desert Research Inst.; and Nevada Univ., Las Vegas. Center for Water Resources Research.
For primary bibliographic entry see Field 5B.
W76-10608

CITIES NEED SEWERLESS TOILETS,
Institute for Local Self-Reliance, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10680

WATER SUPPLY FOR THE GREATER NEW YORK METROPOLITAN AREA,
Corps of Engineers, New York. Northeastern U.S. Water Supply Study.
For primary bibliographic entry see Field 6B.
W76-10983

3E. Conservation In Industry

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, METAL FINISHING INDUSTRY,
Lancy Labs., Zelienople, Pa.
For primary bibliographic entry see Field 5D.
W76-10555

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, METAL FINISHING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10556

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRON AND STEEL INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10557

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, IRON AND STEEL INDUSTRY,
McKee (Arthur G.) and Co., Cleveland, Ohio.
For primary bibliographic entry see Field 5D.
W76-10558

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PULP AND PAPER INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10559

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PETROLEUM REFINING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10560

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, LEATHER TANNING INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-10561

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, FERTILIZER INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-10562

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PLANT CLOSURES.
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10563

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, NON-FERROUS METALS INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10565

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, TEXTILE INDUSTRY.
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10566

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTEWATER TREATMENT IN CHLORINE CAUSTIC PRODUCTION,
Houston Univ., Tex.
For primary bibliographic entry see Field 5D.
W76-10621

DO REGULATED FREIGHT RATES DISCOURAGE RECYCLING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W76-10676

A FEASIBILITY STUDY OF THE CONTROL OF POLLUTION FROM INDUSTRIAL WASTE WATERS DISCHARGED INTO THE LAGOON OF VENICE,
Bostock, Hill and Rigby. Birmingham, (England).
For primary bibliographic entry see Field 5D.
W76-10679

COAL MINING, DEVELOPMENT AND PROCESSING -- THE ASSOCIATED WATER PROBLEMS,
Clyde and Pratt, Salt Lake City, Utah.
For primary bibliographic entry see Field 6E.
W76-10727

CHARACTERIZATION AND TREATMENT OF BRINE WASTEWATERS FROM THE CUCUMBER PICKLE INDUSTRY,
North Carolina Univ., at Chapel Hill. School of Public Health.
L. W. Little, J. C. Lamb, III, and L. F. Horney.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 720, $6.00 in paper copy, $3.00 in microfiche. North Carolina Water Resources Research Institute, Raleight, UNC-WRRI Report No. 99, May 1976. 125 p, 11 figs, 59 tab, 43 ref, 2 append. OWRT A-079-NC(2) 14-31-0001-4033.

Descriptors: *Food processing industry, *Brines, *Brine disposal, *Industrial wastes, *Canneries, Salinity, Water reuse, Fermentation, *Waste water treatment, Recirculated water, Foods, North Carolina, Industrial waste, *Waste identification, Surveys, Recycling.
Identifiers: *Cucumber pickling industry, *Pickle processing ultrafiltration procedure, pH coagulation-precipitation procedure, Ultrafiltration.

Industrial water and wastes surveys were conducted at two pickle companies. Water usage and waste characteristics were determined on major unit operations, including tankyard brining, desalting and processing, slicing and cutting operations, and pasteurization. Laboratory and pilot scale studies were performed to evaluate potential for recycling concentrated tankyard brines. Both a high pH coagulation-precipitation procedure and an ultrafiltration procedure were investigated. A 'desk-top' evaluation of various brine treatment processes compared their cost-effectiveness. The study indicated that in-plant water and salt usage could be substantially reduced by closer management and better housekeeping; that tankyard brines could be treated and reused at least once with no sacrifice of product quality; and the existing wastewater treatment facilities (aerated lagoons) could be upgraded to improve BOD and solids removal. Additionally, the results of the study provide a detailed characterization of the types and concentration of components of waste

streams from unit operations in cucumber pickle production. (StewardiNorth Carolina State)
W76-10805

A CLEAN PIECE OF PAPER,
Beak Consultants Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5D.
W76-10842

PRODUCTION STUDIES ON THE ELECTROLYTIC METHOD OF RECOVERING ZINC FROM EFFLUENT SEDIMENTS (PROIZVODSTVENNYE ISSLEDOVANIYA ELEKTROLITICHESKOGO SPOSOBA REGENERATSII TSINKA IZ OSADKOV STOCHNYKH VOD),
Ukrainskii Institut Inzhenerov Vodnogo Khozaistva (USSR).
For primary bibliographic entry see Field 5D.
W76-10846

USE OF ELECTRODIALYSIS IN THE WATER RECYCLING SYSTEM OF VISCOSE PRODUCTION (PRIMENENIE ELEKTRODIALIZA V SISTEME VODOOBOROTA VISKOZNOGO PROIZODSTVA),
Cherkasskii Zavod Khimicheskogo Volokna (USSR).
For primary bibliographic entry see Field 5D.
W76-10848

POLLUTION CONTROL THROUGH UTILIZATION OF SPENT SULFITE LIQUORS FROM THE PULP INDUSTRY AS ORGANIC NITROGEN FERTILIZER (EIN BEITRAG ZUR UMWELTFREUNDLICHEN TECHNIK DURCH VERWERTUNG DER SULFITABLAUGEN DER ZELLSTOFFINDUSTRIE ALS ORGANISCHER STICKSTOFFDUENGER),
For primary bibliographic entry see Field 5D.
W76-10851

TOUGH ILLINOIS EFFLUENT STANDARDS ARE MET BY CELOTEX BOXBOARD MILL,
For primary bibliographic entry see Field 5G.
W76-10856

EFFLUENTS FROM CHLORINATION AND ALKALINE EXTRACTION OF PINE SULFATE PULP,
Swedish Forest Products Research Lab., Stockholm.
For primary bibliographic entry see Field 5B.
W76-10858

NEW BOILER WATER CHEMICAL TREATMENT REDUCES CORROSION AND SCALE BUILDUP.
Paper Trade Journal, Vol. 160, No. 7, p 30-32, April 1, 1976. 5 fig.

Descriptors: *Boiler feed water, *Pre-treatment(Water), Scaling, Corrosion, Pulp and paper industry, Fuels, Costs, Boilers, Heat transfer, Surfaces, Water quality control, Water softening, Industrial water, *Corrosion control.

When a New England magazine paper mill switched from a chelant-residual program to SCA (Scale Control Agent developed by Nalco Chemical Company) in its low-pressure boilers approximately two years ago, the blowdown reduction saved $25,000 a year in fuel costs. The SCA contains chelant chemicals (not specified) but at much lower concentrations than conventional chelant treatments. At these low concentrations, corrosion is minimized. In addition, the SCA provides a metal-conditioning action that causes heat transfer surfaces to resist scale deposition. Case histories of two other mills are presented, showing other benefits from the chemical treatment. (Witt-IPC)
W76-10859

SEQUENTIAL CHLORINATION -- IMPACT ON THE ENVIRONMENT,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y.
For primary bibliographic entry see Field 5D.
W76-10860

ENVIRONMENTAL AND SOCIAL FACTORS (IN THE PAPER INDUSTRY),
Crown Zellerbach Corporation, Camas, Wash.
For primary bibliographic entry see Field 5G.
W76-10861

HOW TO MEET WATER CLEANUP DEADLINES,
Ecodyne Corp., Union, N. J.
For primary bibliographic entry see Field 5D.
W76-10862

UNIQUE PROCESS FOR SULFITE SPENT LIQUOR KEEPS OLDER MILL VIABLE,
For primary bibliographic entry see Field 5D.
W76-10871

WATER REUSE, A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-10878

3F. Conservation In Agriculture

EFFECT OF SOIL-INCORPORATED DAIRY CATTLE MANURE ON RUNOFF WATER QUALITY AND SOIL PROPERTIES,
Agricultural Research Service, Auburn, Ala.
For primary bibliographic entry see Field 5B.
W76-10539

FARM ANIMAL MANURES: AN OVERVIEW OF THEIR ROLE IN THE AGRICULTURAL ENVIRONMENT,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5G.
W76-10548

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, CONTROL OF WATER POLLUTION FROM SELECTED NONPOINT SOURCES.
Mid West Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-10567

WATER TO THE FIELDS: INDIA'S CHANGING STRATEGY,
Sussex Univ., Brighton (England). Inst. of Development Studies.
R. Wade.
South Asian Review, Vol. 8, No. 4, p. 301-321, 1975. 26 ref.

Descriptors: *Agriculture, *Asia, *Water policy, *Irrigation programs, *Land development, *Institutions, Cooperatives, Water users, Administration, Rotations, Water management(Applied), Water allocation(Policy), Irrigation canals, Adoption of practices, Psychological aspects, Equity, Political constrainsts.
Identifiers: *India, Rotational irrigation.

The institutional structures that are required to meet India's present and future agricultural requirements are discussed, particularly under the Command Area Development Program (CAD). This program is directed primarily at land development at the farm and canal outlet level where the potential for improvement is greatest. Under the CAD, the responsibility for administration of irrigation, agriculture, cooperation, soil conservation, and revenue, within a command area are transferred to a Command Area Development Authority (CAA). Some 32 CAAs have been established and represent a new step in central agricultural administration in India. The problem facing the government is to find methods of land development which will improve efficient water use, increase crop yields, lower production costs, and maintain land fertility, and be replicable on a large scale. Approaches used involve redrawing field boundaries and reallocation of land to farmers in contour terraces; other innovations are rotational irrigation and the formation of local associations that are expected to oversee water distribution, help resolve disputes, collect water rates, and be responsible for the maintenance of water courses and drains. However the resistance to and lack of success of these schemes suggest the need for socio-economic research on canals and canal irrigated agriculture, and institutional studies. (Auen-Wisconsin).
W76-10589

ECONOMIC EFFECTS OF AGRICULTURAL LAND-USE MANAGEMENT ON SOIL EROSION AND FARM INCOME IN THE OBION-FORKED DEER RIVER BASIN,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 4A.
W76-10612

MANURE AND THE NITRATE PROBLEM,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5E.
W76-10616

AGRICULTURAL SEDIMENT CONTROL FOR WATER QUALITY PROTECTION,
Environmental Protection Agency Washington, D. C. Office of Air and Water Programs.
For primary bibliographic entry see Field 5G.
W76-10617

PLANT MEASUREMENTS AS INDICATORS OF CROP WATER DEFICIT,
Southwestern Great Plains Research Center Bushland, Tex.
R. N. Clark, and E. A. Hiller.
Crop Sci. 13(4); p 466-469, 1973.

Descriptors: *Water loss, *Peas, *Lysimeters, Soil water, Indicators, Measurement, Leaves, Infrared radiation, Tensimeters, Crops, Plant physiology.

An irrigation experiment was conducted with southern peas (Vigna sinensis L. (Endl.) cv. 'Burgundy') utilizing lysimeters in which the soil water balance could be controlled. The purpose of the experiment was to compare certain plant measurements as indicators of crop water deficit. Plant measurements made on stressed and non-stressed plants throughout the growing season were leaf-water potential, leaf-air temperature differential and leaf-diffusion resistance. Leaf-water potentials were measured by the pressure chamber method on well-exposed leaves. Leaf temperatures were measured by IR radiometry and a diffusion porometer was used to measure leaf-diffusion resistance. Tensiometers were used to determine the soil-water potential and to time the irrigations. The plant response data taken throughout a day were sensitive to water deficits during the late vegetative stage; however, the measurements were less responsive when the leaves aged, indicated by plants in the pod development stage. The change was particularly evident in the leaf-

vater potential measurements. All 3 plant measurements did indicate water deficit to some legree. Leaf-diffusion resistance was the least esponsive, and leaf-water potential was the most esponsive. Results relating leaf-water potential to eaf-diffusion resistance and soil-water potential re also given.--Copyright 1974, Biological Abtracts, Inc.
W76-10622

ANTITRANSPIRANT SPRAYS AFFECTING FRUIT SIZE OF EARLY AMBER PEACHES,
Agricultural Research and Education Center, Lake Alfred, Fla.
C. R. Barmore, D. W. Buchanan, and L. G. Albrigo.
Proc Fla State Hortic Soc. 85, p 316-319, 1972.

Descriptors: *Peaches, Fruit crops, *Antitranspirants, Sprays, Crop production, Plant growth, Color, Preservation.
Identifiers: Vapor Gard.

Application of an antitranspirant, Vapor Gard, at 0.5% to 'Early Amber' peaches 4 and 5 wk prior to commercial maturity increased fruit size. Vapor Gard increased the proportion of fruit 1-7/8 in. or larger in diameter by 18%. Fruit size was not affected until the end of the final fruit swell period. Data are given on the effects of Vapor Gard on color and shelf-life.--Copyright 1974, Biological Abstracts, Inc.
W76-10725

PEACH IRRIGATION IN FLORIDA,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
D. S. Harrison, and D. W. Buchanan.
Proc Fla State Hortic Soc. 85; p 313-316, 1972.

Descriptors: *Irrigation, *Florida, *Peaches, Fruit crops, *Sprinkler irrigation, *Supplemental irrigation.

There are about 6000 acres of peach and nectarine groves in the central and northern portions of Florida. Supplemental irrigation is necessary in these soils of low-medium water holding capacity. Types of irrigation systems considered best suited for peach production are permanent overhead sprinkler, permanent pop-up under-tree sprinkler, self propelled (traveling) gun and drip or trickle irrigation.--Copyright Biological Abstracts, Inc., 1974.
W76-10749

THE EFFECT OF CHANGING INPUT AND-PRODUCT PRICES ON THE DEMAND FOR IRRIGATION WATER IN TEXAS,
Texas A and M. Univ., College Station. Water Resources Inst.
R. D. Lacewell, and G. D. Condra.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 731, $4.00 in paper copy, $3.00 in microfiche. OWRT A-033-TEX(2) 14-31-0001-5044 14-34-0001-6045. Technical Report No. 75, June 1976. 33 p, 2 tab, 5 fig, 16 ref.

Descriptors: *Farm prices, Natural gas, Nitrogen, Irrigation, *Linear programming, Economics, Water demand, Texas, Energy, Agriculture, *Irrigation water, *Prices, Model studies, Crop production.
Identifiers: *Texas High Plains, Ogallala aquifer, Diesel.

Several studies were done on the Texas High Plains relative to the effect of increasing input prices (natural gas, diesel, and nitrogen) on irrigated agriculture, given alternative crop prices. A linear programming model was developed and applied. The results indicate use of diesel is not very sensitive to price up to about $1.38 per gallon while nitrogen use is very sensitive to price changes. The research emphasized natural gas price increases and suggest fairly significant irrigated agricultural changes begin to occur at a natural gas price of just over $2.00 mfc. Irrigated acres begin to decline, production declines and farmer net returns decline. This carries serious implications for economic viability of the average farm firm in the region.
W76-10810

PREDICTING CONSUMPTIVE USE WITH CLIMATOLOGICAL DATA,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W76-10873

IRRIGATION EFFICIENCY IN THE PRODUCTION OF CALIFORNIA CROP CALORIES AND PROTEINS,
California Univ., Los Angeles. School of Public Health.
E. L. Rada, and R. J. Berquist.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 793, $5.00 in paper copy, $3.00 in microfiche. Completion Report, Contribution No. 158, May 1976. 90 p, 12 fig, 21 tab, 27 ref, 7 append. (California Water Resources Center, Davis, Project UCAL-WRC-W-389). OWRT A-050-Cal(2).

Descriptors: *Foods, *Energy, Food abundance, Water conservation, Conservation, *California, Costs, *Crop production, Nutrients, *Proteins, *Nutrient requirements, *Irrigation efficiency.
Identifiers: *Calories, Agricultural efficiency.

An examination was made of California irrigated food production and agricultural efficiency in terms of nutrition. More than half of the state's calories and proteins come from feed crops. Field crops and small grains produced an additional 20 percent and 15 percent, respectively, of the state's totals. Alfalfa was the largest single producer of calories and proteins. Grains were the most water-efficient calorie producers, while field crops were the most water-efficient protein producers. Fruits and nuts were least efficient in both calorie and protein production per acre-foot. Ensilage was the single most efficient crop in calories (5162 megacalories per acre-foot). Alfalfa was the most productive in proteins (130 kilograms per acre-foot). Irrigated pasture was relatively inefficient per acre-foot of water applied. Among human foods, potatoes were the most efficient at 3178 megacalories per acre-foot, and tomatoes were the most efficient in protein production at 120 kilograms per acre-foot. Other calorie/protein efficient crops were wheat, barley and dry beans. Notably low efficiency crops were rice, grapes, tree fruits, lettuce, melons, and citrus. The total energy efficiency in 1972 for California agriculture was estimated at 0.86, suggesting that agriculture used more energy than it produced.
W76-10875

AGRICULTURAL RUNOFF, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-10879

THE INADVERTENT IMPACTS OF AGRICULTURE ON WEATHER AND CLIMATE AND AGRICULTURAL METHODS FOR AMELIORATION OF CLIMATIC STRESS,
Nebraska Univ., Lincoln. Dept. of Agricultural Climatology.
For primary bibliographic entry see Field 3B.
W76-10902

FIELD AND LABORATORY EVALUATION OF BI-LEVEL DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W76-10934

IRRIGATION SYSTEMS AUTOMATION,
R. E. Shettel.
U. S. Patent No. 3,952,522, 6 p, 21 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1482, April 27, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Distribution systems, *Surface irrigation, *Flood irrigation, Irrigation practices, *Irrigation efficiency, Irrigation ditches, Automation, Remote control.

The invention relates to gravity irrigation systems and the common diversion technique of checking waters for their distribution over farm and ranch lands. The ditch or channel is obstructed to force water up and out the ditch bank by take out openings or notches, with a balancing procedure effecting a measured flow. The object is to make water regulation selective and known and to progressively innovate a developing irrigation system into the complete automation that will employ centralized master programming and cycling. A check means is placed in the ditch. It has a metering valve for regulation and distribution of waters to produce selective and known volumes of water. The check means incorporates a movable lower panel with an upper stationary dam portion with a spillway elevating a mounting base for the location of controls. The lower panel can be manipulated to provide for controlled release of accumulated water. (Sinha-OEIS)
W76-10955

BRAKE MEANS FOR AN AIR-POWERED SPRINKLER SYSTEM,
L. R. Townsend.
U. S. Patent No. 3,952,952, 5 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1729, April 27, 1976. Also as: U. S. Patent No. 3,952,768, 5 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1665, April 27, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Towers, Pipes, Water control, Wind.
Identifiers: Brakes, Air-powered sprinkler systems.

Air-powered sprinkler systems are employed to irrigate large areas of land around a center pivot. Drive towers are provided along the length of the overhead water supply pipe to propel the supply pipe around the center pivot. A problem arises in that the towers tend to roll down steep inclines becoming out of alignment with the other towers. Frequently, wind will also undesirably move the water supply pipe and drive towers. A principal object of the invention is to provide a brake. A control is provided on each of the towers for selectively operating the drive to maintain the pipe and towers in an aligned condition as the water supply pipe is pivoted around the central point. The control is a rotary cam plate having an alignment rod which extends to the gimbal ring on a flexible joint on the water supply pipe adjacent the tower. The rotary cam plate controls the operation of a hydraulic cylinder which is connected to a trojan bar mounted on the drive tower for reciprocating movement. The trojan bar is provided with extending dogs on its opposite ends which engage the drive wheels to rotate the same on actuation of the hydraulic cylinder. A brake is mounted on the drive tower and is urged into engagement with the inside of the drive wheel rim by a spring to prevent undesirable rotation of the drive wheel. An air cylinder is connected to the brake shoe to move

the brake shoe out of frictional engagement with the drive wheel rim as the trojan bar is driving the drive wheels. (Sinha-OEIS)
W76-10956

ALIGNMENT CONTROL APPARATUS FOR CENTER PIVOT IRRIGATION EQUIPMENT,
Frontier Machinery Co., Walla Walla, Wash. (Assignee).
E. K. Ott.
U. S. Patent No. 3,952,769, 5 p, 12 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1665, April 27, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Distribution systems, Irrigation practices, Irrigation efficiency, Pipes, Surface irrigation, Application equipment, Irrigation operation and maintenance.
Identifiers: Alignment.

The invention relates to alignment control systems for self-propelled irrigation equipment. An alignment control apparatus is described for maintaining the pipe sections of center pivot irrigation equipment in substantial linear alignment. The apparatus includes a proximity switch mounted in a water-sealable enclosure adjacent on wall and an exterior proximity element mounted on a level for movement in response to the articulation of the joint interconnecting adjacent pipe sections. The proximity switch when operated energizes a solid state contactor which in turn energizes an electrical drive motor to propel a pipe section. (Sinha - OEIS)
W76-10957

AUTOMATIC WATER SPRINKLER FOR IRREGULAR AREAS,
R. E. Taylor.
U. S. Patent No. 3,952,954, 5 p, 9 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1730, April 27, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Flow control, Water distribution(Applied), Water control, Automation, Application equipment.

An automatic sprinkler apparatus for watering irregular areas is comprised of a programmer, speed control means, a nozzle arranged to rotate about a base while the angle of elevation of the nozzle, or the trajectory of the water spray, can be adjusted to control the radial distance the water travels. The sensor is arranged to adjust the speed control and the angle of the water leaving the nozzle so that time and distance of any finite area subjected to water flowing from the apparatus is maintained constant by the device. In one embodiment of the invention, the speed control is in the form of a hydraulic brake having a closed loop bypass system. Another embodiment discloses a water driven motor having a flow control valve. Either expedient provides the system with a speed control means. The programmer has a sensor device for manipulating both the speed control and a nozzle in a manner whereby the speed of rotation of the nozzle about the support base, as well as the angle of elevation of the water leaving the nozzle, is controlled to uniformly distribute water over an irregular pattern. (Sinha-OEIS)
W76-10959

YIELD AND REMOVAL OF NUTRIENTS BY OAT PLANTS DEPENDING ON FERTILIZER RATES AND SOIL MOISTURE CONTENT, (IN BELORUSSIAN),
I. I. Byerstaw.
Vyestsi Akad Navuk BSSR Syer Syel' Skahaspad Navuk 1, p 24-30. 1975.

Descriptors: *Soil moisture, *Nutrients, *Oats, *Fertilizers, Fertilization, Application rates, *Crop production.

In pot experiments with oats, the effectiveness of increased mineral fertilizer rates increased with an increase of soil moisture. Different conditions of providing the plants with mineral nutrients and moisture changed the removal of nutrients by plants and the relative behavior of various nutrient elements.--Copyright 1976, Biological Abstracts, Inc.
W76-10962

GERMINATION OF WEED SEEDS DEPENDING ON SOIL MOISTURE AND DENSITY, (IN RUSSIAN),
A. V. Fisyunov.
Dokl Veses Ordena Linina Akad S-KH Nauk IM V I Lenina 1, p 18-20. 1975.

Descriptors: *Germination, Seeds, Planting maagement, *Soil moisture, *Weeds.
Identifiers: Barnyard millet, Black bindweed, Millet, Pennycress, Ragweed, Tumbleweed, White goosefoot, Bristlegrass, Redroot amaranth.

Data are presented on the germination of seeds of ragweed, black bindweed, white goosefoot, barnyard millet, green and yellow bristlegrass, tumbleweed, redroot amaranth and field pennycress in loose and compact soil with a moisture content of 36.9, 21.2 and 15.6%.--Copyright 1976, Biological Abstracts, Inc.
W76-10965

COMBINED DRAIN AND FLOOD GATE,
H. J. Soileau.
U. S. Patent No. 3,953,978, 4 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 44, May 4, 1976.

Descriptors: *Patents, *Irrigation, *Flood irrigation, *Irrigation systems, Gates, Spillways, Flow control, Controlled drainage, Diversion structures, Floodways, Spillway gates, Flood control.

A combined drain and flood gate is employed in irrigation and flood control systems and is installed in a levee, bank, dam or the like separating two adjacent land areas for controlling water flow from one area to the other to maintain one area at a predetermined flood level or to completely drain one area into the other. The gate includes a vertically movable panel forming a gate in a spillway or passageway and a drain gate which can be opened and is at the lower level than the vertically movable gate for completely draining water from one area into another. (Sinha-OEIS)
W76-10968

TRICKLE IRRIGATOR,
Rain Bird Sprinkler Mfg., Corp., Glendora, Calif. (Assignee).
W. J. Wichman, and R. A. Vander Ploeg.
U. S. Patent No. 3,954,223, 4 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 125, May 4, 1976.

Descriptors: *Patents, *Irrigation, *Distribution systems, *Irrigation practices, *Irrigation efficiency, Valves, Flow, Flow control, Irrigation operation and maintenance.
Identifiers: Trickle irrigation, Flushing.

The invention provides a trickle-flow irrigation valve which has the desirable features of automatic and manual flushing, low-pressure and low-volume flow, pressure regulation, and anti-siphoning action. The valve includes an inlet tube sealable insertable through the wall of a water supply hose. A pressure chamber has an inlet passage connected to the inlet tube and an outlet passage through the wall of the chamber. An interior wall of the chamber has a shallow channel formed in it intersecting with the outlet passage, and an outlet groove is formed in the center of the channel and also intersects with the outlet passage. On an initial flow of water into the pressure chamber, a flushing action occurs, since a relatively high-volume flow occurs along the channel and groove until pressure builds up in the chamber. The supply pressure in the chamber then deforms the resilient valve element into the shallow channel, restricting flow under the element to the cross-section of the outlet groove, which is appropriately sized to produce the desired flow rate. The outlet groove is long enough to produce a substantial frictional pressure drop between the pressure chamber and the outlet passage, so that a desired low-pressure flow is obtained. (Sinha-OEIS)
W76-10970

REACTION ARM FOR ROTARY SPRINKLER,
Greeno (John S.), Inc., Cincinnati, Ohio. (Assignee).
R. H. Eby.
U. S. Patent No. 3,952,953, 6 p, 18 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1729, April 27, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Distribution systems, Irrigation practices, Irrigation efficiency, Application equipment, Plastics.

A reaction arm for rotary sprinklers is made of injection molded nylon. The arm is formed in two parts including a head and a main body portion. The head contains the spray diverting and deflecting passageways and the main body portion has a head-supporting shoe on one end, an intermediate pivot portion, and a counterweight portion. The shoe is received within an opening in the head and forms one wall of the water passageway. A counterweight may be added to the arm adjacent the head to provide additional mass to the reaction arm for proper operation of the sprinkler. (Sinha-OEIS)
W76-10978

A METHOD FOR DETERMINING THE IRRIGATION REQUIREMENT IN ANTIGUA, W. I.,
MacDonald Coll., Montreal (Quebec).
R. W. Borden.
Tropical Agriculture, Vol. 53, No. 1, p. 41-45, 1976. 2 fig., 1 tab.,7 ref.

Descriptors: *Methodology, *Water utilization, *Irrigation water, *Vegetable crops, Tropic, Evapotranspiration, Rainfall, Water balance, *Water requirements.
Identifiers: *Antigua(West Indies).

A rapid method for determining irrigation water requirements of vegetable crops in Antigua, West Indies, is described. Neither actual or potential evapotranspiration values have been measured, but some climatic and long term rainfall data are available. Empirical formulas using wind, temperature, sunshine, and evaporation were used to calculate evapotranspiration. Mean evapotranspiration was 60% (49-98%) for February-September and 76% for October-January. Several empirical methods of assessing daily evapotranspiration from meteorological data are discussed. The irrigation water required will be approximately the difference between mean rainfall and evapotranspiration calculated from meteorological data, with consideration for rainfall effectiveness, irrigation efficiency, and variations in crops. An average water balance was constructed showing that only November had no irrigation requirement; September and October were low demand months. The daily evapotranspiration for a vegetable crop was estimated and used to plot the estimated total evapotranspiration for vegetables according to percentage crop maturity and time of year. Knowing the month, percentage of growing season lapsed, and days since the last irrigation, total evapotranspiration can be read from the graph and the irrigation interval calculated. Accuracy will improve when various factors have been measured. (Buchanan-Davidson--Wisconsin)
W76-10981

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

STRATEGIES FOR NATURAL RESOURCE DECISION-MAKING: COMMENTS ON THE STAFF REPORT,
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6E.
W76-10503

INTERBOARD PLAN FOR THE GREATER FINGER LAKES - OSWEGO RIVER BASIN,
New York State Dept. of Environmental Conservation, Albany.
November 1973. 17 p, 1 fig, 2 plates, 2 tab.

Descriptors: *Resources development, *Water resources, *Planning, *Management, *River basin development, *Non-structural alternatives, Environmental effects, Reservoirs, Flood protection, Water supply, Recreation, Agriculture, Navigation, Wildlife, Electric power, *New York.
Identifiers: Greater Finger Lakes(NY), *Oswego River Basin(NY).

The river basin of this report covers 5,122 sq mi of New York State, 280 sq mi of which are covered by water including Lakes Canandaigua, Keuka, Seneca, Cayuga, Owasco, Skaneateles, Otisco, Onondaga, and Oneida. Water has been basic to development in the region, which contains more than one million people, dating back to at least 1825 with the completion of the first Erie Canal. Regional resource management is needed in a number of ares including: municipal and industrial water supply, flood damage reduction, water quality, agriculture, recreation, wildlife, navigation, and electric power. This report deals with these areas in the early action period of 1973 to 1980. Non-structural solutions and specific development measures are discussed briefly. An integral part of the plan is a computerized model of the basin's lakes and rivers which provides guidelines on lake levels and river flows to meet multiple water uses. Specific objectives and coverage of plan aspects are summarized. Objectives for lake level regulation during summer and winter are given; the number of miles of shore being managed for flood damage reduction is specified. Recommendation stress the interconnected nature of decisions about resource use: each decision by a local authority affects the way resources may be used by other localities. Managements include communications, data processing and analysis, and cooperation among authorities. In the case of watershed conservation, the boards recommend the acceleration of land conservation programs throughout the basin on a coordinated basis using the capabilities of soil and water conservation districts. (Smith-North Carolina)
W76-10506

THE ECONOMIC IMPACT OF RECREATIONAL LAND-USE IN AN ISLAND ENVIRONMENT: A CASE STUDY OF JEKYLL ISLAND, GEORGIA,
Georgia Marine Science Center, Savannah.
For primary bibliographic entry see Field 6B.
W76-10581

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: THEORY AND APPLICATIONS, (VOL 1),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10604

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: APPENDICES, (VOL. 2),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10605

ECONOMIC EFFECTS OF AGRICULTURAL LAND-USE MANAGEMENT ON SOIL EROSION AND FARM INCOME IN THE OBION-FORKED DEER RIVER BASIN,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
M. B. Badenhop, and R. M. Thomsen.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 647, $4.50 in paper copy, $3.00 in microfiche. Tennessee Water Resources Research Center, Knoxville, Research Report No. 49, June 1976. 61 p, 2 fig, 9 tab, 21 ref, append. OWRT A-039-Tenn(1). 14-34-0001-6044.

Descriptors: *Water management(Applied), Erosion, Sediments, Water quality, Costs, *Land use, Soil erosion, Crop production, Income, *Tennessee, River basins.
Identifiers: Obion-Forked Deer River basin(Tenn), Farm income, Opportunity cost, Agricultural income.

This report is concerned with the effect of water and land management practices on farm income in the upland areas of the Obion-Forked Deer River Basin in Northwest Tennessee. Farm enterprises and resource constraints were quantified and evaluated in a linear programming framework. The problemshed approach was used which involved the use of a Standard (upper limit) on the amount of residual (eroded soil) discharged by the externality producer into the environment (stream). Farm budgets were used to obtain cost and return data on typical farming practices used by farmers in the Basin. The maximum potential net income for the uplands subject to resource constraints was calculated. Then, a soil erosion discharge standard was used to set the maximum allowable level of soil (10 tons per acre) that could be eroded. A system of land use practices was generated to meet this standard. The maximum net returns to the uplands were recalculated subject to the original constraints plus the discharge standard and recommended cropping practices. The difference between these two net return values was an estimate of the opportunity cost involved. The estimated opportunity cost was approximately $4.3 million on an annual basis. This loss in potential agricultural income is considered the minimum cost with such an agricultural production change to limit soil erosion to a maximum of 10 tons per acre.
W76-10612

COMPARING INFLOW AND INFILTRATION,
Pool (Charles) and Associates, Inc., Ketchikan, Alaska.
For primary bibliographic entry see Field 5D.
W76-10683

THE EVAPORATION AND SEDIMENTATION IN MAN-MADE ARADE LAKE, SOUTHERN PORTUGAL,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 2D.
W76-10703

ON THE CALCULATION OF THE MEAN RESIDENCE TIME IN MONOMICTIC LAKES,
Commission of the European Communities, Ispra (Italy). Joint Nuclear Research Center.
For primary bibliographic entry see Field 2H.
W76-10704

SELECTION OF TYPICAL SMALL DRAINAGE BASINS FOR INVESTIGATING AND COMPUTING SPRING RUNOFF FROM LARGE RIVER BASINS,
L. K. Vershinina, and O. I. Krestovskiy.
Soviet Hydrology: Selected Papers, Issue No. 6, p 355-363, 1974. 3 fig, 3 tab, 8 ref. Translated from Transactions of the State Hydrologic Institue, (Trudy GGI), No. 218, p 132-144, 1974.

Descriptors: *Drainage area, *Runoff forecasting, *River basins, Physiographic provinces, Forecasting, Runoff, Networks, Basins, Spring, Meteorology, Floods.
Identifiers: *Small drainage basins, *Large river basins, Spring flood, Spring runoff, Graphic relations.

Investigation of two drainage basins with areas of 2000 to 10,000 sq km showed that they could be used to determine the annual spring runoff depths of large river basins with a high degree of accuracy. In regions where the spring flood runoff accounted for the major part of annual runoff, these small basins also characterized the annual runoff of large river basins. The computation error did not exceed 10% when the values from several small basins totalled 15-25% of the area of the large basin. The root-mean-square error of the computations was 4-8 mm, or 10-30% of the natural variation in spring runoff depth. Use of small areas in large river basins made it possible to increase the density of the observation network and concentrate various kinds of observations, thus improving the quality of all measurements. (Roberts - ISWS)
W76-10705

DENSITY CURRENT SURGES I--THEIR ROLE IN THE INITIAL DISPERSION OF A SURFACE FIELD,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-10707

DENSITY CURRENT SURGES II--THE MOVEMENT OF SURGES IN A TURBULENT ENVIRONMENT AND THEIR ROLE IN SURFACE FIELD DISPERSION,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-10708

ILLINOIS LAWS RELATING TO WATERWAYS 1973.
Illinois State Dept. of Transportation, Springfield. Div. of Waterways.
For primary bibliographic entry see Field 6E.
W76-10720

SOUTH DAKOTA'S SYSTEM OF WATER MANAGEMENT AND ITS RELATION TO LAND USE AND ECONOMIC DEVELOPMENT,
South Dakota Univ., Vermillion. School of Law.
W. A. Garton.
South Dakota Law Review, Vol. 21, No. 1, p. 1-77 (1976). 77 p, 1 chart.

Descriptors: *Land use, *South Dakota, *Water utilization, *Riparian rights, *Appropriation, *Planning, Legislation, Competing uses, Legal aspects, Prescriptive rights, Constitutional law, Interstate compacts, Regulated flow, Water conservation, Water distribution, Water requirements, Water resources, Administrative agencies, Federal government, State governments, Reservation doctrine, Federal jurisdiction, Social aspects, Interstate rivers.
Identifiers: Marketable water rights.

The present water law system of South Dakota may be inadequate to deal with increases in demand for water and with changing public needs and expectations. The author reviews pre-1955 riparian law and appropriation law and their interrelationship. The examination of current water doctrines includes the underlying policy provisions, protection of vested rights, waters available for appropriation, priorities of water rights, abandonment and forfeiture of water rights, transfer of water rights, acquisition of water rights by prescription, and maintenance of minimum flows in streams. The methods used by Colorado and Idaho for maintenance of minimum flow are detailed. Development of future policies for water utilization will require publicly decided priorities for competing uses and implementation of these priorities. The possibilities and problems of marketable water rights are evaluated. Also examined are the roles of state agencies dealing with water use. No radical changes are deemed necessary since the constraints of the federal system limit the state's control of its waters. These constraints include the federal navigability doctrine, the federal reservation doctrine, the 'Winters Doctrine', and the right of neighboring states to their aliquot share. (Capehart-Florida)
W76-10721

MATCHING RESOURCES AND PEOPLE,
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 6B.
W76-10723

INDIAN WATER RIGHTS: SOME EMERGING FRONTIERS,
Native American Rights Fund, Boulder, Colo.
For primary bibliographic entry see Field 6E.
W76-10729

A PROPOSAL FOR ADOPTION OF A LEGAL DOCTRINE OF GROUNDSTREAM WATER INTERRELATIONSHIP IN TEXAS,
Saint Mary's Univ., San Antonio, Tex. School of Law.
For primary bibliographic entry see Field 4B.
W76-10731

DAMS OF PORK,
For primary bibliographic entry see Field 6B.
W76-10738

A SOUND WATER PLAN FOR SOUTH FLORIDA IMPLEMENTATION OF THE 1972 WATER RESOURCES ACT,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-10742

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 2).
For primary bibliographic entry see Field 6E.
W76-10750

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 4).
For primary bibliographic entry see Field 6E.
W76-10751

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 5).
For primary bibliographic entry see Field 6E.
W76-10752

METEOROLOGICAL ASPECTS OF THE OAHU FLOOD OF 19 APRIL 1974,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2B.
W76-10807

HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI. APPENDIX E, F, G, (ENVIRONMENTAL IMPACT STATEMENT.
Army Engineer District, Kansas City, Mo.
January 1973. 265 p, 1 fig, 2 map, 4 photo.

Descriptors: *Dams, *Missouri, *Flood control, *Hydroelectric power, *Reservoir sites, Recreation facilities, Judicial decisions, Social impact, Public health, Government finance, Governmental interrelations, Water resources development, Environmental effects.
Identifiers: Harry Truman Dam, Kaysinger Reservoir, Letters of reply.

Appendix E contains 22 letters of reply conveying various departments' and groups' views on the draft environmental statement prepared for the Harry S. Truman Dam project. Replies were received from several large governmental departments, such as the Environmental Protection Agency, Department of the Interior, and the Department of Agriculture. Appendix F contains the court orders in cases involving the dam project. The orders presented include those by the Honorable John Oliver, the United States 8th Circuit Court of Appeals, and the United States Supreme Court. Appendix G presents the recommendations of the Bureau of Sport Fisheries and Wildlife at Billings, Montana concerning the acquisition of land for wildlife purposes at the Kaysinger Reservoir, a part of the Harry S. Truman Dam project (See also W76-04654) (Hoffman-Florida)
W76-10827

WATER RESOURCES DATA FOR WISCONSIN. PART 1. SURFACE WATER RECORDS. PART 2. WATER QUALITY RECORDS.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 7C.
W76-10832

ENTROPY PRINCIPLE APPLIED TO THE RAINFALL-RUNOFF PROCESS,
Lagos Univ. (Nigeria).
For primary bibliographic entry see Field 2A.
W76-10918

SEEPAGE FLOW THROUGH HOMOGENEOUS SOIL INTO A ROW OF DRAIN PIPES,
Waikato Univ., Hamilton (New Zealand). Dept. f Mathematics.
A. D. Sneyd, and R. J. Hosking.
Journal of Hydrology, Vol. 30, No. 1/2, p 127-146, May 1976. 2 fig, 7 tab, 7 ref, 1 append.

Descriptors: *Seepage, *Drains, *Soil water movement, *Numerical analysis, Fourier analysis, Algorithms, Equations, Boundary processes, Homogeneity, Infiltration, Pipes, Drainage systems, Darcys law, Potential flow, Soil surfaces.
Identifiers: *Drain gap, Asymptotic expansion, Axial symmetry, Cylindrical polar coordinates.

The effect of gap width on flow through homogeneous porous soil into a row of drain pipes was considered, by solving Darcy's law in a model configuration with axial symmetry. The resulting mixed boundary value problem of potential theory was reduced to a Fredholm integral equation of the first kind, which may be solved numerically. In practice, however, the gap width between pipes was small enough to justify an asymptotic expression for the relative flow found by the method of matched asymptotic expansions. To lowest order, it appears that the flow is sensitive to the gap parameters, not on the geometry far away from the gap. In the limit of large pipe radius and shallow depth, earlier two-dimensional results were recovered. (Visocky - ISWS)
W76-10919

PARTIAL DEPLETION OF SALINE GROUNDWATER BY SEEPAGE,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10920

A NOTE ON THE CONTRIBUTION OF FOG DRIP TO STREAMFLOW,
Southampton Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W76-10927

FIELD AND LABORATORY EVALUATION OF BI-LEVEL DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu, and D. W. DeBoer.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 3, p 478-481, May-June 1976. 5 fig, 6 tab, 9 ref.

Descriptors: *Drainage systems, *Theoretical analysis, *On-site tests, *Laboratory tests, Water table, Water levels, Hydraulic conductivity, Porosity, Drains, Data collections, Depth, Graphical analysis, Groundwater movement, Aquifers, Viscosity.
Identifiers: *Bi-level drainage, Hele-shaw model, Drain spacing.

Field and laboratory evaluations of a proposed bi-level drainage (system in which drains are at two different depths on an alternating basis) theory were presented. Graphical comparisons were made between the fall of the water table as predicted by theory and as measured both in the field and in a Hele-Shaw model. In both cases the agreement was good, indicating that the theory is an adequate model to describe the water table fall. (Visocky-ISWS)
W76-10934

UPSTREAM FLOOD LOWERING IN RESERVOIRS,
Tennessee Valley Authority, Knoxville.
B. Buehler.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY2, Proceedings Paper 11911, p 151-170, February 1976. 8 fig, 5 tab.

Descriptors: *Backwater, *Reservoirs, *Tennessee, *Curves, Upstream, Discharge measurement, Stream gage, Flood control, Flood peak, Hydraulics, Rating curves, Roughness coefficient.
Identifiers: *Upstream flood lowering, Tennessee Valley reservoirs, Cost savings, Project planning stage, Reservoir life.

Dams can lower flood levels near upstream limits of their reservoirs. This lowering was observed at four Tennessee Valley locations. The phenomenon is called 'upstream flood lowering.' It results from increased flow carrying capacity primarily due to deep longstanding reservoir waters in alluvial valleys. This smoothes channel linings and eliminates vegetation. The effect occurrs early in reservoir life and is permanent. This paper and its eight figures was prepared in 1954 and presented at a meeting that year, but was not published until 1974. The twenty years of added data confirmed upstream flood lowering but showed that the lowering was underestimated significantly at one and somewhat at two of the four locations. (Roberts - ISWS)
W76-10938

A DISCRETE LINEAR CASCADE MODEL FOR HYDROLOGY,
University Coll., Galway (Ireland).
For primary bibliographic entry see Field 2E.
W76-10946

PROBLEMS OF PUBLIC WORKS PROJECTS IN THE PRESENT ECONOMIC CLIMATE,
San Bernardino Valley Municipal Water District, Calif.
For primary bibliographic entry see Field 6C.
W76-10980

COMPREHENSIVE WATER SUPPLY STUDY FOR NEW YORK STATE,
New York State Dept. of Health, Albany. Bureau of Public Water Supply.
For primary bibliographic entry see Field 6B.
W76-10982

SEEPAGE LOSS FROM HOLDING PONDS,
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5B.
W76-11051

GREATER PITTSBURGH REGIONAL STUDIES, REPORTS AND MAPS, APRIL 1976.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-11072

TECHNIQUES FOR ESTIMATING FLOOD DEPTHS FOR OKLAHOMA STREAMS,
Geological Survey, Oklahoma City, Okla.
W. O. Thomas, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 310, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-2, April 1976. 38 p, 12 fig, 2 tab, 9 ref.

Descriptors: *Flood forecasting, *Peak discharge, *Depth, *Flood recurrence interval, *Oklahoma, Flood plains, Natural flow, Stream gages, Urban hydrology, Analytical techniques, Regression analysis, Probability, Flood profiles, Hydrologic data, Data collections.

Regional relations are defined for estimating the depths of floods having recurrence intervals ranging from 2 to 100 years for both natural and urban streams in Oklahoma. Contributing drainage area and the 2-year 24-hour rainfall are the only independent variables required for estimating flood depths for natural streams. For urban streams the percentage of the basin impervious and served by storm sewers is also required. The only limitations are that the stream be unregulated, that the main channels be unimproved, and that the contributing drainage area and the 2-year 24-hour rainfall be in the range of values used to derive the relations. The standard errors of estimate range from 24 percent for the 50- and 100-year floods to 33 percent for the 2-year flood for the natural streams. The estimation error for urban streams is not evaluated due to paucity of data. Although the flood depths estimated from techniques presented in this report are considered less reliable than those obtained from field surveys and hydraulic computations, the ease and simplicity of their determination are expected to make them useful for many purposes. Data on flood depths for 132 gaging stations are given. (Woodard-USGS)
W76-11075

HYDROLOGIC EFFECTS OF STORMS OF JUNE 24-28, 1974 IN LEE AND COLLIER COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla.
R. A. Miller, and M. A. Benson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-252-324/as, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 57-75, January 1976. 30 p, 11 fig, 5 tab, 9 ref.

Descriptors: *Storms, *Floods, *Flood damage, *Hydrologic data, *Flood frequency, *Florida, Hurricanes, Streamflow, Peak discharge, Rainfall. Identifiers: Lee and Collier Counties(Fla), Hurricane Donna.

The storms of June 24-28, 1974, in Lee and Collier Counties, Florida, produced widespread flooding, beach erosion, and utility failures. Recurrence intervals of the rainfall at Fort Myers are less than 5 years for durations under 6 hours, and less than 10 years for duration under 2 days. Recurrence intervals for peak groundwater elevations in Lee and Collier Counties as a result of the storm are less than 5 years, as are the recurrence intervals for both stage and discharge in streams. (Woodard-USGS)
W76-11077

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON MOHAWK RIVER IN TOWNS OF FRANKFORT AND SCHUYLER, HERKIMER COUNTY, NEW YORK,
Geological Survey, Albany, N.Y.
T. J. Zembrzuski, Jr., and B. Dunn.
Open-file report 76-413, June 1976. 8 p, 2 fig, 2 tab, 5 ref.

Descriptors: *Flood flow, *Flow characteristics, *Bridge design, *Peak discharge, Hydrologic data, Streamflow, Engineering structures, Bridge construction, Rivers, *New York.
Identifiers: Herkimer County(NY), *Mohawk River(NY).

An evaluation of floodflow characteristics at a proposed bridge site on Mohawk River in the towns of Frankfort and Schuyler, Herkimer County, N.Y., revealed that: (1) The 100-year design discharge is 22,500 cfs, of which 21,200 cfs flows in the Mohawk River and 1,300 cfs flows in the Erie (Barge) Canal. (2) The existing bridge and road would be submerged and would cause no backwater during the 100-year flood. (3) The normal elevation for the 100-year flood at the approach section is 406.3 feet referred to mean sea level, datum of 1929. (4) Three alternate bridge designs would cause a 2.1-, 0.5-, and 0.3-foot increase in water level, respectively, at the approach section during the 100-year flood. (5) The combination of one of the alternate bridges and three overflow culverts would cause a 0.4-foot increase in water level at the approach section during the 100-year flood. (Woodard-USGS)
W76-11079

FLOOD FREQUENCY OF MISSISSIPPI STREAMS,
Geological Survey, Jackson, Miss.
B. E. Colson, and J. W. Hudson.
Progress Report, May 1976. 34 p, 8 fig, 3 tab, 12 ref.

Descriptors: *Flood frequency, *Flood forecasting, *Flood recurrence interval, *Mississippi, *Streams, Methodology, Mathematical models, Hydrologic data, Regression analysis, Digital computers, Topography, Synthetic hydrology, Drainage area, Rainfall-runoff relationships.

Techniques have been developed for estimating future flood magnitudes for Mississippi streams having recurrence intervals as great as 100 years. Estimates for gaged sites were obtained by application of the log-Pearson Type III frequency distribution. Estimates for ungaged sites are defined by mathematical relations which may be solved using data from topographic maps. Nomographs were designed for making rapid estimates for flood-frequency values. Synthetic records generated by a digital computer model of the rainfall-runoff process for drainage areas ranging from 0.04 to 4.35 sq mi were combined with long-term observed records to define the relation of basic characteristics to flood frequency on drainage areas as great as 6,630 sq mi. Multiple-regression techniques indicated that drainage area, slope, and length were the most significant variables affecting flood frequency. (Woodard-USGS)
W76-11083

APPLICATION OF SIMPLE DAM BREAK ROUTING MODEL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-11084

SIMPLIFIED ROUTING OF DAM BREAK WAVES,
Geological Survey, Bay St. Louis, Miss., and Geological Survey, Reston, Va.
T. N. Keefer, and R. S. McQuivey.
In: Fundamental Tools to be Used in Environmental Problems; Proceedings of 16th Congress of International Association for Hydraulic Research, Sao Paulo, Brazil, July 27-August 1, 1975, Volume 2, p 325-329, 1975. 3 fig, 4 ref.

Descriptors: *Hydraulic models, *Dam failure, *Flood routing, *Regression analysis, Flood profiles, Hydrographs, Methodology, Equations, Dam design, Evaluation, Model studies.
Identifiers: *Multiple-linearization technique.

One-dimensional flow routing schemes based on finite-difference techniques are commonly used to analyze dam break problems. Such techniques provide accurate answers but require large amounts of cross-section and roughness information. The routing model evaluated here is the multiple-linearization technique. It treats the routing reach as a series of linear systems. The model is checked by comparing routed flood hydrographs obtained from the multiple-linearization and finite-difference models in both rectangular and non-rectangular primatic channels. There is no significant difference between the results for the cases investigated. The multiple-linearization model is considerably less expensive to operate. (Woodard-USGS)
W76-11085

4B. Groundwater Management

WATER QUALITY AND ECONOMIC CRITERIA FOR RURAL WASTEWATER AND WATER SUPPLY SYSTEMS,
Duke Univ., Durham, N. C. School of Forestry.
For primary bibliographic entry see Field 5D.
W76-10583

AN EMPIRICAL NA-K-CA GEOTHERMOMETER FOR NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W76-10598

QUALITY OF WATER CONSIDERATIONS IN ARID AREA WATER MANAGEMENT,
Nevada Univ., Reno. Desert Research Inst.; and Nevada Univ., Las Vegas. Center for Water Resources Research.
For primary bibliographic entry see Field 5B.
W76-10608

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT: PARAMETER IDENTIFICATION,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-10613

LEGAL REQUIREMENTS FOR MONITORING GROUNDWATER QUALITY,
Banks (Harvey O.), Inc., Belmont, Calif.
For primary bibliographic entry see Field 5G.
W76-10656

ECONOMIC FRAMEWORK FOR GROUNDWATER QUALITY MONITORING,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-10657

DEVELOPMENT OF A METHODOLOGY FOR MONITORING GROUNDWATER QUALITY,
California Univ., Berkeley.
For primary bibliographic entry see Field 5A.
W76-10658

MONITORING GROUNDWATER POLLUTION,
For primary bibliographic entry see Field 5A.
W76-10659

MANAGEMENT OF GROUNDWATER QUALITY DATA,
Commonwealth Associates, Inc., Jackson, Mich.
For primary bibliographic entry see Field 5A.
W76-10660

GROUNDWATER POLLUTION MONITORING CASE STUDIES,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5A.
W76-10661

MONITORING OF SUBSURFACE WASTE-DISPOSAL OPERATIONS: A GENERALIZED SYSTEMS APPROACH WITH EXAMPLES FROM CANADIAN CASE HISTORIES,
Windsor Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 5D.
W76-10662

LAND DISPOSAL OF WASTES: POTENTIAL FOR GROUNDWATER POLLUTION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W76-10667

CONFORMITY OF GROUNDWATER RECHARGE RATE BY TRITIUM METHOD AND MATHEMATICAL MODELLING,
National Geophysical Research Inst., Hyderabad (India).
For primary bibliographic entry see Field 2F.
W76-10700

WATER TRACING IN TROPICAL REGIONS, THE USE OF FLUOROMETRIC TECHNIQUES IN JAMAICA,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2F.
W76-10701

GROUNDWATER AVAILABILITY IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
E. W. Sanderson, and E. Zewde.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 796, $6.00 in paper copy, $3.00 in microfiche. Circular 124, 1976. 139 p, 16 fig, 2 tab, 39 ref, 2 append.

Descriptors: *Groundwater availability, *Water quality, *Water wells, *Illinois, Wells, Deep wells, Shallow wells, Water chemistry, Hardness(Water), Water analysis, Water supply, Municipal water, Groundwater resources, Groundwater, Aquifers, Glacial aquifers, Geology, Hydrogeology, Water sources, Water yield, Water table, Subsurface waters, Water treatment, Pumping.
Identifiers: *Champaign County(Ill).

Groundwater in Champaign County normally can be obtained from one of three primary water-bearing sand and gravel units within the glacial drift materials. These materials were deposited on top of the bedrock formations during three ages of glaciation. The lower aquifer system is associated with a major bedrock valley in the northwest portion of Champaign County. About 84% of the county's water supply is pumped from this sand and gravel aquifer. Groundwater from the glacial deposits is hard (250 to 600 mg/l) and normally contains objectionable concentrations of iron (1 to 5 mg/l). These undersirable constituents can be successfully removed with home or municipal treatment units. An estimated 23.3 million gallons a day (mgd) of water is pumped from the aquifers of Champaign County to satisfy industrial, municipal, domestic, and rural needs. A much larger quantity of water, perhaps as much as 90 mgd, could probably be withdrawn without overdevelopment. This report describes pertinent geologic factors, groundwater occurrence and movement, temperature and chemical quality, and well development. Appendix A contains available records of all known wells, and appendix B lists the results of chemical analyses of water from all wells sampled. (Sims - ISWS)
W76-10718

PUBLIC GROUNDWATER SUPPLIES IN MCHENRY COUNTY,
Illinois State Water Survey, Urbana
D. M. Woller, and E. W. Sanderson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 633, $4.50 in paper copy, $3.00 in microfiche. Bulletin 60-19, 1976. 52 p, 3 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Well data, Aquifers, Unconsolidated aquifers, Gravels, Sand aquifers, Groundwater, Groundwater availability, Hydrology, Hydrogeology, Water resources, Water quality, Water wells, Municipal water, Water yiel, Water properties, Hardness(Water), Chemical properties, Wells, Shallow wells, Deep wells, Geology.
Identifiers: *McHenry County(Ill), Dissolved minerals, Water bearing formations.

All available information was reported on production wells used for public groundwater supplies in McHenry County, Illinois. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Sand and gravel deposits in the unconsolidated materials above bedrock are tapped by 26 public water systems in McHenry County as a source of all or part of their water supply. There are presently 43 production and standby wells, ranging in depth from 47 to 272 ft, tapping only the sand and gravel deposits. Their reported yields range from 15 to 1350 gpm depending primarily upon the type of well and the permeability, thickness, and areal extent of the sand and gravel unit tapped by each well. Production from these wells in 1973-1975 was estimated to be about 6,550,000 gpd. The analyses of water from these wells show that the iron content ranges from 0.0 to 3.9 mg/l and the hardness from 204 to 512 mg/l. Individual production wells for each supply were described in the order of their construction. The description for each well includes the aquifer or aquifers tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses. (Sims - ISWS)
W76-10719

EQUITABLE APPORTIONMENT OF INTERSTATE GROUND WATERS,
Fischer and Beatty, Fort Collins, Colo.
W. H. Fischer.
Rocky Mountain Mineral Law Institute, Vol. 21, p. 721-741 (1975). 22 p, 41 ref.

Descriptors: *Equitable apportionment, *Legal aspects, *Legal aspects, *Legal review, *Groundwater, *Groundwater resources, State governments, State jurisdiction, Boundary disputes, Riparian rights, Riparian water loss, Appropriation, Judicial decision, Exploitation, Groundwater potential, Water utilization.

Examined here are the rights of the respective states to groundwater flowing across state boundaries. The law of groundwater has been slow to develop; however, the common law rule allowing withdrawal without regard to outside effect has gradually been modified by the Reasonable Use Rule and the Correlative Rights Doctrine. In addition to determining which of these rules or doctrines will be applied, a party considering private litigation over injurious groundwater withdrawal may also have problems deciding where to sue and where the injury actually occurred. The author suggests equitable apportionment as a substitute for private litigation. Different Supreme Court cases are cited that support a trend towards interstate apportionment, even between riparian and apportionment doctrine states. These cases, often between States and thus originating in the Supreme Court, have the basic problem of presenting adequate proof of damages from withdrawal. Ultimately, equitable apportionment can best be achieved by interstate compacts. (Frank-Florida)
W76-10728

INDIAN WATER RIGHTS: SOME EMERGING FRONTIERS,
Native American Rights Fund, Boulder, Colo.
For primary bibliographic entry see Field 6E.
W76-10729

A PROPOSAL FOR ADOPTION OF A LEGAL DOCTRINE OF GROUNDSTREAM WATER INTERRELATIONSHIP IN TEXAS,
Saint Mary's Univ., San Antonio, Tex. School of Law.
J. N. Castleberry, Jr.
St. Mary's Law Journal, Vol. 7, No. 3, p. 503-14 (1975). 12 p.

Descriptors: *Texas, *Groundwater resources, *Judicial decisions, *Percolating waters, *Water supply development, Water pollution, Federal government, Legislation, Legal aspects, Water pollution control, Water pollution effects, Common law, Law enforcement, Legal review, Water permits, Classification, Laws, Underground, Water resources, Groundwater movement, Underground streams.

The courts and legislature of Texas have failed to produce a workable solution to the state groundwater problem. Instead, the law has evolved groundwater classification predicated upon that point in the water cycle at which water is taken for use. Subterranean waters, for example, have been classified into percolating waters and underground streams. The 'English Rule' established that the owner of the freehold absolutely owned all the waters percolating beneath his surface tract. Many American States rejected the 'English Rule' to adopt the reciprocal reasonable use - correlative rights view, also known as the 'American Rule' This rule states that a property owner whose property overlies a reservoir common to several tracts containing percolating water is restricted to such use of the water as is reasonable with respect to his own use and that of the other landowners whose tracts overlie the reservoir. Texas courts follow the English Rule in cases involving rights in percolating waters but apply 'surface stream' rules to subterranean streams and have stated that if the 'American Rule' is to be adopted, the change must come through legislative action. Texas decisions have not yet explored differences between percolating waters which never become part of a flowing stream and percolating waters which contribute to the flow of streams. The author con-

cludes that the legislature should take advantage of the first opportunity to adopt and implement a modern scientific groundwater concept which recognizes the interrelationship between surface and ground waters. (Hadoulias-Florida)
W76-10731

A SOUND WATER PLAN FOR SOUTH FLORIDA IMPLEMENTATION OF THE 1972 WATER RESOURCES ACT,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-10742

AN ANALOG MODEL OF THE CHIPUXET AQUIFER, RHODE ISLAND,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W76-10814

ADJUSTMENTS DUE TO A DECLINING GROUNDWATER SUPPLY: HIGH PLAINS OF NORTHERN TEXAS AND WESTERN OKLAHOMA,
Texas A and M Univ., College Station. Water Resources Inst.
R. D. Lacewell, L. L. Jones, and J. Osborn.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 792, $4.00 in paper copy, $3.00 microfiche. Technial Report, No. 74, June 1976. 42 p, 1 fig, 10 tab, 35 ref. OWRT B-179-TEX(2), 14-31-0001-4165.

Descriptors: *Regression analysis, Model studies, Community development, *Texas, *Oklahoma, *Groundwater, Economics, Water supply, Aquifers, Irrigation, Agriculture, *Linear programming, Costs.
Identifiers: Exhaustible aquifer, Community services, *Interindustry analysis, Ogallala aquifer, *High Plains(Tex.-Okla.) Cost adjustments.

Reduced annual withdrawals of groundwater for irrigating agricultural crops due to a progressively declining water supply will exert significant downward pressure on the economy of the region. The reduced agricultural output will be reflected throughout the region in terms of population, employment and gross output of non-agricultural sectors. The declining groundwater supply affects costs of providing community services. Of particular significance is the expected effect on smaller communities (less than 5,000) where rather dramatic increases in costs of community services are indicated. The structure of the Northern High Plains economy has been quantified. Data have been developed relative to expected changes in population, employment, per capita disposable income and agriculture and non-agricultural output. This provides information to planners in developing policy for regional development. Models are provided for estimating the impact of alternative policies such as water importation or encouragement toward rapid growth in specific industries. Limitations of these models are explicitly defined. Verification is presented that regional projects crossing university and state lines can be most successful. For a major problem as the declining groundwater in the Northern High Plains, there are several affected communities and two states. By cooperating and joining in a single project a much superior product evolved than that could be expected from each university operating independently.
W76-10874

PARTIAL DEPLETION OF SALINE GROUNDWATER BY SEEPAGE,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10920

GEOTHERMAL ENERGY RECOVERY PROCESS,
Bechtel International Corp., San Francisco, Calif.
For primary bibliographic entry see Field 3A.
W76-10967

DECISION MAPPING - TOOL FOR UNDERGROUND WASTE MANAGEMENT,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W76-11063

GROUND WATER QUALITY MONITORING FOR CALIFORNIA'S NEEDS,
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5A.
W76-11065

GROUNDWATER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-11066

THE SPARTA AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-11067

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-11068

CONSTRUCTION AND TESTING OF TWO WASTE-INJECTION MONITOR WELLS IN NORTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-11070

GROUND-WATER LEVELS IN NEW MEXICO, 1974,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2F.
W76-11073

GEOHYDROLOGY OF THE ANZA-TERWILLIGER AREA, RIVERSIDE COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. R. Moyle, Jr.
Available from the National Tecnical Information Service, Springfield, Va 22161, as PB-252-834, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-10, March 1976. 25 p, 12 fig, 2 tab, 14 ref.

Descriptors: *Hydrogeology, *Groundwater resources, *Withdrawal, *Water level fluctuations, *Water quality, Pumping, *California, Hydrologic data, Aquifer characteristics, Streamflow, Water utilization, Land use, Nitrates.
Identifiers: Riverside County(Calif), *Anza-Terwilliger area(Calif).

The Anza-Terwilliger area consists of about 96 square miles (249 square kilometers) in the upper parts of the Santa Margarita River and Coyote Creek drainage basins in Riverside County, Calif., about 90 miles (145 kilometers) southeast of Los Angeles. This report deals with geology, steady state and transient state of ground water, net depletion of ground water, surface-water flow, precipitation, chemistry of water, land and water use, and gravity data for the area. The rate of ground-water depletion has accelerated since 1950. Pumping depressions adjacent to the Cahuilla Indian Reservation have increased the hydraulic gradient and are causing water beneath the reservation to flow toward these depressions. Total depletion of ground water since 1950 is about 14,000 acre-ft (17.3 cubic hectometers). Ground water in local areas contains concentrations of nitrate above that recommended by the Environmental Protection Agency for human consumption. (Woodard-USGS)
W76-11074

MODELING SOLUTE TRANSPORT IN GROUND WATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-11076

RECYCLING GROUND WATER IN WAUSHARA COUNTY, WISCONSIN: RESOURCE MANAGEMENT FOR COLD-WATER FISH HATCHERIES,
Geological Survey, Madison, Wis.
R. P. Novitzki.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-253-408, $4.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-20, A .u 1976. 60 p, 24 fig, 5 tab, 22 ref.

Descriptors: *Groundwater recharge, *Recycling, *Fish hatcheries, *Water quality, *Water management(Applied), Methodology, Ponds, Infiltration, Water quality control, Pumping, Water wells, Water temperature, Cold-water fish, Trout, Salmon, *Wisconsin, Water reuse.
Identifiers: Waushara County(Wisc).

A permanent recharge pond with supplementary ponds would fulfill the needs of a hatchery development at the Greenwood Wildlife Refuge site, Waushara County, Wisconsin, and insure protection of the groundwater system. Recycling water within the local groundwater system can increase the quantity of water available for use, control or avoid environmental pollution, and control temperature of the water supply. Pumped groundwater supplied a fish-rearing facility for 15 months, and the waste water recharged the local groundwater system through an infiltration pond. Eighty-three percent of the recycled water returned to the well. Pumping 300 gpm, combined with recycling, resulted in water-level declines equivalent to a pumping rate of approximately 50 gpm. Using this effective pumping rate in the Their nonequilibrium equation resulted in predicted drawdowns within 0.5 foot of those observed throughout the 15-month period. The concentration of nitrate in the water supply increased only slightly during the 15 months of recycling. The water-supply temperature can be maintained within the optimum range for trout and salmon rearing during recycling. (Woodard-USGS)
W76-11082

4C. Effects On Water Of Man's Non-Water Activities

THE ECONOMIC IMPACT OF RECREATIONAL LAND-USE IN AN ISLAND ENVIRONMENT: A CASE STUDY OF JEKYLL ISLAND, GEORGIA,
Georgia Marine Science Center, Savannah.
For primary bibliographic entry see Field 6B.
W76-10581

MULTIOBJECTIVE PLANNING AND ENVIRONMENTAL EVALUATION OF WATER RESOURCE SYSTEMS,
State Univ. of New York at Binghamton. Dept. of Geological Sciences; and State Univ. of New York at Binghamton. School of Advanced Technology.

For primary bibliographic entry see Field 6G.
W76-10610

STUDIES FOR WILDLIFE ON ENERGY AREAS,
Utah State Div. of Wildlife Resources, Salt Lake City.
For primary bibliographic entry see Field 6G.
W76-10820

A SELECTED ANNOTATED BIBLIOGRAPHY ON FISH AND WILDLIFE IMPLICATIONS OF MISSOURI BASIN WATER ALLOCATION,
Colorado Univ., Boulder, Colo. Inst. of Behavioral Science.
A. Cochran.
Report No. FWS/OBS-76/10, 1975, 71 p.

Descriptors: *Missouri River, *Bibliographies, Water quality, *Water allocation(Policy), Water demand, Urbanization, Irrigation, Water supply, Energy, *Wildlife, *Fish, Reservoir construction, Water pollution, Aquatic habitats, Wildlife habitats, Decision-making, Streamflow forecasting, Strip mines, Water distribution(Applied), *Environmental effects.
Identifiers: Upper Missouri River Basin.

This annotated bibliography of 234 references was prepared as a part of a research assessment on the fish and wildlife implications of water allocation change to serve energy and other developments in the Upper Missouri River Basin. The bibliography contains a list of 62 bibliographies and other secondary reference materials. It also lists and describes 100 publications on the social and economic effects of energy development, rehabilitation of mined land and disposal of wastes, questions of water supply and demand, studies that deal with energy development in a comprehensive manner, and alternative energy policy studies. A section on water allocation and related legal studies lists and describes 30 publications. The effects of pollutants on aquatic environments and publications dealing directly with the effects of energy development on fish and wildlife are referenced via 42 publications. A subject index is included. (See also W76-10826) (FWS)
W76-10825

FISH AND WILDLIFE IMPLICATIONS OF UPPER MISSOURI BASIN WATER ALLOCATION, A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
W. B. Lord, S. K. Tubbesing, and C. Althen.
Report No. FWS/OBS-76/04, 1975. 114 p.

Descriptors: *Missouri River, *Reviews, *Environmental effects, *Water allocation(Policy), Water demand, Urbanization, Irrigation, Water supply, Energy, *Wildlife, *Fish, Reservoir construction, Water pollution, Aquatic habitats, Wildlife habitats, Decision-making, Streamflow forecasting, Strip mines, Water quality, *Water distribution(Applied).
Identifiers: Upper Missouri River Basin.

Major water allocation changes are occurring in the Upper Missouri Basin because of urban expansion, energy development, and possibly irrigation. Some water can come from existing supplies, irrigation, and new and existing reservoirs. Direct fish and wildlife impacts will occur through streamflow reduction, reservoir construction, water pollution, and through habitat changes caused by reduced water supplies to land areas. Decision-making institutions frequently fail to give adequate weight and protection to fish and wildlife values. Most state water laws fail to safeguard minimum streamflows for fish and wildlife protection. Federal water project planning has been criticized for inadequate consideration of fish and wildlife. Two complementary means of improving this situation are (1) modification of water allocation and decision-making institutions, and (2) provision of more information on potential fish and wildlife impacts. In both cases, research can help improve the current situation. Opportunities for additional research are described. (See also W76-10825) (FWS)
W76-10826

URBAN-INDUSTRIAL EFFECTS ON CLOUDS AND PRECIPITATION,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 111-139. 7 fig, 6 tab, 52 ref.

Descriptors: *Urbanization, *Industries, *Weather modification, Clouds, Precipitation(Atmospheric), Rainfall, Thunderstorms, Weather, Temperature, Climatology, Cloud physics, Air pollution, Pollutants, Radiation, Solar radiation, Turbidity, Cities, Powerplants, Cooling towers, Mills, Agriculture, Urban runoff, Streamflow, Hydrologic aspects, Meteorology.
Identifiers: *Inadvertent weather modification.

Man through modifications of the biosphere has been affecting the atmosphere on local and regional scales for many years. These alterations have been produced by urban-industrial centers, non-urban industrial centers, land use changes in rural areas (deforestation, crop changes, drainage, etc.) and marine areas. A major means whereby man has affected weather has been through his urban environment. The increase in urbanization that began 200 years ago with the industrial revolution has led to relatively significant local and mesoscale changes in the weather in and near urban locales. Since urban areas first proliferated in Europe, considerable scientific attention has been directed to this problem in the European area during the last 100 years. Now that major urban-industrial complexes are prevalent in many countries, worldwide attention to this problem has grown rapidly in the last 20 years, and the development of megalopolises in the United States during the past 30 years has brought with it increasing public and scientific awareness of the degree and the seriousness of urban effects on mesoscale weather and climate. (See also W76-10901) (Sims-ISWS).
W76-10905

URBAN AEROSOLS AND INADVERTENT WEATHER MODIFICATION,
Rockwell International, Thousand Oaks, Calif. Science Center.
G. M. Hidy.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 275-288. 7 fig, 4 tab, 11 ref.

Descriptors: *Aerosols, *Weather modification, *Nucleation, *California, Cities, Air pollution, Pollutants, Chemistry, Particle size, Clouds, Cloud physics, Precipitation(Atmospheric), Rainfall, Fog, Atmosphere, Meteorology.
Identifiers: *Inadvertent weather modification, *Los Angeles(Calif).

Current research on the physical and chemical characteristics of atmospheric aerosols is providing a sounder basis for understanding the behavior of urban haze, including photochemical smog. Such information, combined with more direct measurements of urban cloud condensation nuclei (CCN) and ice forming nuclei (IFN) concentrations, helps to place into perspective the micro or molecular scale process potentially leading to inadvertent weather modification. The Los Angeles atmosphere is a prolific producer of haze over a wide geographical region of Southern California. Yet the differences in CCN or IFN from this area appear to be rather small compared with the 'norms' in other locations. The efficiency of removal of such material combined with dilution in the atmosphere suggest that the influence of Los Angeles on weather changes involving cloud formation over a wide geographical region should be quite subtle in extent and probably undetectable within our limitations of knowledge and instrumentation. However, this conclusion cannot be generalized at this point for all cities, whose air may contain widely different aerosol populations. (See also W76-10901) (Sims - ISWS)
W76-10913

DEPOSITION IN UPPER PATUXENT ESTUARY, MARYLAND, 1968-1969,
Madison Coll., Harrisonburg, Va. Dept. of Geology.
W. P. Roberts, and J. W. Pierce.
Estuarine and Coastal Marine Science, Vol. 4, No. 3, p 267-280, 1976. 6 fig, 3 tab, 32 ref.

Descriptors: *Urban runoff, *Sedimentation rates, *Deposition(Sediments), *Estuaries, *Maryland, Sediment transport, Suspended load, Rivers, River flow, Discharge(Water), Tidal effects, Hydraulics.
Identifiers: *Patuxent River(Md), Suspended sediment discharge, Thickness of sediment deposition.

Urbanization leads to increased runoff and sediment discharge during construction, as shown in a year-long study of the Patuxent River drainage basin during a period of intense development for housing. Although precipitation was only 80% of previous years, water discharge to the estuary was 2.4 time the average. A net upstream flux of suspended sediment indicated that all fluvial suspended sediment was deposited in the upper reaches of the estuary. Two areas of net deposition were separated by a central turbidity maximum, which fluctuated in position over a 10-km distance in response to high or 'average' river discharge. During low river discharge, two turbidity maxima were observed; one, corresponding with the salt front; and the other, with a downstream constriction in the estuary channel. The average rate of deposition in the upper 50 km of the estuary was calculated to be 7.45 g per sq cm per year. If approximately 20% of the riverborne sediment was deposited between the tidal limit and the average position of the salt front, then 5.88 g per sq cm were deposited during the study period, forming a layer with an average thickness of 3.7 cm. (Lee - ISWS)
W76-10925

POSSIBLE URBAN EFFECTS ON MAXIMUM DAILY RAINFALL AT PARIS, ST. LOUIS AND CHICAGO,
Meteorologie Nationale, Paris (France).
J. Dettwiller, and S. A. Changnon, Jr.
Journal of Applied Meteorology, Vol. 15, No. 5, p 517-519, May 1976. 2 tab, 12 ref. NSF AEN73-07796.

Descriptors: *Rainfall, *Cities, *Urbanization, Precipitation(Atmospheric), Weather modification, Weather data, Time series analysis, Winter, Summer, Meteorology, Climatology.
Identifiers: *Paris(France), *Chicago(Ill), *St. Louis(Mo), Urban effects, Inadvertent weather modification, Convective precipitation.

The seasonal maximum daily rainfall values for the 1871-1970 period at these three large cities in different climates were studied to discern trends. Upward trends of 19-38% were found in the warm season values at all cities, but no significant up or down trends were found in the cold season values. The upward trends in the warm season appear to reflect both natural climatic changes and inadvertent urban effects on local convective precipitation. (Sims-ISWS)
W76-10929

EFFECT OF VEGETATION ON LATERAL MIGRATION OF ANASTOMOSED CHANNELS OF A GLACIER MELTWATER RIVER,
Calgary Univ., Alberta. Dept. of Geography.
D. G. Smith.
Geological Society of America Bulletin, Vol. 87, No. 6, p 857-860, June 1976. 6 fig, 1 tab, 19 ref.

Descriptors: *Geomorphology, *Canada, *Channels, Erosion, Rivers, Sedimentation, Flood plains, Streams, Hydraulics, Vegetation, Vegetation effects, Bank protection.
Identifiers: *Fluvial geomorphology, *Channel stability, River bank vegetation, Anastomosed channels, Erosion box.

A series of experiments were performed on bank materials of anastomosed channel in flood-plain silt deposits in the Alexandra Valley in Banff Park, Alberta, to determine the effect of vegetation roots on bank erodibility and lateral migration of channels. Underground roots from the dense growth of meadow grass and scrub willow provide the reinforcement of bank sediment and a riprap-like protection of channel banks from river erosion. Result from the experiments suggested that in cool environments with aggrading river conditions where overbank deposition of silt, clay, and fine sand dominate the valley fill, vegetation roots are able to rapidly accumulate and decay very slowly, thus affording protection to banks from erosion in deeper parts of the channels. Experiments were performed with a specially designed erosion box, used as a means to simulate natural erosion conditions and measure the influence of vegetation roots in reducing bank erosion. Results indicated that the bank sediment with 16 to 18% by volume of roots with a 5-cm root-mat for bank protection, typical of the area, had 20,000 times more resistance to erosion than comparable bank sediment without vegetation. Assuming five severe erosion days per year, potential lateral channel migration would amount to 4.2 cm per year. Such resistance, due to vegetation, accounts for the remarkable stability of channels during the last 2,500 yr in the Alexandra Valley. (Lee - ISWS)
W76-10940

THE IMPACT OF HIGHWAY CONSTRUCTION ON A NORTH FLORIDA WATERSHED,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5B.
W76-10945

GREATER PITTSBURGH REGIONAL STUDIES, REPORTS AND MAPS, APRIL 1976.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-11072

4D. Watershed Protection

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRRIGATED AND NON-IRRIGATED AGRICULTURE.
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 5G.
W76-10564

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, CONTROL OF WATER POLLUTION FROM SELECTED NONPOINT SOURCES.
Mid West Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-10567

MULTIOBJECTIVE PLANNING AND ENVIRONMENTAL EVALUATION OF WATER RESOURCE SYSTEMS,
State Univ. of New York at Binghamton. Dept. of Geological Sciences; and State Univ. of New York at Binghamton. School of Advanced Technology.
For primary bibliographic entry see Field 6G.
W76-10610

ECONOMIC EFFECTS OF AGRICULTURAL LAND-USE MANAGEMENT ON SOIL EROSION AND FARM INCOME IN THE OBION-FORKED DEER RIVER BASIN,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 4A.
W76-10612

AGRICULTURAL SEDIMENT CONTROL FOR WATER QUALITY PROTECTION,
Environmental Protection Agency Washington, D. C. Office of Air and Water Programs.
For primary bibliographic entry see Field 5G.
W76-10617

THE INFLUENCE OF SLOPE AND RAIN INTENSITY ON RUNOFF AND INFILTRATION.
SLETCO, Beirut (Lebanon).
For primary bibliographic entry see Field 2A.
W76-10702

THE ABILITY OF DEBRIS, HEAVILY FREIGHTED WITH COARSE CLASTIC MATERIALS, TO FLOW ON GENTLE SLOPES,
Stanford Univ., Calif. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W76-10711

APPLICATION OF THE STANFORD WATERSHED MODEL TO NIGERIAN WATERSHEDS,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-10923

THE IMPACT OF HIGHWAY CONSTRUCTION ON A NORTH FLORIDA WATERSHED,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5B.
W76-10945

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

PERIPHYTIC AND PLANKTONIC ALGAE OF THE LOWER FRASER RIVER IN RELATION TO WATER QUALITY CONDITIONS,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5C.
W76-10504

CHLORINATED HYDROCARBON RESIDUES IN FISHES FROM THE LOWER FRASER RIVER,
British Columbia, Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5C.
W76-10505

SAMPLING TECHNIQUES IN URBAN RUNOFF QUALITY STUDIES,
Canada Centre for Inland Waters, Burlington, Ontario, Hydraulic Div.
J. Marsalek.
American Society for Testing Materials (ASTM), Special Technical Publication 573, 1975, p 526-542. 5 fig, 3 tab, 10 ref.

Descriptors: *Urban runoff, *Storm water, *Storm runoff, Water quality, *Sampling, Model studies, *Water pollution, Calibrations, *Pollutant identification.
Identifiers: Environmental tests.

Sampling techniques employed depend on use of data collected. If only total pollutant yields are important, then inexpensive flow-proportioned composite sampling may be used. When time variation of pollutant concentration is of interest, an empirical model should be established to be used in the experimental design of data collection program for a runoff quality study. Composite sampling techniques include; simple composite samples of water are withdrawn at regular intervals and put in a container; flow-weighted composite, either a constant fraction of the flow is collected or constant volumes are collected which depend on water quality; and pollutant mass-flow-weighted composite sample, by monitoring a particular parameter, samples are collected at preselected constant increments of the cumulative pollutant mass flow. In order to determine the type of sampling and minimum number of samples needed, an empirical model is needed to describe the variation of runoff quality. Several attempts at models are examined. Runoff quality is described either by the rate at which the pollutant is washed from the drainage system or by the variation of the pollutant concentration during the runoff event. It is found in testing models that they are often only applicable to a particular site which is affected by pollutant concentrations which are non-uniform over the urban area. An example is given of experimental design for sequential sampling, but practical aspects are stressed. It is important to avoid systematic sampling error by examining the depth at which the sample is taken, the capability of the sampler, sample cross-contamination, and lack of synchronization between the flow recording and sampling. (Smith-North Carolina)
W76-10509

FACTORS IN THE PURIFICATION OF FLOWING SEWAGE AND ACTIVATED SLUDGE PROCESS - PART 2,
Indian Inst. of Science. Bangalore. Dept. of Biochemistry.
For primary bibliographic entry see Field 5D.
W76-10513

RESIDUAL ORGANIC MATTER IN ACTIVATED SLUDGE PROCESS EFFLUENTS VIII. SEPARATION BY MOLECULAR WEIGHTS ON SEPHADEX COLUMNS (ZBYTKOVE LATKY PO AKTIVACNIM PROCESU VIII. DELENI PODLE MOLEKULOVYCH HMOTNOSTI NA SEPHADEXECH),
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
J. Chudoba, P. Lischke, F. Tucek, and A. Maglicova.
Scientific Papers of the Institute of Chemical Technology, Prague, F 19 (1974) Technology of Water. 15 fig, 6 tab, 26 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Organic compounds, *Analytical techniques, *Molecular structure, *Weight, Sewage treatment, Biological treatment, Activated sludge, Sewerage, Chemical oxygen demand, Treatment facilities.
Identifiers: *Molecular weight.

Residual organic compounds found in biologically purified waste waters were fractionated by means of gel chromatography on Sephadex columns. The first sample treated was a concentrate of the residual compounds from a laboratory activated sludge unit using a mixture of glucose and glutamic

acid as the substrate; it contained only the compounds produced by the activated sludge microorganisms. Sample 2 was a concentrate of the residual compounds from biologically treated Prague sewage. Sample 3 was a concentrate of trace organic compounds from Prague tap water, which were not removed by the coagulation process in the water treatment plant. Six percent of the compounds in the first sample had molecular weights (MW) greater than 50,000, and 78% had MW lower than 700. Sample 2 contained no compounds with MW above 50,000, 5% compounds with MW between 10,000 and 50,000, and 77% compounds with MW below 700. Thirteen percent of the compounds in sample 3 had MW between 10,000 and 50,000, and 77% had MW below 700. Previous conclusions are discussed in the light of these findings. Coagulation tests verified the theoretical conclusion that, since about 75% of the residual organic compounds have MW below 700, they cannot be removed from the solution by the usual coagulation process. The maximum chemical oxygen demand (COD) removal for various samples varied between 23% and 29%. (See also W76-10515) (Snyder-FIRL)
W76-10514

RESIDUAL ORGANIC MATTER IN ACTIVATED SLUDGE PROCESS EFFLUENTS. IX. ISOLATION FROM WATER, FRACTIONATION ON ALUMINUM OXIDE COLUMNS AND ATTEMPTS OF IDENTIFICATION (ZBYTKOVE LATSY PO AKTIVACNIM PROCESU. IX. IZOLACE Z VODNEHO PROSTREDI, DELENI NA KYSLICNIKU HLINITEM A POKUSY O IDENTIFIKACI),
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
J. Chudoba, F. Tucek, P. Lischke, A. Dousa, and V. Kubelka.
Scientific Papers of the Institute of Chemical Technology, Prague, F 19 (1974) Technology of Water. 8 fig, 16 tab, 44 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Activated sludge, *Analytical techniques, *Chemical oxygen demand, Organic matter, Effluents, Organic compounds, Gas chromatography, Mass spectrometry.

Residual organic compounds prepared in a laboratory activated sludge unit fed with glutanic acid and glucose were concentrated, separated from inorganic salts, and fractionated on aluminum oxide columns. Individual compounds were identified by examining fractionated groups using a gas chromatograph-mass spectrometer technique. Sixty-five percent of the chemical oxygen demand (COD) was adsorbed from the effluent of the activated sludge unit when desalination was carried out using a strongly acidic cation-exchange resin and a weakly basic anion-exchange resin. When inorganic compounds were precipitated with ethanol and an ethanol and acetone mixture, 61% of the COD entered the precipitate. The extract obtained with ether after the first desalination was shown by fractionation to contain at least five compounds. The main portion of the compounds not extractable by ether was fractionated by gradient elution and contained 14 groups of compounds. At least three compounds were obtained by combining and refractionating the lesser polar compounds. Only the samples extracted with ether could be analyzed by gas chromatography-mass spectrometry, because the other samples contained nonvolatile compounds. Four derivatives of benzothiazole substituted in the position 2, benzothiofene and its two derivatives, indanone, difenylamine, di-N-probylaniline, nitrophenoles, methylisopropyl phenole, and several other compounds with uncertain structures were identified on the basis of mass spectra. Residual organic compounds originating as waste products of activated sludge microorganisms represent a varied mixture, from less polar to highly polar. (See also W76-10514) (Snyder-FIRL)
W76-10515

DETERMINATION OF 14C-DDT RADIOACTIVITY IN SEA WATER AND MARINE SUSPENDED MATTER BY LIQUID SCINTILLATION,
Institut Rudjer Boskovic, Zagreb (Yugoslavia).
N. Picer, M. Picer, and P. Strohal.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 5, 1 tab., 3 fig., 6 ref. p. 565-570, 1975.

Descriptors: Methodology, *Analytical techniques, *Sea water, *Suspended solids, *Pollutant identification, *DDT, Laboratory tests, Technology, Research and development, *Carbon radioisotopes, Pesticide residues, Pesticides, Chlorinated hydrocarbon pesticides, Carbon.
Identifiers: *Liquid scintillation, Instagel, Tritone.

A method for determining 14C-DDT radioactivity by liquid scintillation is presented. The instagel scintillator showed higher efficiencies in the presence of solid particles in seawater medium than the previously used Tritone scintillator. The content of water in the samples must be relatively high, to insure good detection of 14C-DDT with the Instagel method. (Katz)
W76-10518

PHYSICAL AND CHEMICAL PROPERTIES OF OUTDOOR BEEF CATTLE FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Inst. of Agriculture and Natural Resource.
For primary bibliographic entry see Field 5B.
W76-10543

SAMPLERS FOR MONITORING RUNOFF WATERS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
H. L. Manges, and C. C. Nixon.
Presented at the 1975 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 15-18, 1975, Paper No. 75-2562, 10 p. 4 fig, 9 ref.

Descriptors: *Agricultural runoff, *Sampling, Equipment, *Design, *Performance, Monitoring, Pollutant identification, Farm wastes.

A proportional sampler using short tubes to divide runoff flow was designed, built and tested. In laboratory tests, sampling ratio became constant after decreasing with increasing flow rates for unsubmerged flow and was constant for submerged flow. Sampling ratio was quite variable during field testing due to debris clogging the reservoir below the short tubes. A sampler using orifices surrounded by short tubes in place of the short tubes alone for dividing flow had a slightly better sampling ratio for unsubmerged flow and a constant sampling ratio for submerged flow. Additional research and development is needed to perfect the design and construction of the proportional sampler. However, it has the potential for wide use in runoff monitoring when perfected. (Merryman-East Central)
W76-10550

WATER QUALITY ANALYSIS, SANTEE RIVER BASIN,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.
W76-10578

WATER QUALITY ANALYSIS, COLUMBIA RIVER.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W76-10579

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
W. D. Haseman, C. Holsapple, and A. B. Whinston.
Socio-Economic Planning Sciences, Vol. 10, No. 1, p. 31-36, 1976. 4 fig., 17 ref.

Descriptors: *Data storage and retrieval, *Water quality control, *Computer programs, *Planning, *Management, Monitoring, *Pollutant identification, Data collections.
Identifiers: Generalized Planning System, FORTRAN.

The capabilities, storage adjustments, and retrieval of the Generalized Planning System (GPLAN), its application to the National Pollutant Discharge Elimination System (NPDES), and its implementation of a state permit monitoring program are described. The information system reflects the economic, technical, environmental, and social interdependence of meeting water quality objectives and is designed with particular emphasis as an aid to planning in addition to the functions of monitoring and logistics. The overall structure of the GPLAN system consists of the following major components: (a) Data management system, (b) collection of application programs, and (c) high level query language, each of which are coordinated by a control program, directing the access of data from the data base and the execution of application programs to satisfy the request entered through the query language. To meet the flexibility to the selectivity and the configuration of data retrieval by a planner, the GPLAN query language allows both selective and unconditional retrieval without requiring the planner to be a computer specialist. The planner can receive the results of the execution of a large scale application program, e.g., optimization/simulations, using the required data from the data base as input. FORTRAN is the host language and the system implementation language. (Auen-Wisconsin).
W76-10588

TRANSPORT OF CHLORINATED HYDROCARBONS IN SEDIMENTS OF THE UPPER CHESAPEAKE BAY,
Westinghouse Oceanic Div., Annapolis, Md.
For primary bibliographic entry see Field 5B.
W76-10607

DIRECTORY OF EPA, STATE AND LOCAL ENVIRONMENTAL QUALITY MONITORING AND ASSESSMENT ACTIVITIES.
Smithsonian Institution, Cambridge, Mass. Center for Short-Lived Phenomena.
For primary bibliographic entry see Field 5G.
W76-10623

REPORT ON POLLUTION OF INTERSTATE WATERS OF THE CONNECTICUT RIVER.
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 744, $4.50 in paper copy, $3.00 in microfiche. November, 1963, 65 p, 6 fig, 5 tab, 1 append.

Descriptors: *Pollutant identification, *Sewerage, *Sewage, *Water quality, Natural streams, Industrial wastes, Tributaries, Degradation(Stream), Downstream, Impounded waters, Rivers, *Connecticut River, Solid wastes, Water pollution sources, Massachusetts.

Pollution of interstate waters of the Connecticut River is reported, based on previous reports, official Public Health Service records, and data from a field study in September and October 1963. Various state and local agencies and individuals also provided data and information. Both river water and sewage were sampled and analyzed. Sixty-two miles of the river, from Hatfield, Massachusetts, to 12 miles below Hartford, Connecticut, were studied, as were portions of the Chicopee and West-

ield rivers, tributaries of the Connecticut River ear Springfield, Massachusetts. Two dams on the Connecticut River and several small dams on the ther two rivers provide hydroelectric power and ndustrial process water. The river receives raw nd partially treated sewage from a population of 50,000 and industrial discharges equivalent to raw ewage from a population of 100,000. As a result, t is excessively polluted. In 1963, bacterial quality f the water did not meet common water pollution ontrol objectives at any point on the river. The uspended solids produced sludge deposits from a hort distance below Holyoke Dam to Enfield Dam. Dissolved oxygen was intermittently epleted below the desirable level by the oxygen lemand of the decomposing wastes. Visual vidence of pollution included cloudy water near lischarges, intermittent dye colors from industrial vastes, small grease balls, bits of excreta near ewage discharges, and intermittent oil films. Wastes discharged into these rivers in Massachusetts endanger Connecticut residents' health nd welfare, and are therefore subject to abatement under the Federal Water Pollution Control Act. (Snyder-FIRL)
W76-10626

CHARACTERIZATION OF SULFIDE MINERAL SURFACES IN FROTH FLOTATION SYSTEMS USING ELECTRON SPECTROSCOPY FOR CHEMICAL ANALYSIS,
Missouri Univ., Rolla. Dept. of Metallurgical and Nuclear Engineering.
For primary bibliographic entry see Field 5D.
W76-10635

INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SENSING AND ASSESSMENT, VOLUMES 1 AND 2.
World Health Organization, Geneva (Switzerland).
September 14-19, 1975, Las Vegas, Nevada, (500 p). A Joint Conference of the International Symposium on Environmental Monitoring and the Third Joint Conference on Sensing of Environmental Pollutants.

Descriptors: *Monitoring, *Analytical methods, *Legal aspects, *Water quality, *Pollutant identification, Flow, Surface waters, Groundwater, Oceans, Estuaries, Network design, Waste disposal, Equipment, *Conferences.

More than 200 conference papers dealing with topics related to environmental sensing and assessment techniques are presented, with 57 of the presentations dealing with water resources. Topics covered include: surface-groundwater relationships; groundwater contamination; estuarine circulation; the identification of water pollutants; pollutant pathways in ground, surface, and coastal waters; the effects of pollutants on water uses; waste treatment and disposal processes; water quality control; methods for evaluating monitoring projects; the legal aspects of monitoring aquatic environments; the design of monitoring networks; remote sensing techniques; collection and sample preparation methods; laboratory analytical methods; and field monitoring devices. (See W76-10638 thru W76-10672) (Kreager-FIRL)
W76-10637

FLOW OF TOXIC METALS IN THE ENVIRONMENT,
Pan American Health Organization, Mexico City.
For primary bibliographic entry see Field 5B.
W76-10638

SAMPLING AND ANALYSIS OF METALS IN AIR, WATER AND WASTE PRODUCTS,
California Inst. of Tech., Pasadena. W.M. Keck Lab. of Environmental Engineering Science.
J. J. Morgan.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 1-2-1 - 1-2-9, 4 tab, 83 ref.

Descriptors: *Pollutant identification, *Metals, *Sampling, *Analytical techniques, Neutron activation analysis, X-ray fluorescence, Mass spectrometry, Potable water, Surface waters, Sewage, Sludge, Aquatic life.
Identifiers: Atomic absorption spectrometry, Plasma emission spectrometry.

Monitoring, sampling, and analytical procedures for different environmental compartments are reviewed from the standpoint of source-flow-receptor and chemical element balance concepts. Levels of various metals in drinking water, surface waters, sewage effluent, and sewage sludge are compared. Standard, tentative, and approved analytical methods are reviewed for the analysis of metals in water along with methods for collection, preconcentration, and sample preparation. The effects of sampling, storage, processing, and preconcentration steps on the overall analysis of water samples containing metals are also discussed. Analytical methods such as instrumental neutron activation analysis, X-ray fluorescence, flame and non-flame atomic absorption, plasma emission spectrometry, and spark source mass spectrometry are reviewed in terms of their accuracy and range of use. The need for advancements in chemical speciation is discussed in terms of the effects of particular metals on aquatic life. (See also W76-10637) (Kreager-FIRL)
W76-10639

MONITORING: THE TRIGGER FOR ACTION,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
I. E. Wallen.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 2-1-1 - 2-1-3.

Descriptors: *Monitoring, Programs, *Water quality, *Pollutant identification, *Water treatment, Chlorination, Industrial wastes, Potable water, Organic compounds, Asbestos, Inorganic compounds, Chemical reactions, Standards, Surveys.
Identifiers: Halogenated organics, Halomethanes.

Environmental Protection Agency air and water monitoring programs are reviewed. The programs include the monitoring of drinking water for organics that are suspected carcinogens, the monitoring of industrial waste waters for asbestos, early warning efforts to screen water samples from industrial areas for toxic organic and inorganic compounds, and a project to identify multimedia exposure to selected halogenated organics in air, water, soil, and food as well as the levels of these chemicals in human populations throughout an exposure area. A survey of 80 drinking water supplies has already established the possibility that chlorination may be contributing to the formation of halomethanes in drinking water. The use of monitoring data in setting standards is also discussed. (See also W76-10637) (Kreager-FIRL)
W76-10640

ENVIRONMENTAL LEVELS OF PCB'S,
Environmental Protection Agency, Washington, D. C.
D. J. Ruopp, and V. J. DeCarlo.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 2-3-1 - 2-3-5. 1 fig, 4 tab, 35 ref.

Descriptors: *Polychlorinated biphenyls, *Water pollution, *Water pollution effects, *Monitoring, Fish, Pollutant identification, Surveys, Surface waters, Groundwater, Industrial wastes, Sewage, Treatment facilities, Effluents, Human population.

Data from national surveys of environmental levels of polychlorinated biphenyls are presented. Surface water and groundwater levels throughout the United States range from 0.1-4.0 micrograms/liter, and levels in fish range from 0.10-14.8 ppm. On the basis of national aquatic environmental data collected in 1971-1972 and in 1974, a continuing widespread accumulation of polychlorinated biphenyls in water, sediment, and fish appears to be occurring. A human monitoring program in 1972 revealed that 3035 out of 4102 samples of human adipose tissue showed levels ranging from less than one ppm to more than 3 ppm. In 1973, 964 out of 1277 samples from 28 states again showed levels in the same range. The major sources contributing to the environmental levels of polychlorinated biphenyls appear to be industrial effluents, manufacturing processes, consumer and industrial waste materials, sewage treatment facilities, and accidental spills. (See also W76-10637) (Kreager-FIRL)
W76-10641

A PRELIMINARY DESIGN FOR A NATIONAL ENVIRONMENTAL CENSUS,
Energy Resources Co., Inc., Cambridge, Mass.
R. H. Rosen, and R. P. Beck.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 3-2-1 - 3-2-3. 3 tab, 6 ref.

Descriptors: *Monitoring, *Water quality, *Costs, *Census, Economics, Water pollution control, Evaluation, Projections, Design criteria.
Identifiers: National environmental census.

Present and future requirements for pollution control expenditures in the United States are reviewed, and a national environmental census designed to overcome inadequacies of the present monitoring system is proposed. The capital investment for water pollution control is expected to exceed $80 billion between now and 1982. Although over 5453 water monitoring stations presently exist, which is more than enough to meet the nation's needs, a lack of rational distribution of monitoring facilities is evidenced by the fact that 10 of the 50 states have less than half of the number of monitoring stations required to represent the population. A national environmental census is proposed as a solution to the distribution problem. The census is expected to cost between 68 and 104 million dollars/year for water monitoring. (See also W76-10637) (Kreager-FIRL)
W76-10642

DESIGN OF NATIONWIDE WATER-QUALITY MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
R. J. Pickering, and J. F. Ficke.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 3-3-1 - 3-3-4. 2 fig, 5 ref.

Descriptors: *Monitoring, *Water quality, *Network design, *Pollutant identification, Groundwater, Surface waters, Rivers, Design criteria, Networks, Biological properties, Organic compounds, Radioactive wastes.
Identifiers: National Stream Quality Accounting Network.

Design criteria for water quality monitoring networks are discussed, and the United States Geological Survey's National Stream Quality Accounting Network is described. Specific objectives of a monitoring program must be defined before a proper mix of sampling sites, frequency of measurement, and characteristics to be measured can be selected. Design of groundwater quality networks, for example, must be based on knowledge of direction and rate of water movement, while proper sampling in streams requires a

knowledge of velocity distribution in the cross section and expected variation in streamflow and water quality with time. A National Stream Quality Accounting Network which subdivides the United States into 325 hydrologic accounting units is being designed by the Geological Survey to provide a measure of the quality of the Nation's rivers. Reports from the network will describe geographic and annual variations in stream flow and water quality, their probable causes, and detectable long-term trends. Organic and radioactive substances and biological characteristics will be measured at selected network stations that constitute subnetworks of the National Stream Quality Accounting Network. (See also W76-10637) (Kreager-FIRL)
W76-10643

SOME INTERNATIONAL ACTIVITIES IN ENVIRONMENTAL MONITORING,
World Health Organization, Geneva (Switzerland).
G. Ozolins.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 3-4-1 - 3-4-4.

Descriptors: *Monitoring, *Water quality, *International commissions, Programs, International hydrological decade, Potable water, Surface waters, Oceans, Sea water, Irrigation water, Surveys, Hydrology, Fisheries.

A review of international environmental monitoring activities is presented. The World Health Organization is providing direct assistance to less developed countries for the establishment of drinking water surveillance programs and is preparing a training manual for this purpose. The Food and Agriculture Organization is involved in providing technical assistance and guidance on the development of water quality monitoring programs for commercial fisheries and is also pursuing monitoring projects related to agriculture, particularly irrigation waters. The United Nations Educational, Scientific and Cultural Organization is concentrating on the coordination of the International Hydrological Decade and the International Hydrological Program and is preparing a guidebook for water quality surveys. The Intergovernmental Oceanographic Commission, the Intergovernmental Maritime Consultative Organization, and other organizations are involved in studying pollution of oceans and the seas. The World Health Organization is involved in surface water monitoring activities and is giving assistance to Member States in developing national water pollution monitoring programs. The World Meteorological Organization is primarily directing its monitoring activities towards operational hydrology. (See also W76-10637) (Kreager-FIRL)
W76-10644

EARTHWATCH-SENTINEL FOR THE FUTURE,
National Oceanic and Atmospheric Administration, Rockville, Md.
C. E. Jensen, and D. W. Brown.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 3-5-1 - 3-5-3.

Descriptors: *Monitoring, *Water quality, *Water pollution effects, *Baseline studies, *Environmental effects, Programs, Oceans, Lakes, Hydrology, Data collections, Information exchange, Indicators, Pollutant identification, Fish.
Identifiers: EARTHWATCH.

The global environmental assessment program, EARTHWATCH, is described. This program is part of the United Nations Environment Program and calls for the establishment of World Environmental Assessment Centers and Regional Environmental Assessment Centers which in turn are supported by national facilities. EARTHWATCH Reference Sites are to be established for providing an integrated base of benchmark data and information and will include selections from ongoing and planned activities dealing with hydrology stations, lake biome programs, open ocean baseline sites, and river outflow stations. Impact sites will provide a continuing, systematic appraisal of immediate and nearterm environmental impacts and will include programs dealing with regional marine monitoring activities. An EARTHWATCH Indicator Program will begin with the designation of a series of target substances or organisms to be included in reference and impact monitoring activities. Three pilot projects are also proposed. (See also W76-10637) (Kreager-FIRL)
W76-10645

NETWORK DESIGN CONSIDERATIONS FOR THE GLOBAL ENVIRONMENTAL MONITORING SYSTEM (GEMS) OF THE UNITED NATIONS,
Smithsonian Astrophysical Observatory, Cambridge, Mass.
R. Citron.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 3-6-1 - 3-6-6. 6 tab, 22 ref.

Descriptors: *Monitoring, *Networks, *Water quality, *Pollutant identification, Programs, Heavy metals, Organic compounds, Chemical properties, Biological properties, Potable water, Sea water, Rain, Freshwater, Sewage.
Identifiers: Chlorinated hydrocarbons.

Worldwide existing and planned environmental monitoring programs are surveyed in connection with a Global Environmental Monitoring System being developed by the United Nations. One of the first priorities of the System is to coordinate and support monitoring programs that provide information on the states and trends of global pollution. At least 160 programs operating over 10,000 sites in 44 countries are currently monitoring toxic heavy metals and chlorinated hydrocarbons in air, fresh water, marine water, drinking water, soil, plants, food, animals, and man. More than 50 programs over 3500 sites are monitoring these pollutants in North America. On a worldwide basis, 145 marine water programs, 278 fresh water programs, 48 drinking water programs, 9 rain programs, and 2 sewage programs are operating over 15,837, 32,246, 6440, 232, and 18 sites, respectively, for monitoring the biological and chemical properties of these media. (See also W76-10637) (Kreager-FIRL)
W76-10646

POLYCHLORINATED BIPHENYLS OFF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W76-10647

WATER CONTAMINATION DETECTION,
Rockwell International, Canoga Park, Calif. Rocketdyne Div.
I. Lysyj.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-2-1 - 4-2-3. 4 tab, 4 ref.

Descriptors: *Analytical techniques, *Water quality, *Organic compounds, *Gas chromatography, *Waste water(Pollution), Surface waters, Feasibility studies, Evaluation, Measurement, Rivers, Effluents, *Pollutant identification.
Identifiers: Pyrographic analysis.

The feasibility of using pyrographic analysis for detecting gross discharges and spills of waste materials into open waters and for monitoring gross changes in the quality of the receiving water was evaluated. Pyrographic analysis involves subjecting the water sample to elevated temperatures so that the organics in the water are pyrolyzed. The pyrolysis gases are then separated by gas chromatography and detected as a series of peaks by a flame ionization detector. A field study in the Occonee River in Georgia demonstrated that pyrographic patterns of discharged waste were different from pyrographic patterns of natural unpolluted waters, providing a means for determining general or gross water quality of a receiving stream. A method of developing a scale of relative septicity as an indicator of gross water quality was also presented. (See also W76-10637) (Kreager-FIRL)
W76-10648

SPARK SOURCE MASS SPECTROMETRY: THE OPTIMUM REFEREE METHOD FOR MULTIELEMENT ANALYSIS,
Environmental Research Lab., Athens, Ga.
C. E. Taylor.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-4-1 - 4-4-2. 2 fig.

Descriptors: *Mass spectrometry, *Pollutant identification, *Water quality, *Analytical methods, X-ray fluorescence, Neutron activation analysis, Measurement, Performance, Evaluation.
Identifiers: Multi-element analysis, Trace analysis, Atomic absorption spectrometry, Plasma emission spectrometry.

The use of spark source mass spectrometry for the multielement analysis of water samples is discussed. The method can be used to routinely yield data on up to 82 elements simultaneously at the parts per billion level. The operating parameters for the instrumentation are constant for all samples, thus eliminating the need for optimization procedures. A comparison of spark source mass spectrometric analyses with those of instrumental neutron activation analysis, plasma emission, atomic absorption, and X-ray fluorescence revealed unexpected errors in the latter methods associated with the complex and variable matrices of environmental samples. (See also W76-10637) (Kreager-FIRL)
W76-10649

FREQUENCY DISTRIBUTIONS FOR COLIFORM BACTERIA IN WATER,
Drexel Univ., Philadelphia, Pa. Dept. of Environmental Engineering and Science.
W. O. Pipes, P. Ward, and S. H. Ahn.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-5-1 - 4-5-5. 4 fig, 1 tab, 7 ref.

Descriptors: *Coliforms, *Waste water(Pollution), *Statistical models, *Statistical methods, *Fermentation, Evaluation, Measurement, *Pollutant identification, Mathematical studies, Water treatment.
Identifiers: Bacterial counts, Poisson distribution, Binomial distribution, Multiple tube fermentation tests.

Data from multiple fermentation coliform counts on raw water from a water treatment plant were analyzed to determine the best fit statistical frequency distribution. The data for each of five runs fit a negative binomial distribution and did not fit a Poisson distribution which had been assumed to be valid for coliform counts. Thus, the use of the Poisson distribution to represent coliform counts appears to lead to an underestimate of the variability of these counts, and the calculation of the most probable number values from multiple tube fermentation tests leads to underestimates of mean coliform densities. (See also W76-10637) (Kreager-FIRL)
W76-10650

TRACE METAL ANALYSIS BY ATOMIC EMISSION USING A D.C. ARGON PLASMA,
Naval Underwater System Center, Newport, R. I. Material and Chemistry Branch.
W. G. Cox.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-6-1 - 4-6-4. 2 fig, 12 ref.

Descriptors: *Spectrophotometry, *Argon, *Analytical techniques, *Pollutant identification, *Metals, Water quality, Sea water, Mercury, Lead, Cadmium, Zinc, Copper, Chromium, Costs, Evaluation, Performance, Measurement.
Identifiers: Atomic emission spectrometry, Plasma atomic emission spectrometry.

The use of direct current argon plasma atomic emission spectrometry for the analysis of trace metals in water samples is discussed. The method utilizes an Echelle grating spectrometer with a direct current argon plasma to achieve high resolution, high luminosity, and wide spectral coverage. Matrix effects which have traditionally plagued atomic absorption techniques are minimized or eliminated. Calculated detection limits for mercury, lead, cadmium, zinc, copper, and chromium in sea water samples were 57, 35, 12, 12, 6 and 8 micrograms/liter, respectively, using the argon plasma atomic emission technique. The overall acquisition and maintenance costs of the system are comparable to those for an atomic absorption system. (See also W76-10637) (Kreager-FIRL)
W76-10651

AN EVALUATION OF AUTOMATIC WASTEWATER COMPOSITORS,
Environmental Protection Agency, Kansas City, Kans. Surveillance and Analysis Div.
D. J. Harris, and W. J. Keffer.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-7-1 - 4-7-5. 3 tab, 2 ref.

Descriptors: *Sampling, Equipment, *Waste water(Pollution), *Monitoring, *On-site tests, Evaluation, Performance, Treatment facilities, Waste water treatment, Instrumentation, Municipal wastes, Sewage treatment, *Pollutant identification.

Results from field evaluations of automatic waste water samplers are presented, and field compliance monitoring procedures used by the Environmental Protection Agency are reviewed. Comparison studies of various commercial waste water samplers at four sewage treatment plants indicated variations in water chemistry data which were greater than could be explained by laboratory analytical error. Samplers which produced the highest concentrations of solids had higher liquid intake velocities. Slower acting peristaltic and piston pump type samplers appeared to be either not capturing settleable materials or were exhibiting higher settling velocities than liquid intake velocities after introduction to the intake line. High vacuum sampling equipment is used by the Environmental Protection Agency on waste sources with appreciable concentrations of large and/or heavy settleable material such as raw municipal waste water since this type of sampling equipment appears to produce more representative samples. (See also W76-10637) (Kreager-FIRL)
W76-10652

SOME CONSIDERATIONS ON MONITORING OF TRACE METALS IN ESTUARIES AND OCEANS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
D. A. Segar, and A. Y. Cantillo.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 6-5-1 - 6-5-5. 3 fig, 1 tab, 13 ref.

Descriptors: *Metals, *Estuary, *Oceans, *Pollutant identification, *Analytical techniques, Sampling, Rivers, Sewage sludge, Dredging, Zinc, Copper, Iron, Separation techniques, Coasts, New York, New Jersey.
Identifiers: Atomic absorption spectrophotometry, Bights, Dredge spoil dumping.

The trace metal chemistry of the coastal waters of New York and New Jersey in the vicinity of the Hudson-Raritan river discharge was studied. Contamination-free samples were obtained using a 'top drop' Niskin bottle and a rosette multi-sampler. Analysis was performed by flameless atomic absorption spectrophotometry. Large geographical and short-term temporal variations in dissolved trace metal content were observed. Intensive sampling in a restricted geographical area also revealed the existence of coherent cells of water which contained anomalously high metal concentrations. The geographical location of these cells suggested that they were caused by the river discharge influence and by sewage sludge or dredge spoil dumping. An appreciable fraction of the metal present in the dissolved phase of the New York Bight could not be determined by traditional analytical techniques such as solvent extraction. Continuous real-time horizontal profiling of trace metal concentrations from a moving vessel apears to be required for adequately describing the processes affecting metal introduction, transport, and removal in the area. Data on the percentage of total dissolved copper and iron which is determinable by solvent extraction and atomic absorption are presented along with vertical distributions of total zinc. (See also W76-10637) (Kreager-FIRL)
W76-10653

ENVIRONMENTAL MONITORING IN LATIN AMERICA AND THE CARIBBEAN,
Pan American Health Organization, Washington, D. C.
R. Haddad, and W. Castagnino.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 8-1-1 - 8-1-7. 4 fig, 5 tab, 13 ref.

Descriptors: *Monitoring, *Water quality, *Pollutant identification, *Rivers, *Model studies, Dissolved oxygen, Biochemical oxygen demand, Coliforms, Bacteria, Solid wastes, South America.
Identifiers: *Latin America, *Caribbean.

Water pollution monitoring activities in Latin America and the Caribbean are reviewed. Most countries in the region have been collecting water quality information for several decades with varying degrees of coverage. An example of studies being performed to evaluate basin-wide water quality is the Pan American Health Organization report on 'Water Quality in the Plata River Basin.' This study includes monitoring of dissolved oxygen, biochemical oxygen demand, and coliform level in the Matanza River (Buenos Aires area); assessing the influence of Bermejo River solid load discharge into the Parana River system; and bacterial pollution monitoring in the Guaiba River (Porto Alegre area). Studies designed to predict future water quality and the degree of pollution control required for meeting specific socio-economic needs are also being conducted. An example is the Guanabara Bay modelling effort and its monitoring requirements. (See also W76-10637) (Kreager-FIRL)
W76-10654

ENVIRONMENTAL QUALITY SURVEILLANCE IN INDONESIA,
National Inst. of Health, Research and Development, Djakarta (Indonesia).
S. S. Soesanto.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 8-7-1 - 8-7-4. 1 tab 1 ref.

Descriptors: *Monitoring, *Water quality, *Pollutant identification, *Industrial wastes, Waste water treatment, Treatment facilities, Rivers, Coasts, Biochemical oxygen demand, Dissolved oxygen, Bacteria, Saline water intrusion, Sea water, Reservoirs.
Identifiers: *Indonesia.

Water quality monitoring data are presented for indonesia. River and storm water canals in Jakarta show biochemical oxygen demand levels ranging from 100-200 ppm; dissolved oxygen often drops to 0 ppm. An assessment o of the bacteriological quality of raw water taken from the storm water canal for the Jakarta Water Treatment Plants shows a mean probability number of 500,000-2,000,000/100 ml. Biochemical oxygen demand values as high as 1000 ppm exist in the Pluit reservoir, it is located near the sea where industrial waste is discharged. Saline water intrusion is a problem in some coastal area such as the northern coast of Java and the southern coast of Kalimantan. Water pollution from fertilizer plant wastes exists in South Sumatera, and East Java is experiencing water pollution problems as a result of petrochemical wastes. (See also W76-10637) (Kreager-FIRL)
W76-10655

LEGAL REQUIREMENTS FOR MONITORING GROUNDWATER QUALITY,
Banks (Harvey O.), Inc., Belmont, Calif.
For primary bibliographic entry see Field 5G.
W76-10656

ECONOMIC FRAMEWORK FOR GROUNDWATER QUALITY MONITORING,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-10657

DEVELOPMENT OF A METHODOLOGY FOR MONITORING GROUNDWATER QUALITY,
California Univ., Berkeley.
D. K. Todd, and L. G. Everett.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-3-1 - 9-3-4.

Descriptors: *Monitoring, *Groundwater, *Water quality, *Pollutant identification, Data collections, Programs, Network design, Measurement, Water pollution, *Methodology.

A chronological procedure for implementing a groundwater quality monitoring program is presented. The approach is general so that it can be applied in a local area under a variety of land use and hydrogeologic conditions. The implementation procedure consists of the following steps: selection of the area or basin to be monitored, definition of groundwater usage, identification of pollution sources and causes, definition of the hydrogeologic situation, studies of existing groundwater quality, prioritization of pollution sources and causes, evaluation of existing monitoring programs, identification of alternative monitoring approaches, selection and implementation of the monitoring program, review and interpretation of the monitoring results, and summarization and transmittal of monitoring information. (See also W76-10637) (Kreager-FIRL)
W76-10658

MONITORING GROUNDWATER POLLUTION,
K. D. Schmidt.

In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-4-1 - 9-4-6. 25 ref.

Descriptors: *Groundwater, *Monitoring, *Wells, *Aquifers, *Soils, Infiltration, Groundwater movement, Infiltration rates, Soil water movement, Soil properties, Water quality, *Pollutant identification, Bacteria, Inorganic compounds, Subsurface waters, Sampling. Percolation, Water table, Water pollution.

Procedures for the monitoring of groundwater pollution are outlined. Groundwater pollution monitoring entails source monitoring, evaluation of infiltration potential, monitoring in the topsoil and vadose zone, and aquifer monitoring. The most important aspect of groundwater pollution monitoring is in water well sampling. If existing wells are not sufficient, specially designed monitoring wells may have to be constructed. Source monitoring also includes inventorying and sampling solid and liquid wastes which may eventually percolate to the water table. Waste disposal methods partly determine infiltration potential and whether or not portions of the soil-groundwater system are being bypassed. In general, major inorganic constituents are the most mobile in soil-groundwater systems, and bacteriological pollutants are the least mobile. Time trends and the three-dimensional distribution of groundwater quality must be evaluated to successfully monitor aquifer pollution. (See also W76-10637) (Kreager-FIRL)
W76-10659

MANAGEMENT OF GROUNDWATER QUALITY DATA,
Commonwealth Associates, Inc., Jackson, Mich.
N. F. Hampton.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-5-1 - 9-5-5. 1 tab, 5 ref.

Descriptors: *Groundwater, *Water quality, *Data collections, *Computer programs, *Data storage and retrieval, Data processing, Computers, Subsurface waters, Management, Water pollution.

Elements necessary for the efficient management of a groundwater quality data base are outlined. A comprehensive groundwater management information system must be capable of maintaining the following types of data: station descriptions, water quality criteria, geologic information, hydrologic information, water quality parameter identifiers, water quality measurements, temporal information, information qualification data, monitoring agency status data, and information indexing. Primary factors considered in selecting data collection systems are purchase and operating cost, reliability, responsiveness, and minimizing bottlenecks created by relatively high internal computer processing speeds and low input speeds. User access to groundwater surveillance data should be in the batch mode, whereas access to the information index system component should be in the real-time mode. The development of the data storage component of the system entails the selection of hardware devices, data organization schemes, and data base management software packages. Computerized data processing is accomplished either in batches or on a real-time basis. Real-time processing should be implemented only where rapid system response is needed since batch processing permits more efficient hardware utilization. The data retrieval component of a groundwater data file must yield both alphanumeric and pictorial output. (See also W76-10637) (Kreager-FIRL)
W76-10660

GROUNDWATER POLLUTION MONITORING CASE STUDIES,
Arizona Water Resources Research Center, Tucson.
L. G. Wilson.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-6-1 - 9-6-4. 20 ref.

Descriptors: *Monitoring, *Groundwater, *Aquifers, *Sampling, *Wells, *Pollutant identification, Heavy metals, Organic compounds, Microorganisms, Subsurface waters, Groundwater flow, Tracers, Hydrogeology, Computer models.

Recommendations for groundwater pollution monitoring based on five case studies of aquifer contamination are presented. The following procedures are recommended: establish an interdisciplinary committee at the outset to ensure collection of interrelated quality parameters; examine the hydrogeology of the problem site; ensure that the sampling well network is as dense as possible in the vicinity of the pollution source; use alternative techniques in addition to wells for defining the confines of the pollution plume; establish a thorough regular sampling program in wells and surface water supplies; analyze samples not only for major constituents but also for heavy metals, organic toxins, and microbial concentrations; use tracers for defining the flow of pollution; use predictive computer models of the flow system; monitor in the zone of aeration as well as in the saturated zone, particularly when the former is of considerable thickness and when perching layers may develop; develop innovative or specialized monitoring techniques when necessary; and continue monitoring until the problem has been quantified. (See also W76-10637) (Kreager-FIRL)
W76-10661

MONITORING OF SUBSURFACE WASTE-DISPOSAL OPERATIONS: A GENERALIZED SYSTEMS APPROACH WITH EXAMPLES FROM CANADIAN CASE HISTORIES,
Windsor Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 5D.
W76-10662

POLLUTIONAL EFFECTS OF SUSPENDED, SEDIMENTED AND ERODED PARTICULATE MATERIAL IN THE AQUEOUS ENVIRONMENT,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5C.
W76-10663

AUTOMATED FORECAST PROCEDURES FOR RIVER QUALITY MANAGEMENT,
D. A. Dunsmore, and R. J. Boes.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 14-6-1 - 14-6-5. 2 fig. EPA 16090 DHX.

Descriptors: *Model studies, *Ohio river, *Water quality, *Forecasting, *Automation, Monitoring, Surface waters, Dissolved oxygen, Chlorides, Water management(Applied), Rivers, Computer programs.

A dynamic water quality model designed for use in conjunction with a robot monitor network in the Ohio River Basin is described. The model, which is known as STREAM, is both time and event dependent and operates on the basis of appropriate river geometry definitions in conjunction with waste load discharge data. Depending on the modeling objective, the model may accept any combination of constant or dynamically variable data to model travel time, river temperature, dissolved oxygen, conductivity, and chloride in one of three operational modes available. Additional variables may be modeled by means of optional user exits and a user data bank. A free form of input combined with the availability of a command structured dictionary allows individuals with little computer expertise to operate the model efficiently. The model is being used to supplement water quality management activities throughout the Ohio River and is part of an automated pollution forecasting system. (See also W76-10637) (Kreager-FIRL)
W76-10664

A STRATEGY FOR AQUATIC POLLUTANTS FATE AND TRANSPORT DETERMINATION,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5B.
W76-10665

REMOTE SENSING OF GROUND AND SURFACE WATER CONTAMINATION BY LEACHATE FROM LANDFILL,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
D. A. Sangrey, W. L. Teng, W. R. Philipson, and T. Liang.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 15-1-1 - 15-1-5. 2 fig, 2 tab, 2 ref.

Descriptors: *Remote sensing, *Aerial photography, *Infrared radiation, Water pollution, *Landfills, *Leachate, On-site investigations, Feasibility studies, Evaluation, Performance, Photography, Analytical techniques, Groundwater, Surface waters, *Pollutant identification.
Identifiers: Thermal infrared imagery.

The feasibility of using remote sensing procedures for detecting and evaluating ground and surface water contamination by landfill leachate was evaluated at 15 landfill sites in central New York. Aircraft flights and ground sampling were performed at key times during a one-year period, and the aerial data included color and color infrared photography and thermal infrared imagery. Each type of remote sensing proved to be useful to some extent, and the combination of color and color infrared photography was the most effective system. Wetness, discoloration of land and surface waters, and vegetative stress were useful ground characteristics imaged by the remote sensors. In no case were they uniquely indicative of leachate; however, in association with landfill, they defined prime areas for more detailed study and ground level confirmation. No methods were found for quantitatively defining leachate. Remote sensing was most effective during wet periods in early spring. (See also W76-10637) (Kreager-FIRL)
W76-10666

LAND DISPOSAL OF WASTES: POTENTIAL FOR GROUNDWATER POLLUTION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W76-10667

A PROPOSED NATIONAL MONITORING SYSTEM FOR ORGANICS IN WATER,
Environmental Research Lab., Athens, Ga.
J. M. McGuire.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 15-4-1 - 15-4-4. 4 fig, 1 tab, 6 ref.

Descriptors: *Organic compounds, *Gas chromatography, *Mass spectrometry, Computers, *Pollutant identification, *Water quality, Industrial wastes, Effluents, Data collections, Data storage and retrieval, Monitoring, Analytical techniques.

A computerized gas chromatographic/mass spectrometric technique is proposed for use in a national monitoring system for identifying organics in natural water and industrial effluents. The

system combines the separation capability of gas chromatography with the detection capability of mass spectrometry. A combination of the techniques results in a mass spectrum of each peak as it elutes from the gas chromatograph, thus providing a 'fingerprint' of the organic compounds in a sample. Computerization can be used to shorten the time required for spectral interpretation and compound identification. Other refinements include record-keeping programs to provide statistics on how frequently a given compound is identified, where particular compounds are identified, and how often the same unidentified spectrum is encountered. Currently, a data base of over 35,000 reference spectra exists. (See also W76-10637) (Kreager-FIRL)
W76-10668

CAPABILITIES AND LIMITATIONS IN IDENTIFYING AND MEASURING AQUATIC POLLUTANTS,
Environmental Research Lab., Athens, Ga.
W. T. Donaldson.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 15-5-1 - 15-5-3. 13 ref.

Descriptors: *Pollutant identification, *Potable water, *Organic compounds, *Gas chromatography, *Mass spectrometry, *X-ray fluorescence, *Nuclear magnetic resonance, Analytical techniques, Infrared radiation, Evaluation, *Measurement.
Identifiers: Fourier transform infrared spectroscopy, Raman spectroscopy, Multi-element analysis, Freeze concentration, Low-temperature distillation, Ion exchange liquid chromatography, Plasma emission spectrometry.

Methods for the qualitative organic analysis and multi-element analysis of water samples, particularly drinking water, are discussed in terms of their present capabilities and limitations. Gas chromatography-mass spectrometry with computerized data interpretation allows for the identification of extractable, volatile organic compounds; but identification of polar and high molecular weight compounds is not possible by this method. Freeze concentration, low-temperature distillation, and high-pressure ion exchange liquid chromatography show some promise for the identification of polar compounds. Atmospheric pressure ionization mass spectrometry, Fourier transform infrared spectroscopy, Raman spectroscopy, and nuclear magnetic resonance spectrometry offer some hope for identifying high molecular weight compounds. For multi-element analyses, spark source mass spectrometry is capable of measuring simultaneously up to 82 elements at concentrations as low as one microgram/liter; however, this method is slow and expensive and requires a highly skilled analyst to operate the instrument. X-ray fluorescence and inductively coupled plasma emission spectrometry show promise for overcoming most of these shortcomings. (See also W76-10637) (Kreager-FIRL)
W76-10669

ASSESSMENT OF THE BENEFITS OF ENVIRONMENTAL REMOTE SENSING,
Enviro Control, Inc., Rockville, Md.
A. Hershaft.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 16-1-1 - 16-1-6. 1 tab.

Descriptors: *Remote sensing, *Water quality, *Monitoring, *Water management(Applied), Analytical techniques, Estuaries, Lakes, Oceans, Coasts, Eutrophication, Surface waters, Water pollution, Sediments, Sedimentation, Waste disposal, Hydrology.

Benefits accruing from the use of remote sensing in environmental monitoring are analyzed using a case study designed to assess the benefits of data supplied by a continuing Earth Resources Survey mission in the 1977-1986 time frame. Demand for water quality data is estimated on the basis of the legislative climate, interviews with potential users, and the projected amount of data required. Promising applications in the area of water quality management include: the detection of sediment discharges from non-point sources to assist in establishing waste load allocations in large water bodies, the delineation of dispersion patterns from offshore dumps, and the characterization of long-term trends in sedimentation and eutrophication of large water bodies. Remote sensing also appears to be useful in characterizing hydrologic circulation patterns and in determining water quality trends in large lakes, estuaries, and offshore waters. In general, remote sensing appears to be of value in complementing rather than replacing in situ monitoring data. (See also W76-10637) (Kreager-FIRL)
W76-10670

MONITORING ESTUARINE CIRCULATION AND OCEAN WASTE DISPERSION USING AN INTEGRATED SATELLITE-AIRCRAFT-DROGUE APPROACH,
IIT Electro-Physics Lab., Inc., Columbia, Md.
V. Klemas, G. Davis, H. Wang, W. Whelan, and G. Tornatore.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 16-2-1 - 16-2-10. 14 fig, 1 tab, 11 ref.

Descriptors: *Monitoring, *Dispersion, *Wastes, *Circulation, *Tracking techniques, *Tracers, *Remote sensing, Oceans, Estuaries, Sediments, Currents(Water), Satellites(Artificial), Aircraft, Oil spills.
Identifiers: Drogues.

An integrated satellite-aircraft-drogue approach for monitoring ocean waste dispersion and estuarine circulation is described. The approach employs remotely tracked expendable drogues together with satellite and aircraft observations of waste plumes and tracers such as suspended sediment or dye. The use of drogues tracking currents at various selected depths complements satellite imaging which is unable to determine current magnitude and to penetrate beyond the upper few meters of the water column. Since in turbid coastal regions suspended sediment acts as a natural tracer, cost is minimized by eliminating the need for expensive injections of large volumes of dye. Tests conducted on the Continental Shelf and in Delaware Bay indicate that the system can provide an effective means of studying current circulation, oil slick movement, and ocean waste dispersion even under severe environmental conditions. By combining the wide coverage of a satellite with aircraft or shore stations capable of tracking expendable drogues, a cost-effective, integrated monitoring system is achieved. (See also W76-10637) (Kreager-FIRL)
W76-10671

EVALUATION OF WATER SAMPLES COLLECTED DURING LANDSAT-1 OVERPASSES OF THE LOWER CHESAPEAKE BAY AREA,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
D. E. Bowker, and W. G. Witte.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 16-3-1 - 16-3-5. 8 fig, 8 tab, 1 ref.

Descriptors: *Remote sensing, *Satellites, *Chesapeake Bay, *Sediments, *Chlorophyll, Monitoring, Statistical methods, Sampling, Water quality, *Pollutant identification, Evaluation.
Identifiers: LANDSAT.

Water samples which were collected on 18 days when the LANDSAT-1 satellite was passing over the lower Chesapeake Bay area were analyzed and compared with MSS radiance values obtained from the satellite. An analysis of the radiance values revealed a low correlation with chlorophyll content and a good correlation with total particulates and sediment. The most consistent correlations were established with sediment; hence, this variable appears to be the most important water parameter for remote sensing surveys with the satellite. A linear relationship was established between sediment and particulates, but the relation varied widely from day to day. Thus, it was not possible to infer the sediment level from the total particle count without a calibration curve. (See also W76-10637) (Kreager-FIRL)
W76-10672

DUMPING SEWAGE SLUDGE IN THE OCEAN.
For primary bibliographic entry see Field 5E.
W76-10674

PESTICIDE INCINERATION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W76-10675

GROUNDWATER AVAILABILITY IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-10718

PCB'S IN THE ENVIRONMENT,
Natural Resources Defense Council, N. Y., New York.
For primary bibliographic entry see Field 5C.
W76-10739

ABUNDANCE AND BIOMASS OF ZOOPLANKTON DURING THE SYNOPTIC INVESTIGATION OF THE SHALLOW INLETS TO THE SOUTH OF THE ZINGST PENINSULA (SOUTH BALTIC) DURING MAY/JUNE, 1972. (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10817

EFFECTS OF THREE EMULSIFYING AGENTS AGAINST CRUDE OIL ON THE PRIMARY PRODUCTIVITY OF AN EXPERIMENTAL COMMUNITY OF BENTHIC DIATOMS,
Laboratoire de Physiologie des Etres Marins de l'Institut Oceanographique, Paris, France.
For primary bibliographic entry see Field 5C.
W76-10831

WATER RESOURCES DATA FOR WISCONSIN. PART 1. SURFACE WATER RECORDS. PART 2. WATER QUALITY RECORDS.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 7C.
W76-10832

THE FIBERLOG, A NEW MONITOR FOR FIBROUS EFFLUENTS,
Swedish Forest Products Research Lab., Stockholm.
J. Hill, L. Eriksson, and G. Fladda.
Svensk Papperstidning, Vol. 79, No. 4, p 118-122, 132, March 10, 1976. 9 fig, 3 ref, 2 tab.

Descriptors: *Pulp wastes, *Fibers(Plant), *Instrumentation, Water pollution sources, Industrial wastes, Wastes, Foreign research, Operation and maintenance, Installation, Equipment, *Monitoring, Measurement, Pollutant identification, Indicator.
Identifiers: *Fiberlog, White water(Paper machines), Sweden.

Both economic and ecological considerations prompt the desire to monitor good fiber contents in white waters and other effluents. The instrument developed at the Swedish Forest Products Research Laboratory sounds a rapid alarm when the good (reusable) fiber level exceeds a predetermined concentration. The apparatus, based on optical principles, has a measuring range extending to 500 mg/liter. Advantages include insensitivity to color changes, to fillers, and to the presence of fines (nonreusable fiber debris). About 25 Fiberlogs are currently in mill operation. Advice on installation and positioning (location) of these monitors is given, and practical experience with their operation is reported. (Brown-IPC)
W76-10843

DETERMINATION OF THE BIOMASS AND DETRITUS CONTENT FROM NATURAL PHYTOPLANKTON SCOOP SAMPLES, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
E. Wittenbrug, and H. Heinrich.
Wiss Z Univ Rostock Mathnaturwiss Reihe 22(10), p 1119-1128, 1973.

Descriptors: *Biomass, *Phytoplankton, *Detritus, Sampling, *Pollutant identificattion, Europe.
Identifiers: Scoop samples, East Germany.

The application of a method, originally intended for use with laboratory cultures, for determining the biomass and detritus in natural scoop samples of phytoplankton taken from the chain of shallow inlets to the south of Darss (East Germany) by the fluorometric in situ determination of DNA and RNA using ethidum bromide is described. The reliability of the data is tested by comparing the data with other parameters (chlorophyll a, protein, dry weight, particulate C and N). The static and dynamic conditions of phytoplankton populations are characterized.--Copyright 1976, Biological Abstracts, Inc.
W76-10864

ATOMIC-ABSORPTION DETERMINATION OF VANADIUM AND MOLYBDENUM IN TAP WATER AND MINERAL WATERS AFTER ANION-EXCHANGE SEPARATION,
Vienna Univ. (Austria). Institut fuer Analytisches Chemie.
J. Korkisch, and H. Krivanec.
Analytica Chimica Acta, Vol. 83, p 111-118, May, 1976. 23 ref, 3 tab.

Descriptors: *Water analysis, *Molybdenum, Anion exchange, Spectroscopy, Analytical techniques, Metals, Trace elements, Water pollution sources, Separation techniques, Ion exchange, Mineral water, Potable water, Heavy metals, *Pollutant identification.
Identifiers: *Vanadium, *Atomic absorption spectrometry.

A method is described for the determination of vanadium and molybdenum in samples of tap and bottled mineral water. After acidification with citric acid the water sample is heated to about 80C to remove carbon dioxide; sodium citrate and ascorbic acid are added and the resulting solution of pH 3 is passed through a column of Dowex 1-X8 (citrate form) on which both vanadium and molybdenum are adsorbed as anionic citrate complexes. Vanadium is eluted with 6 molar HC1; molybdenum is recovered with 2 molar perchloric acid-1 Molar HC1. Vanadium and molybdenum are determined in the eluates by atomic-absorption spectrometry. The samples analyzed contained 0.1-0.9 micrograms/liter of vanadium and 0.2-13 micrograms/liter of molybdenum. (Witt-IPC)
W76-10869

A RAPID METHOD FOR THE SIMULTANEOUS DETERMINATION OF PARAQUAT AND DIQUAT IN POND AND RIVER WATERS BY PYROLYSIS AND GAS CHROMATOGRAPHY,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
A. J. Cannard, and W. J. Criddle.
The Analyst (The Analytical Journal of The Chemical Society), Vol. 100, No. 1197, p 848-853, December, 1975. 3 fig, 6 ref, 2 tab.

Descriptors: *Herbicides, *Water analysis, *Paraquat, *Diquat, *Gas chromatography, Analytical techniques, Water pollution sources, Halogenated pesticides, Organic compounds, Organic pesticides, Pesticides, Water properties, Water chemistry, Trace elements, *Pollutant identification.
Identifiers: *Pyrolysis.

A method is described for the determination of two widely used herbicides (paraquat and diquat) in aqueous systems. Pyrolysis of the herbicides under carefully controlled conditions, followed by gas-chromatographic analysis of the pyrolyzate, allows detection of the herbicides down to 0.01 ppm. At the lowest concentration levels (0.01-0.1 ppm), there is some loss of linearity of response, possibly due to adsorption of the herbicides on the glass surfaces of the vessels used. This effect may have resulted in substantial errors in previously reported low levels of paraquat and diquat and may also occur in the determination of other ionic herbicides. (Witt-IPC)
W76-10870

DDT IN WATER, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-10877

TECHNIQUES DE DETERMINATION RADIDE DES EFFETS DE SYNERGIE RADIONUCLEIDES - POLLUANTS, (TECHNIQUES FOR RAPID DETERMINATION OF EFFECTS OF SYNERGY BETWEEN RADIONUCLIDES AND POLLUTANTS),
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
A. Saas, and A. Grauby.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Munich, June 2-5, 1975. IAEA-SM-197/16. p 145-154, 6 fig, 5 ref.

Descriptors: *Radioisotopes, *Pollutant identification, Analytical techniques, *Iodine, Organic wastes.
Identifiers: Synergism.

Several chromatographic techniques for the rapid determination of synergism between radionuclides and various components in water are presented. One of these is concerned with the variation of chemical equilibrium of iodine in the presence of organic and mineral compounds. The second technique makes it possible to define the effects of synergy within a given hydrographic basin. Another technique deals with synergistic effects of groundwater in the presence of various types of irrigation water. The mobility potential of a radionuclide in a given aqueous effluent is defined. (See also W76-09490) (Chilton-ORNL)
W76-10891

CHRONIC TOXICITY OF LINDANE TO SELECTED AQUATIC INVERTEBRATES AND FISHES,
EG and G, Bionomics, Wareham, Mass.
For primary bibliographic entry see Field 5C.
W76-10895

THE TOTAL AEROBIC HETEROTROPHIC BACTERIA GERM CONTENT OF WATER FROM THE SERIES OF SHALLOW INLETS TO THE SOUTH OF DARSS FOUND BY INVESTIGATION USING THE CAST PLATE AND THE MPN METHODS, (IN GERMAN),
H. Westphal, and G. Gubsch.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10); p 1111-1114, 1973.

Descriptors: *Bacteria, Shallow water, Methodology, *Pollutant identification.
Identifiers: *Aerobic bacteria, East Germany, *Heterotrophic bacteria.

Total germ counts were made during regular trips and at 1 permanent station (from May 29-June 2) in the chain of shallow inlets to the S of Darss (East Germany) during 1972 using the cast plate and MPN (most probable number) methods. The 2 methods are compared and discussed.--Copyright 1976, Biological Abstracts, Inc.
W76-10897

COMPARATIVE TOXICITY OF SEWAGE-EFFLUENT DISINFECTION TO FRESHWATER AQUATIC LIFE,
Environmental Research Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W76-10898

EFFECTS OF MIREX, METHOXYCHLOR AND MALATHION ON DEVELOPMENT OF CRABS,
Duke Univ., Beaufort, N. C.
For primary bibliographic entry see Field 5C.
W76-10899

ACUTE TOXICITY OF SELECTED TOXICANTS TO SIX SPECIES OF FISH,
Chemico Process Plants Co., El Monte, Calif. Envirogenics Systems.
For primary bibliographic entry see Field 5C.
W76-10900

ATMOSPHERIC EFFECTS OF POLLUTANTS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
P. V. Hobbs.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 45-61. 1 fig, 3 tab, 18 ref.

Descriptors: *Pollutants, *Weather modification, *Atmosphere, *Aerosols, Air pollution effects, Precipitation(Atmospheric), Cloud physics, Clouds, Radiation, Solar radiation, Ozone, Carbon dioxide, Nitrogen compounds, Temperature, Weather, Meteorology.
Identifiers: Inadvertent weather modification.

It was argued that aerosols are probably the principal agents by which pollutants may affect weather and climate. They are most likely to act by influencing the structure and distribution of clouds. On the local scale the effects of pollutants on some aspects of weather are unmistakable. The effects of man-made pollutants on global climate are a matter of debate, but they might already be significant. (See also W76-10901) (Sims-ISWS)
W76-10903

PARTICLE EMISSIONS FROM A LARGE KRAFT PAPER MILL AND THEIR EFFECTS ON THE MICROSTRUCTURE OF WARM CLOUDS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
P. V. Hobbs.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 63-109. 25 fig, 5 tab, 23 ref. NSF GI-31759.

LIBRARY U. OF R. DRAWER-CHEMI...

Descriptors: *Air pollution effects, *Clouds, *Weather modification, *Pulp and paper industry, Industries, Mills, Industrial wastes, Aerosols, Particle size, Cloud physics, Instrumentation, Aircraft, Surveys, On-site investigations, Pollutants, Weather, Meteorology.
Identifiers: Inadvertent weather modification.

Airborne measurements of cloud condensation nuclei (CCN), Aitken nuclei, the size distribution of particles and the microstructure of warm clouds have been made in the vicinity of a large Kraft pulp and paper mill. The plume of CCN and Aitken nuclei from the mill is well-defined at distances up to 40 km downwind, and the concentrations of these particles reach values which exceed those in the polluted air by a factor of about 4. A large secondary maximum in the concentrations of CCN was measured in the plume at a distance downwind of the mill corresponding to a travel time of about four hours. The concentrations of Aitken nuclei in the plume peaked after about two hours of travel time downwind. The particles in the plume were measured over the size range 0.3 to 8 micrometers; their concentrations were much higher than in the unpolluted air, particularly those with diameters less than 1 micrometer. At points downwind in the plume corresponding to travel times greater than about six minutes, a secondary peak appeared in the concentration of particles with diameters just in excess of 0.3 micrometers. It persisted for travel times up to about four hours. (See also W76-10901) (Sims-ISWS)
W76-10904

SOME CHARACTERISTICS OF A DUSTY RAIN IN YUGOSLAVIA,
Yugoslavic Academy of Science and Arts, Zagreb. Inst. for Physics of the Atmosphere.
I. Lisac.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 141-155. 7 fig, 3 tab, 28 ref.

Descriptors: *Dusts, *Rainfall, *Air pollution, *Europe, Chemistry of precipitation, Particle size, Hydrogen ion concentration, Turbidity, Sediments, Sands, Winds, Weather, Sampling, Rain water, Meteorology.
Identifiers: *Dusty rain, *Yugoslavia.

A dusty rain or snow (sometimes called red or yellow rain or snow) and dust-laden winds, mostly at the end of winter or in springtime, is a well known phenomenon in European Mediterranean countries. The yellow-reddish fine dust does not show up every year, but has been observed several times in the last 100 years. In the Croatian capital city of Zagreb, Yugoslavia, rain water acidity measurements are routinely made and the data are available since 1967 for three sites distributed over a broader town area. In the rain water sampled on May 16, 1972, the reddish-yellow fine dust sediment displayed remarkably high pH-values. The samples have been studied and the results were presented. It appears that the dust sediment (particle size less than 0.05 mm) contained particles of domestic origin and particles advected with the tropical air mass originating in African desert area. The dust sediment consisted mostly of small crystals characteristic of desert sand (quartz). The general synoptic situation was suitable for a steady transport of air masses created over the broad NW African continent towards the Apennin and the Balkan peninsula. (See also W76-10901) (Sims-ISWS)
W76-10906

DISPERSION OF POLLUTANTS,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5B.
W76-10907

WIND-TUNNEL SIMULATION OF ATMOSPHERIC FLOW AND DISPERSION,
Colorado State Univ., Fort Collins. Fluid Mechanics Program.
J. E. Cermak.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 189-226. 20 fig, 30 ref.

Descriptors: *Model studies, *Winds, *Air pollution, *Dispersion, Cities, Flow, Pollutants, Wind velocity, Boundary layers, Laboratory tests, Instrumentation, Equipment, Meteorology.
Identifiers: *Model scaling, Wind tunnels, Physical models.

Motion in the atmospheric boundary layer can be simulated with sufficient accuracy to make laboratory studies of air-pollutant transport useful for planning air-pollution control measures. Satisfactory agreement between diffusion characteristics in the simulated and real atmosphere has been found whenever field data have been available for making comparisons. Geometrical scaling on the order of 1:100 is necessary for investigations of air-pollutants in the immediate vicinity of buildings. Pollutant transport over complex terrain may be simulated by using topographic models scaled on the order of 1:10,000, provided that advective transport by the mean surface flow is the dominant transport process. This occurs when a stably stratified atmosphere flows over highly irregular terrain. When the stratification is neutral or unstable, exaggeration of the vertical scale is necessary to preserve dynamic similarity of flow over topographic features. (See also W76-10901) (Sims-ISWS)
W76-10908

RECENT DEVELOPMENTS IN CHEMICAL AEROSOL ANALYSIS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
R. F. Pueschel.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 237-253. 8 fig, 1 tab, 13 ref.

Descriptors: *Aerosols, *Analytical techniques, *Chemical analysis, Nucleation, *Air pollution, Laboratory tests, Particle size, Chemistry, Spectroscopy, X-ray spectroscopy, Measurement, Weather modification, Weather, Cloud physics, Meteorology, *Pollutant identification.
Identifiers: Inadvertent weather modification.

The atmosphere over remote areas of the globe, such as the mid-Pacific, is still unpolluted. Although the turbidity at such locations is affected by occasional volcanic eruptions, no trend is apparent which could be attributed to industrial growth during the past 15 years. The situation is different near population centers. There evidence is found of a deteriorated environmental quality that is in direct proportion to the density of anthropogenic pollution sources. Although commercially available instruments provide valuable information about existing nuclei populations, they do not permit much information about the chemical composition of individual particles. Therefore, a laser spectroscopic particle analyzer has been developed and elemental analysis is performed using a combination of scanning electron microscopy--energy dispersive X-ray analysis. This method of determining the elemental composition of individual aerosol particles enables one to identify man-made aerosols; thus, changes in nuclei concentrations with man's activities can be correlated. (See also W76-10901) (Sims-ISWS)
W76-10910

INTRODUCTION TO THE ATMOSPHERIC AEROSOL SYSTEM,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
V. A. Mohnen.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 255-274. 7 fig, 1 tab.

Descriptors: *Aerosols, *Atmosphere, *Air pollution, Pollutant identification, Path of pollutants, Particle size, Diffusion, Sedimentation, Water vapor, Rainfall, Precipitation(Atmospheric), Chemistry, Chemical analysis, Gases, Weather modification, Meteorology.
Identifiers: Inadvertent weather modification.

The relationships that exist between, or might connect, the atmospheric aerosol system and inadvertent weather modification are discussed. It included the sources of atmospheric particles, their motions and interaction while in suspension, and their sinks. Man's activity through fossil fuel combustion, agricultural processes, etc., results in an increase of particles of all types and trace gases that enter and participate in the natural cycles. Once all transformation processes and all 'quantities' entering the system are fully known and properly assessed, then a complete system analysis can be made demonstrating the degree of sensitivity of the water cycle to any combination of changes caused by man-made emissions into the atmosphere. (See also W76-10901) (Sims-ISWS)
W76-10911

THE LEGAL REQUIREMENT FOR THE ASSESSMENT OF INADVERTENT WEATHER MODIFICATION - AN ENGINEERING VIEWPOINT,
Dames and Moore, Atlanta, Ga.
For primary bibliographic entry see Field 3B.
W76-10912

WATER QUALITY CHARACTERISTICS OF THE ILLINOIS RIVER AT PEORIA,
Illinois State Water Survey, Peoria. Water Quality Section.
V. Kothandaraman, and R. A. Sinclair.
Transactions of the Illinois State Academy of Science, Vol. 68, No. 3, p 230-241, September 1975. 4 fig, 6 tab, 7 ref.

Descriptors: *Water quality, *Chemical analysis, *River forecasting, *Mathematical studies, *Illinois, Analytical techniques, Water analysis, Water chemistry, Nutrients, Surface waters, Statistical methods, Regression analysis, Mathematical models, Equations, Rivers, Seasonal.
Identifiers: *Illinois River, Peoria(Ill), Stream standards, Dissolved minerals.

Weekly data on chemical quality characteristics of the Illinois River at Peoria were summarized. Apart from the seasonality in temperature and river flows, distinctive seasonal changes were observed in dissolved oxygen, ammonia, and silica. A comparison of the river water quality with the stream standards adopted by the Illinois Pollution Control Board was presented. The interrelationships among the observed water quality characteristics were evaluated by the stepwise linear regression method. (Henley - ISWS)
W76-10922

A COMPARISON OF SEVERAL WATER QUALITY INDEXES,
CACI, Inc., Reston, Va. Information Technology Dept.
J. M. Landwehr, and R. A. Deininger.
Journal of the Water Pollution Control Federation, Vol. 48, No. 5, p 954-958, May 1976. 6 tab, 7 ref.

Descriptors: *Chemical properties, *Physical properties, *Water quality, Water properties,

*Environmental effects, Biochemical oxygen demand, Dissolved oxygen, Dissolved solids, Hydrogen ion concentration, Temperature, Turbidity, Nitrates, Phosphates, Chemical analysis, Water quality standards, Chemistry, Coliforms, Pollutant identification.
Identifiers: *Water quality indexes, *Arithmetic water quality index, *Multiplicative index, *Harkins' index, Indexes, Fecal coliform count, Mineral constituents.

The purpose is to compare several water quality indexes that have been recently developed. Five different water quality indexes were considered. The nine parameters chosen for inclusion in the index were fecal coliform count, biochemical oxygen demand, pH, NO3, PO4, temperature deviation from equilibrium, turbidity, total solids, and percent saturation of dissolved oxygen. It was shown that all five indexes correlate well with mean ratings devised by a panel of experts, as well as with each other. Harkins' index is in least agreement with the experts' opinions and is the only index that has to be recalculated every time new data become available. Comparisons between data sets are not possible unless index values are recalculated for a merged data set of all values of interest. This major drawback of Harkins' index makes it an untenable choice for a water quality index to be used regularly on a regional or national level. (Henley-ISWS)
W76-10926

AUTOMATED DETERMINATION OF CARBON IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
P. D. Goulden.
Water Research, Vol. 10, No. 6, p 487-490, 1976. 3 fig, 2 tab, 6 ref.

Descriptors: *Carbon, *Water chemistry, *Carbon dioxide, *Analytical techniques, *Instrumentation, Carbonates, Inorganic compounds, Automation, Chemical analysis, Electronic equipment, Nutrients, Organic compounds, Organic matter, Water pollution, Water quality, Water properties, *Pollutant identification, Suspended solids.
Identifiers: Total carbon, *Organic carbon, Inorganic carbon, Automated method, Infrared analyzer, Cobalt oxide, Flame ionization detector, TOC analyzer.

An automated method for determining inorganic carbon, organic carbon in water was described. The sample is acidified and the CO2 from inorganic carbonate is removed in a packed column and measured with an i.r. analyzer. The stripped liquid is pumped to a furnace containing cobalt oxide catalyst at 950C where the organic carbon is oxidized; the resulting CO2 is measured with an i.r. analyzer. Operating as a 'two-channel' system, inorganic carbon and organic carbon are measured simultaneously at 20 samples per hour. If used in a 'single-channel' mode, inorganic and organic carbon are measured separately, inorganic carbon at 60 samples per hour, organic carbon at 20 samples per hour. The coefficients of variation at 1 and 5 mg/l organic carbon are 5.1 and 2.8% respectively. The detection limit is 200 micrograms/l C. (Henley - ISWS)
W76-10936

MODIFIED CURCUMIN AND DIANTHRIMIDE METHODS FOR THE DETERMINATION OF BORON IN THE PRESENCE OF HIGH LEVELS OF NITRATE AND ORGANICS,
Canada Centre for Inland Waters, Burlington (Ontario).
P. D. Goulden, and Y. P. Kakar.
Water Research, Vol. 10, No. 6, p 491-495, 1976. 1 fig, 4 tab, 9 ref.

Descriptors: *Boron, *Analytical techniques, *Nitrates, *Organic compounds, *Water quality, Organic matter, Inorganic compounds, Solvent extractions, Organic wastes, Water pollution, Automation, Instrumentation, Chemical analysis, Nutrients, Water chemistry, Water properties, *Pollutant identification, Agriculture, Sewage effluents, Irrigation water.
Identifiers: Boron analysis, *Curcumin method, *Dianthrimide method, Nitrate interference.

Modifications have been made to the curcumin and 1,1'-dianthrimide methods for boron analysis so that they may be used in the presence of up to 700 mg/l NO3(-) and 500 mg/l organic carbon. In the curcumin method, nitrate is removed by alkaline reduction using a slurry of aluminum powder. In the dianthrimide method, nitrate up to 1000 mg/l NO3(-) is removed in the dehydration-with-sulfuric-acid step; organics are most conveniently removed by treatment of the dehydrated sample with solid potassium persulfate. With dianthrimide, an automated procedure is used for the color formation and measurement steps. (Henley - ISWS)
W76-10937

SUBSURFACE WATERS OF EROSION TROUGHS IN THE AKTYUBA REGION OF THE URAL - A SOURCE OF DRINKING WATER SUPPLY,
For primary bibliographic entry see Field 2F.
W76-10943

SOME WATER QUALITY ASPECTS IN A NASCENT IMPOUNDMENT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5B.
W76-10950

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. I. MONITORING DURING PILOT OPERATION,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5D.
W76-10993

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. II. DEVELOPMENT OF GUIDELINES BY METHODS, OF ADDITIONS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5D.
W76-10994

NEAR SURFACE SAMPLER,
Woods Hole Oceanographic Institution, Mass.
J. D. McCleary.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 272-275. 1 fig. NOAA SG 04-4-158 4.

Descriptors: *Water sampling, Equipment, Design, *Pollutant identification, *Sampling, Instrumentation, Measurement.

A device, to obtain water samples from near the water surface, consists of a pine dowel plunger shaft aligned with a 48 inch long pine main shaft. The sample bottle is a standard 280-300 ml nalgene wide mouth bottle secured at the base of the main shaft. The plunger is a removable tapered soft rubber stopper. The plunger assembly is PVC flat stock bent ninety degrees at each end and secured to the main shaft by two screws riding in slots in the plunger assembly. The upper slot has an offset notch to lock the plunger in an open position to help cap the sample bottle before removing, resulting in less spillage; also a fresh sterile bottle can be installed before being uncapped. The assembly is stored in the open position to prevent distortion of the rubber stopper. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-10995

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME II.
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-11007

PELAGIC TAR IN THE NORTH PACIFIC OCEAN,
C. S. Wong, D. R. Green, and W. J. Cretney.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 400-415, 2 tab., 4 fig., 24 ref.

Descriptors: *Oil pollution, *Oil spills, Ships, *Monitoring, *Data collections, On-the-site investigation, Navigation, Oceans, Operators, *Pacific Ocean, Plankton nets, Sampling, *Pollutant identification.
Identifiers: *Tar balls, North Pacific Ocean, Net tows, Plastic pollution, Tar, Plastic wastes.

Monitoring tar lump concentrations by means of net tows would appear to be a convenient method of monitoring the level of oil pollution in the world's oceans from sea-going traffic. One person with a modicum of training and equipment capable of operatingat ships' varying speeds could operate from almost any vessel plying the oceans. A tremendous amount of data on the standing stock of tar lumps in the oceans and how they may vary both seasonally and annually could be in ashort time. (See also W76-11007) (Katz)
W76-11009

SOME REFLECTIONS ON THE BIODEGRADATION OF MINERAL OILS IN THE MARINE ENVIRONMENT,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5B.
W76-11016

EFFECT OF A LIVESTOCK WINTERING OPERATION ON A WESTERN MOUNTAIN STREAM,
Montana State Univ., Bozeman. Dept. of Agricultural Engineering.
C. M. Milne.
Presented at 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, Paper No. 74-4058, 17 p, 2 fig, 9 tab.

Descriptors: Streams, *Water pollution, *Bacteria, *Sampling, Analysis, Agricultural runoff, Livestock, Chemical properties, *Pollutant identification, Water analysis, Analytical techniques.
Identifiers: *Confinement wintering operations, *Ion-specific electrode.

A four year project was begun during the winter of 1970-71 to evaluate the impact of livestock confinement wintering operations on the quality of waters adjacent to such operations. The approach taken was to periodically sample stream flow at several points near a wintering operation for constituents which might indicate animal activity. Five stations were established for water sampling and quality measurement. Experimental procedure varied during the course of the project. In the first two years the basic analytical method was the ion-specific electrode. During the third and fourth years of the project, emphasis was on laboratory

bacteriological and chemical analyses. Study of the chemical data revealed that (1) the stream was basically Calcium-Magnesium-Bicarbonate water, (2) chlorides increased in concentration, and (3) nitrogen and phosphorus-related nutrient values were very low. Study of the bacteriological data showed that (1) where a large amount of dispersed animal activity occurred, but was fairly dispersed, little effect on the stream was noted, (2) where the greatest amount of concentrated livestock activity occurred and it was concentrated, bacterial infection increased, and (3) where little activity occurred, bacteria counts were significantly reduced by dilution or drying off. (Cameron-East Central)
W76-11059

GROUND WATER QUALITY MONITORING FOR CALIFORNIA'S NEEDS,
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
T. E. Bailey.
In: Proceedings, Tenth Biennial Conference on Ground Water, September 11-12, 1975, Ventura, California, p 174-188, 7 fig.

Descriptors: *Water quality control, *Monitoring, *Water analysis, *Laboratory analysis, *Legislation, State governments, Water pollution, Surface waters, Groundwater, Wells, Water resources development, Planning, Overdraft, Groundwater basins, *California, Water management(Applied), *Classification.
Identifiers: *Water Resources Control Board, Demographic studies, Design control, Operational control.

California, through the State Water Resources Control Board, is developing a water quality surveillance and monitoring program stressing design control and operational control. These two elements describe the rationale for conducting a sampling program and present an opportunity for data interpretation, use and display to directly effect changes in the data collection program. The Board's program will be emphasizing use of agencies' existing activities to form the basis of defining needed changes and additions. The ground water quality monitoring program in California is predicated on establishing priority basins and designating principal aquifers for the purpose of scheduling and budgeting. Priority basins are classified and ranked according to criteria related to population, water use by agriculture, water supply sources, quality problems and available ground water storage capacity. (Heiss-NWWA)
W76-11065

THE SPARTA AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-11067

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-11068

WATER-QUALITY INVESTIGATION, EEL RIVER, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
G. A. Irwin.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 744, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-5, April 1976. 35 p, 1 fig, 9 tab, 9 ref.

Descriptors: *Water quality, *Surface waters, *Chemical analysis, Streams, *California, Inorganic compounds, Biochemistry, Chemical properties, Data collections, Sampling, Trace elements, Pesticides, Correlation analysis, Regression analysis, Statistical methods, *Pollutant identification.
Identifiers: *Eel River(Calif).

Water-quality data are summarized for sample collected in the Eel River, Calif., during a reconnaissance study from November 1971 through January 1975. Also included is a summary of the major inorganic chemical data collected near Dos Rios, at South Fork, and at Scotia since early 1950's. The recent reconnaissance involved data collected for nitrogen, phosphorus, total organic carbon, trace elements, and pesticide compounds in the river at Van Arsdale Dam, near Dos Rios, at Fort Seward and at Scotia. Most of the constituents were low in concentration; although some variability was measured for some constituents. Sampling was designed so that each site would represent a large range in discharge. Discharge was not the singular factor controlling the concentration variance for most constituents. However, the concentrations of total ammonia, phosphorus, arsenic, chromium, copper, and zinc indicated a direct relation with discharge at some sites. Statistical analysis indicate that the past sampling program has been adequate to estimate the major chemical constituents of the river. Specific conductance in the river near its headwaters ranges from 110 to 300 micromhos about 98 percent of the time; and at Scotia, near the mouth, the specific conductance ranges from 110 to 340 micromhos about 98 percent of the time. Regression analyses indicate that between 83 and 88 percent of the variance in specific conductance can be explained by discharge. (Woodard-USGS)
W76-11069

GEOHYDROLOGY OF THE ANZA-TERWILLIGER AREA, RIVERSIDE COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W76-11074

MODELING SOLUTE TRANSPORT IN GROUND WATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-11076

VARIATION IN CONCENTRATION OF SELECTED WATER-QUALITY CONSTITUENTS IN THE SACRAMENTO RIVER AT BEND BRIDGE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
L. J. Britton, and R. C. Averett.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 414/as, $3.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-14, March 1976. 15 p, 5 fig, 2 tab, 13 ref.

Descriptors: *Water quality, *Chemical analysis, *Rivers, *Water analysis, *California, Sampling, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Specific conductivity, Nutrients, Phytoplankton, Streamflow, Flow rates, Evaluation.
Identifiers: *Sacramento River, Bend Bridge(Calif).

During an intensive water-quality study of the Sacramento River at Bend Bridge, Calif., from September 4 to 7, 1973, differences in selected water-quality constituent concentrations were evaluated at three locations at a single site in the river for two 24-hour periods. Water temperature, dissolved oxygen, pH, specific conductance, selected major ions and plant nutrients, and phytoplankton were measured and analyzed to determine thoroughness of mixing in the transection. Slight fluctuations in constituent concentrations occurred with time although the vertical and horizontal differences among sampling locations were not statistically significant at the 0.05 probability level. Consequently, one location probably would have been sufficient to obtain representative concentrations of most water-quality constituents at this site. The measured concentration differences, especially in the plant nutrients, may be of some biological importance where slight fluctuations in low concentrations may cause limiting conditions for plant growth. (Woodard-USGS)
W76-11078

U.S. GEOLOGICAL SURVEY WATER QUALITY MONITOR, OPERATIONS MANUAL,
Geological Survey, Bay Saint Louis, Miss.
J. H. Ficken.
Geological Survey report, April 1976. 31 p, 6 fig, 2 tab.

Descriptors: *Monitoring, *Water quality, *Instrumentation, *Operation and maintenance, *Telemetry, Methodology, Publications, Data collections, Water analysis.
Identifiers: *Operations manual(Water quality monitor).

This manual describes the operation of the U.S. Geological Survey Water Quality Monitor; a system designed to measure and record up to 10 water quality parameters. The system is composed of the following items: Wall mounted cabinet, sensors, sample chamber, timer, and recorder. The cabinet contains the programmer, signal conditioners, buffers, power supplies and standby batteries, and requires 115 V AC current. The sample chamber can hold up to six sensor assemblies and requires a continuous water sample of at least 5 gpm. The operation procedure is described under the following main headings: (1) Side panel connectors; (2) Wiring channel connectors; (3) Mating connectors; (4) Installation; (5) Start up; (6) Shut down; (7) Calibration for all parameters; (8) Adjustment of power supply voltages; (9) Adjustment of amplifier balance; (10) Test probes; and (11) Maintenance and parts replacement. (Woodard-USGS)
W76-11080

WATER-QUALITY DATA FOR CANALS IN EASTERN BROWARD COUNTY, FLORIDA, 1969-1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-11081

BARIUM IN SOUTHERN CALIFORNIA COASTAL WATERS: A POTENTIAL INDICATOR OF MARINE DRILLING CONTAMINATION,
Scripps Institution of Oceanography, La Jolla, Calif.
T. J. Chow.
Science, Vol 193, No 4247, p 57-58, July 2, 1976. 2 tab, 4 ref.

Descriptors: *Continental Shelf, *Resources development, *Pollutant identification, *Water pollution sources, Water resources, *Environmental effects, Drilling, Operations, Drilling fluids, Sea water, Chemical analysis, Coasts, California, Pacific Ocean.
Identifiers: *Outer Continental Shelf, *Barium, Offshore drilling, Environmental impact.

The present barium content of Southern California coastal waters was determined to be 11 to 22 micrograms per kilogram of seawater. These values may be used as base-line concentrations to monitor marine contamination during future offshore oil and gas explorations. Sections of the Southern California outer continental shelf have been leased for offshore oil and gas exploration. Many potentially toxic chemical compounds will be unavoidably released into the ocean during the drilling operations. Any spillage of drilling mixture

(in 1975, the United States used 1.4 million metric tons of barite in the drilling mixture), which will result in dissolution of the BaSO4, can be readily detected in terms of a significant increase in Ba2+ in these waters. Therefore, the barium content of seawater may serve as an indicator to monitor drilling-related contamination. (Sinha-OEIS)
W76-11089

IDENTIFICATION AND POTENTIAL BIOLOGICAL EFFECTS OF THE MAJOR COMPONENTS IN THE SEAWATER EXTRACT OF A BUNKER FUEL,
California Univ., Berkeley. School of Public Health.
H. E. Guard, L. Hunter, and L. H. DiSalvo.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 4, p 395-400, 1975. 1 fig, 1 tab, 7 ref.

Descriptors: *Continental Shelf, *Oil spills, *Oil pollution, *Fossil fuels, *Crabs, Environmental effects, Resources development, Water resources, Water pollution effects, Birds, Coasts, *California, Oil wastes, *Pollutant identification, Sea water.
Identifiers: *Outer Continental Shelf, *Bunker fuel, *San Francisco Bay(Calif), Pachygrapsus crassipes.

In January, 1971, approximately 840,000 gal of bunker fuel was accidently discharged into San Francisco Bay. Escaping portions of the oil fouled littoral marine communities and water birds, often with fatal results. Unknown amount of the volatile fractions of oil escaped to the atmosphere, and some dissolved in the water column. The authors report the composition of the seawater extract of a bunker fuel similar to that spilled in 1971, and comment on previous methodology for obtaining the seawater-soluble fraction of bunker fuels as well as the possible significance of the dissolved oil to a local crab species. The fouling of Duxbury Reef, about 20 km north on the coast from San Francisco, suggests that some water-soluble components could have been transported to that location in the oil slick and concurrently dissolved in surface water. Sedentary littoral animals on Duxbury were severely affected by floating oil which became thickly deposited on a great part of the reef. The vagile population of the shore crab Pachygrapsus crassipes, which may have been able to escape the physical effects of the oil, was nonetheless decimated over a large portion of the reef. Similar effects were observed within the Bay at a breakwater near the city of Sausalito. A possible explanation of the disappearance of the crabs is that they were adversely affected by the water-soluble components as identified above. (Sinha-OEIS)
W76-11099

THE ROLE OF DISPERSION IN FUEL OIL BIOASSAY,
Battelle Pacific Northwest Lab., Richland, Wash. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W76-11100

5B. Sources Of Pollution

DETERMINATION OF 14C-DDT RADIOACTIVITY IN SEA WATER AND MARINE SUSPENDED MATTER BY LIQUID SCINTILLATION,
Institut Rudjer Boskovic, Zagreb (Yugoslavia).
For primary bibliographic entry see Field 5A.
W76-10518

POLLUTION POTENTIAL OF RUNOFF FROM LIVESTOCK FEEDING OPERATIONS,
South Dakota State Univ., Brookings. Water Resources Inst.
J. M. Madden, and J. N. Dornbush.
Presented at 1971 Annual Meeting, American Society of Agricultural Engineers, Washington State University, Pullman, June 27-30, 1971, Paper No. 71-212, 15 p. 5 tab, 3 ref.

Descriptors: *Agricultural runoff, *Pollution abatement, *South Dakota, *Feed lots, Livestock, *Farm wastes, Precipitation(Atmospheric), *Water pollution sources, Water pollution control.
Identifiers: *Statistical analysis.

A 2-year study was conducted to determine the quantity and quality of runoff from production feedlots in eastern South Dakota. A statistical analysis was used in evaluating the relationship between runoff volume, precipitation amounts, and animal concentration and the pollutional constituents associated with runoff. The following conclusions were drawn: (1) Estimation equations using feedlot characteristics and design runoff volumes can be applied to determine the total and suspended solids, plant nutrients, and oxygen demanding material in feedlot runoff. (2) Conventional methods of determining runoff from rainfall may not give accurate estimates of runoff from livestock feedlots. (3) Although the annual losses of animal waste from feedlots by runoff represent a small percentage of the total waste produced, the quantities are sufficient that control measures must be provided on feedlots whose runoff reaches lakes and streams. Further study is needed. (Merryman-East Central)
W76-10531

EFFECT OF CATTLE FEEDYARD RUNOFF ON SOIL INFILTRATION RATES,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
O. R. Lehman, and R. N. Clark.
Journal of Environmental Quality, Vol. 4, No. 4, p. 437-439, October-December, 1975. 5 fig, 6 ref.

Descriptors: *Cattle, *Feed lots, *Agricultural runoff, *Infiltration rates, Soils, Groundwater, Farm wastes, Water pollution sources.

A compact clay soil from a playa lake and a relatively porous, blocky, buried soil, both representative of feedyard runoff holding basins in the Texas High Plains, were treated with clear water and synthesized feedyard runoff to test the effects of runoff on soil permeability. Infiltration rates changed most notably with the buried soil, where the rate decreased from 5 cm/hour for clear water, to less than 0.006 cm/hour for the synthesized runoff. The addition of the synthesized feedyard runoff quickly reduced infiltration rates in both the laboratory cores and field basins. Rates were reduced to less than 0.006 cm/hour in 14 to 20 days in all cores and basins receiving the runoff. Sealing was attributed to clogging at or near the surface because the initial infiltration rate was restored when the top 2 cm of soil was removed. For basins constructed in porous soil material, clay liners decreased the time required for sealing, but did not necessarily change the degree of sealing. One main benefit of a clay liner would be to decrease the total volume of water infiltrated. (Cameron-East Central)
W76-10538

EFFECT OF SOIL-INCORPORATED DAIRY CATTLE MANURE ON RUNOFF WATER QUALITY AND SOIL PROPERTIES,
Agricultural Research Service, Auburn, Ala.
F. L. Long, Z. F. Lund, and R. E. Hermanson.
Journal of Environmental Quality, Vol. 4, No. 2, p 163-166, 1975. 3 fig, 6 tab, 14 ref.

Descriptors: *Agricultural runoff, *Nitrates, Biochemical oxygen demand, *Farm wastes, Soil properties, Cattle, Water pollution sources, Decomposing organic matter, Crop response.
Identifiers: *Land application, Rye, Millet.

A study was made on .04 ha plots of Norfolk sandy loam to determine the effects of cattle manure application on the quality of runoff water and soil properties. Gahi-1 pearl millet and Abruzzi rye were grown separately on 2 plots each. Manure was applied to 2 plots at rates of 45 metric tons per ha on a dry rate basis for 3 years. The 2 check plots received 450 kg N, 160 kg P, and 180 kg K ha-1 year-1. The BOD of the runoff water from manured plots did not exceed that from the control plots. The nitrate levels of runoff water from manured plots were affected very little by either application and all values were less than 5 mg per liter. Nitrates increased slightly in the top 90 cm of the manured plots; organic nitrogen increased only to a depth of 15 cm. Nitrate accumulated in millet forage above the safe level for feeding cattle, but not in the rye forage. Soil pH was increased to a range of 5.7 to 6.6 to a depth of 60 cm by manure application. Organic matter decomposed fairly rapidly and at the end of 3 years only 38 percent of the applied carbon remained. These results indicate that at least 45 metric tons per ha of dairy cattle manure can be disposed of on a Norfolk sandy loam by incorporation into the surface 15 cm of soil for a period of at least 3 years without any appreciable effect on the quality of runoff water or soil. (Cannon-East Central)
W76-10539

EXCESSIVE MANURE CAN AFFECT POTABLE WATER.
Hoard's Dairyman, Vol. 120, No. 13, p 799, July 10, 1975.

Descriptors: *Groundwater pollution, *Pennsylvania, *Regulation, *Dairy industry.
Identifiers: *Land application, *Application rates.

Five years of experiments were made to determine what happens under Pennsylvania soil and crop conditions when concentrated operations use the land for manure disposal. Dairy manure slurry was injected under orchard grass sod at rates of 120-600 tons per acre yearly for three years. The lowest rate supplied 700 lbs of nitrogen per acre per year. Two years after the applications were discontinued, Penn State researchers still found nitrate nitrogen in the soil water in excess of 10 milligrams per liter, the potable water standard. This was found at 4 feet, where the lowest rate had been applied. Fifty to eighty tons of slurry per acre, supplying 300-500 lbs of nitrogen per acre, were injected in November, 1973, and in April, 1974, to compare fall and spring applications. Nitrate nitrogen from the fall application had moved down four feet in soil water by June of 1974 but remained near the potable standard of 10 milligrams per liter after July. The nitrate nitrogen from the spring-applied manure never exceeded 10 milligrams per liter during the growing season. (Merryman-East Central)
W76-10542

PHYSICAL AND CHEMICAL PROPERTIES OF OUTDOOR BEEF CATTLE FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Inst. of Agriculture and Natural Resource.
C. B. Gilbertson, J. R. Ellis, J. A. Nienaber, T. M. McCalla, and T. J. Klopfenstein.
Research Bulletin 271, Agricultural Experiment Station, University of Nebraska, Lincoln, August, 1975, 16 p. 2 fig, 11 tab, 16 ref.

Descriptors: *Physical properties, *Chemical properties, *Feed lots, *Agricultural runoff, *Nebraska, Design criteria, Cattle, Farm wastes, Water pollution sources, Pollutant identification, Sampling.

From August, 1968 to December, 1972, feedlot runoff and its control were studied. Continuous flow systems, a batch system, and pairs of feedlots with a buffer strip between each pair were established. Automatic samplers were installed to obtain composite samples of runoff from each feedlot and of

effluent discharged from each debris basin. Physical and chemical analyses were performed. Total, fixed, and volatile solids transported in rainfall runoff averaged 1.52, 0.84, and 0.68 (percent w.b.) respectively. Solids transported in rainfall runoff were 28 percent filtrable solids. The volatile solids portion decreased with a decrease in particle size while the particle density increased. The unit weight of runoff was 63.02 lb per cu ft. Settleable solids transported in runoff and discharged from the debris basin to the holding pond averaged 217 and 63 cu ft per acre-inch (60, 760, and 17,640 ppm) respectively. Bulk density of the settleable solids in runoff and discharged from the debris basin to the holding pond averaged 10.72 and 8.03 lb per cu ft respectively. Seventy-one percent (by weight) of the settleable solids settled within the first 15 minutes under static conditions. Runoff COD ranged from 14,100 to 77,100 mg/l in snowmelt runoff and 1300 to 8200 mg/l for rainfall runoff. Total N and P concentration in rainfall runoff averaged 916 and 361 ppm, respectively. Average values were 2105 and 292 ppm for snowmelt runoff. Solids transport and settling characteristics data may be valuable in calculating detention times and storage capacities for solids settling facility design. Results can also be used to calculate solids accumulations in holding ponds to estimate maintenance requirements. Feedlot runoff should be restricted from freely flowing into streams. (Merryman-East Central)
W76-10543

INTACT MANURE PACKS HALT SEEPAGE.
For primary bibliographic entry see Field 5G.
W76-10544

WATER QUALITY AND MANAGEMENT CHARACTERISTICS OF FEEDLOT RUNOFF HOLDING PONDS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-10545

FARM ANIMAL MANURES: AN OVERVIEW OF THEIR ROLE IN THE AGRICULTURAL ENVIRONMENT,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5G.
W76-10548

QUALITY VARIATION OF FEEDLOT RUNOFF IN STORAGE,
Agricultural Research Service, Lincoln, Nebr.
C. L. Linderman, and J. R. Ellis.
Presented at the 1975 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 15-18, 1975, Paper No. 75-2563, 16 p. 9 fig, 2 tab, 10 ref.

Descriptors: *Feed lots, *Agricultural runoff, *Waste storage, Water quality, Nutrients, Chemical properties, Farm wastes, Water pollution sources.
Identifiers: *Holding ponds, Land disposal.

Studies were performed to determine changes in feedlot runoff effluent stored in holding ponds. Feedlot runoff effluent stored in holding ponds may vary in composition due to solids settling, microbial activity, evaporation, and dilution by direct rainfall. These factors had the greatest effect on runoff which was stored with no additions of new runoff. Solids, nitrogen, phosphorus, and salts varied twofold to threefold. When no new runoff was added, NH4-N varied sevenfold and electrical conductivity varied ninefold. If it is desired to efficiently utilize the nutrients in feedlot runoff in land disposal, chemical analyses should be performed periodically. This should foster better utilization of nutrients and should arm the feedlot operator in controlling soil salinity. (Merryman-East Central)
W76-10549

SAMPLERS FOR MONITORING RUNOFF WATERS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-10550

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRRIGATED AND NON-IRRIGATED AGRICULTURE.
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 5G.
W76-10564

ANATOMY OF AN OIL SPILL,
W. Wertenbaker.
Marine Technology Society Journal, Vol 8, No 3, p 16-28, March 1974.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, Water resources, Water pollution effects, Water pollution sources, *Ecosystems, *Pollutant identification, *Oil industry, Continental shelf, Coasts, Beaches, Marshes, Fishkill, Shellfish, Invertebrates, Barges, Grasses, Estuaries, Inlets(Waterways), Bays, Fish, *Massachusetts.
Identifiers: *Outer Continental Shelf, Environmental impact, Refineries, Crude oil, Petroleum, Hydrocarbons, Tankers, West Falmouth(Ma).

An exposition is presented of a major research effort in a continuing controversy concerning the effects of an oil spill. On the evening of September 15, 1969, a tug, New York Central No. 34, and a barge started up Buzzards Bay toward the Cape Cod Canal. The barge carried almost two thousand five hundred tons of No. 2 fuel oil. She was called the Florida. Near midnight, several miles up the bay from Woods Hole, the tug and the Florida went hard aground on a cluster of submerged boulders, which tore a hole in the bottom of the barge. By daylight the stench of oil was far inland, and a slick of oil could be seen downwind from the barge as far as Nye's Neck, in North Falmouth, two miles away. In scientific generalities, the marine animal population of the area, in the course of the next week or so, declined from about two hundred thousand animals per square metre to about two animals per square metre. Details are given on the depopulation of various small areas within the vicinity of the spill. The oil industry has advanced the view that the effects of spills have been hysterically overstated. During the second year after the spill, the less polluted areas were periodically repolluted with fresh oil from inshore; but in the spring marsh grass began to grow in some places. The oil continued to weather and degrade on the surface of the sediments. The spill showed, contrary to almost all published statements that some parts of petroleum will dissolve in water-namely, the toxic aromatics, and that petroleum will as readily sink as evaporate. It also showed the relative ineffectiveness of all present means of dealing with oil after a spill. (Sinha-OEIS)
W76-10597

LITERATURE REVIEW: MOVEMENT OF SPILLED OIL AT SEA,
Mathematica, Inc. Philadelphia, Pa. Regional and Environmental Studies,
M. H. Fallah, and R. M. Stark.
Marine Technology Society Journal, Vol 10, No 1, p 3-18, January 1976. 12 fig, 1 tab, 198 ref.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution sources, Water pollution effects, *Resources development, Water resources, *Bibliographies, Continental shelf, Spreading, Drifting(Aquatic), Diffusion, Dispersion, Pollutants, *Path of pollutants.
Identifiers: *Outer Continental Shelf, Offshore technology, Environmental impact.

The continuing importance of understanding the movement of spilled oil at sea suggests the usefulness of reviewing the state of the art and referencing the many publications in a single source. Four distinct modes of oil-water interaction are recognized: spreading, drift, diffusion, and dissipation. An overview is provided of some of the important works. It is followed by a comprehensive bibliography. (Sinha-OEIS)
W76-10599

TRANSPORT OF CHLORINATED HYDROCARBONS IN SEDIMENTS OF THE UPPER CHESAPEAKE BAY,
Westinghouse Oceanic Div., Annapolis, Md.
H. D. Palmer, K. T. S. Tzou, and A. Swain.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 688, $6.75 in paper copy, $3.00 in microfiche. (1976), 109 p, 46 fig, 7 tab, 53 ref, append. OWRT C-5160(4204) (1).

Descriptors: *Chlorinated hydrocarbons, *Sediment transport, *Estuaries, *PCB, *DDT, *Chlordane, *Seston, Maryland, Circulation, Bottom sediments, Tidal currents, *Chesapeake Bay, *Path of pollutants, Water pollution.
Identifiers: Susquehanna River(Md), Baltimore Harbor(Md).

The analyses of both bottom sediments and seston from 3 depths over 28 hour periods at fixed stations have yielded information on the levels of PCB, DDT and chlordane in the Upper Chesapeake Bay of Maryland. Seston samples showed mean concentrations of 4.3 ppt (parts per trillion) of PCB, .23 ppt of DDT and .81 ppt chlordane off Annapolis; off Baltimore Harbor the mean concentrations were 4.5 ppt PCB, .27 ppt DDT and .62 ppt chlordane. At the head of the bay, these values were 12.08 ppt PCB, 1.03 ppt DDT and 0.72 ppt chlordane. Transport direction was generally to the south. It is concluded that most of the chlorinated hydrocarbon compounds in the upper bay have come from the Susquehanna River drainage, and that Baltimore Harbor, although displaying high local values in bottom sediments, is not a major source to the upper bay.
W76-10607

QUALITY OF WATER CONSIDERATIONS IN ARID AREA WATER MANAGEMENT,
Nevada Univ., Reno. Desert Research Inst.; and Nevada Univ., Las Vegas. Center for Water Resources Research.
G. F. Cochran, D. Fitzsimmons, J. Garrett, and G. Watson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 716, $5.00 in paper copy, $3.00 in microfiche. Center for Water Resources Research, Publication No. 16, Dec. 1973. 85 p, 22 fig, 37 tab, 87 ref, 2 append. OWRT C-2152-NEV(3371) (1).

Descriptors: *Water management(Applied), Urbanization, Water utilization, *Nevada, Arid lands, *Water quality, Groundwater, *Water supply, Water reuse, Reclaimed water, Artificial recharge, Model studies, Surface-groundwater relationships.
Identifiers: *Las Vegas Valley(Nev).

This report is the third in a series of four to be published on a study entitled, 'Research and Analysis to Plan, Develop, and Manage a Ground and Surface-Water Supply.' The area considered is the Las Vegas Valley in southern Nevada where a ground- and surface-water supply system has been developed. This report focuses on (1) water quality considerations as they pertain to water supplied for domestic, industrial and municipal uses from resources of different quality and quantity; (2) laws and institutions which play an active role in

all aspects of water quality, such as primary water use, reclaimed water use, artificial ground-water recharge and control of once used water and its discharge; (3) potential uses, values and costs of reclaimed water after various levels of treatment, (4) continued extention and refinement of the master water resource model for the area; and (5) examination of the effects of water quality constraints and objectives on 'optimal' water use policies as determined with the master water resource model. (See also W72-01333 and W74-01662) (Fallon-Nevada)
W76-10608

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT: PARAMETER IDENTIFICATION,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 648, $4.50 in paper copy, $3.00 in microfiche. Cornell University Water Resources and Marine Sciences Center, Ithaca, May 1976, 67 p, 10 fig, 5 tab, 65 ref, 3 append. OWRT A-052-NY(1). 14-31-0001-5032.

Descriptors: *Groundwater, *Artificial recharge, Kinetics, Adsorption, Mass transport, Equations, Simulation analysis, Water reuse, *Mathematical models, Model studies, Algorithms, Finite element analysis, Management.

Mathematical models are presented for assessing the potential impact of the artificial recharge of municipal wastewater effluents on the subsurface environment. Wastewaters are assumed to be recharged to a shallow unconfined groundwater aquifer in surface spreading basins. A Galerkin finite element simulation model predicts the time and spatial variations of conservative and nonconservative constituent concentrations within the soil profile. The model incorporates time dependent non-equilibrium absorption and chemical and/or biochemical reactions. The Galerkin procedure transforms the partial differential equations describing mass transport and absorption into systems of first-order ordinary differential equations. The resulting equations are recursively solved by finite difference techniques. The simulation equations form the basis for the parameter identification model which is formulated as a quadratic programming problem using a generalized Newton-Raphson procedure. The model is used to estimate (1) the kinetic, dispersion, and adsorption parameters characterizing quality changes within the soil system, and (2) the initial distribution of a contaminant within the sorbed or solution phases at the inception of the spreading cycle. The simulation model and the parametric identification algorithm are validated using published analytical solutions of the adsorption and mass transport equations. The results indicate the computational efficiency of the identification algorithm for the large scale estimation of groundwater quality parameters.
W76-10613

CHEMICAL AND MICROBIOLOGICAL CHANGES IN POULTRY LITTER APPLIED TO SOIL AS INFLUENCED BY THE TIME AND METHOD OF APPLICATION,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W76-10615

MANURE AND THE NITRATE PROBLEM,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5E.
W76-10616

DIRECTORY OF EPA, STATE AND LOCAL ENVIRONMENTAL QUALITY MONITORING AND ASSESSMENT ACTIVITIES.
Smithsonian Institution, Cambridge, Mass. Center for Short-Lived Phenomena.
For primary bibliographic entry see Field 5G.
W76-10623

REPORT ON POLLUTION OF INTERSTATE WATERS OF THE CONNECTICUT RIVER.
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W76-10626

ADVANCES IN INTERFACIAL PHENOMENA OF PARTICULATE/SOLUTION/GAS SYSTEMS; APPLICATIONS TO FLOTATION RESEARCH,
American Inst. of Chemical Engineers, N.Y.
For primary bibliographic entry see Field 5D.
W76-10627

INTERFACIAL CHEMISTRY OF PARTICULATE FLOTATION,
Henry Krumb School of Mines, New York.
P. Somasundaran.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 1-15, 1975. 24 fig, 3 tab, 100 ref.

Descriptors: *Flotation, *Chemical properties, *Physical properties, *Water pollution treatment, Separation, Frothing, Flocculation, Treatment.
Identifiers: Precipitate flotation.

Basic principles governing particulate flotation are reviewed, with particular emphasis on the interfacial chemistry involved. Although froth flotation is emphasized, precipitate flotation which appears to hold promise for future applications is also discussed. Topics covered include: the classification of flotation techniques on the basis of separation mechanism and size of the material separated, selective hydrophobicity, frothing, flotation activation and depression, flotation deactivation, and the effects of such variables as collector chain length, surfactant chemical structure, collector concentration, solution pH, collector ionic strength, flocculant and dispersant addition, and the conditioning temperature. Techniques for studying the mechanism of particulate flotation are also discussed. (See also W76-10627) (Kreager-FIRL)
W76-10628

ELECTROCHEMICAL PROPERTIES OF THE OXIDE-SOLUTION INTERFACE IN RELATION TO FLOTATION,
Department of Energy, Mines and Resources, Ottawa (Ontario). Mineral Sciences Div.
S. M. Ahmed.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 24-33, 1975. 11 fig, 2 tab, 48 ref.

Descriptors: *Flotation, *Adsorption, *Electrochemistry, *Waste treatment, *Oxides, Chemical properties, Electrical properties, Ions, Water pollution control.

The electrochemical nature of the oxide-solution interface is discussed in relation to the adsorption and flotation properties of oxides. Hydrogen and hydroxyl ions, when adsorbed on oxide surfaces, together constitute a polarizable hydration layer with a hydrogen-bonded structure. For surface behaviors characterized as acidic where the pH range is above the zero point of charge and where there is little or no dissociation, hydrogen and hydroxyl ion activities in the hydration layer are greatly altered due to ion-surface interactions. The corresponding potential drop is attributed to the re-orientation of water dipoles and to the rearrangement of the hydrogen-bonded structure. The surface charge densities are low in this pH range, but the adsorption of neutral organic molecules such as starches and alcohols can be high. As the pH is increased, the double layer becomes strongly ionic due to acidic dissociation of the surface hydroxyl groups; and a further potential drop occurs in the compact layer due to specific adsorption of cations. Oxides characterized by a basic surface behavior of dissociation display the converse behavior, and the oxides characterized by amphoteric dissociation display a composite behavior of the above two types, with or without the specific adsorption of anions. (See also W76-10627) (Kreager-FIRL)
W76-10629

DETERMINATION OF SURFACE EQUILIBRIA AND MASS TRANSFER RATES IN A CONCURRENT FLOW BUBBLE COLUMN,
California Univ., Berkeley. Dept. of Chemical Engineering; and California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 5D.
W76-10632

BEHAVIOR OF HYDROGEN AND HYDROXYL IONS AT THE OXIDE-WATER INTERFACE,
Kyoto Univ., (Japan). Dept. of Mineral Science and Technology.
T. Wakamatsu, and S. Mukai.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 81-87, 1975. 12 fig, 17 ref.

Descriptors: *Adsorption, *Flotation, *Waste treatment, *Ions, Hydrogen, Surfactants, Separation techniques, Chemical properties, Performance.
Identifiers: Hydroxyl ions, Sodium dodecylsulfonate.

Adsorption isotherms of hydrogen and hydroxyl ions on alumina were determined in the presence and absence of sodium dodecylsulfonate by means of an acid titration method. The pH value at which hydrogen and hydroxyl ions are equally adsorbed onto the alumina, known as the equi-adsorption point, was also determined. Both studies were performed to explain the behavior of such ions in terms of collection and depression mechanisms in flotation. The equi-adsorption point for alumina occurred at a pH value of 7.4, while the isoelectric point for the same material occurred at a pH of 9.0. The equi-adsorption point of alumina did not change even with the addition of dodecylsulfonate. It was also established that the adsorption density of hydrogen ion as well as that of hydroxyl ion on alumina increased with an increase in sulfonate concentration. (See also W76-10627) (Kreager-FIRL)
W76-10633

CHARACTERIZATION OF ADSORBED COBALT AT THE OXIDE-WATER INTERFACE,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
For primary bibliographic entry see Field 5D.
W76-10634

ADSORPTION MECHANISM OF SULFIDES AT A PLATINUM-SOLUTION INTERFACE,
Karnataka Regional Engineering Coll., Suratkal (India).
For primary bibliographic entry see Field 5D.
W76-10636

INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SENSING AND ASSESSMENT, VOLUMES 1 AND 2.
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.

LIBRARY U. OF L. URBANA-CHAMPAIGN

W76-10637

FLOW OF TOXIC METALS IN THE ENVIRONMENT,
Pan American Health Organization, Mexico City.
D. W. Jenkins.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 1-1-1 - 1-1-5. 2 fig, 5 tab, 22 ref.

Descriptors: *Metals, *Toxicity, *Surface waters, *Ecosystems, *Water pollution effects, *Groundwater, Oceans, Rivers, Estuaries, Waste disposal, Arsenic compounds, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Nickel, Zinc, Washouts, Leaching.
Identifiers: Anitimony, Tin, Vanadium, Enrichment factors.

The various pathways and flows of twelve toxic metals through the air, terrestrial ecosystems, freshwater, and the ocean are outlined. Pathways relevant to water pollution include: washout and deposition from the atmosphere, leaching and sewage disposal from terrestrial ecosystems to fresh water, the flow of fresh water via rivers and estuaries to the ocean, and the direct dumping of wastes via ocean outfalls. Each environmental compartment has metals flowing in and out of it, with the exception of the ocean. The ocean receives large amounts of toxic metals, but only a small portion of these metals leave in the form of marine products. Oceanic levels of antimony, arsenic, cadmium, chromium, cobalt, copper, lead, mercury, nickel, tin, vanadium, and zinc are estimated at 617, 2740, 27, 55, 685, 1370, 55, 137, 2740, 4110, 2740, and 13,700 million tons, respectively. The amounts of these metals added to the ocean annually as a result of river flow and atmospheric washout are also tabulated. Maximum enrichment factors of marine organisms are also presented. (See also W76-10637) (Kreager-FIRL)
W76-10638

SOME CONSIDERATIONS ON MONITORING OF TRACE METALS IN ESTUARIES AND OCEANS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5A.
W76-10653

ENVIRONMENTAL QUALITY SURVEILLANCE IN INDONESIA,
National Inst. of Health, Research and Development, Djakarta (Indonesia).
For primary bibliographic entry see Field 5A.
W76-10655

MONITORING GROUNDWATER POLLUTION,
For primary bibliographic entry see Field 5A.
W76-10659

GROUNDWATER POLLUTION MONITORING CASE STUDIES,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5A.
W76-10661

AUTOMATED FORECAST PROCEDURES FOR RIVER QUALITY MANAGEMENT,
For primary bibliographic entry see Field 5A.
W76-10664

A STRATEGY FOR AQUATIC POLLUTANTS FATE AND TRANSPORT DETERMINATION,
Environmental Research Lab., Athens, Ga.
W. M. Sanders, III.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 14-7-1 - 14-7-5. 1 tab, 25 ref.

Descriptors: *Model studies, *Water quality, *Chemical degradation, *Kinetics, *Water pollution effects, Chemical reactions, Chemical properties, Rivers, Lakes, Organophosphorus pesticides, Chlorides, Computer programs.
Identifiers: Malathion, Vinyl chloride, Chlorinated hydrocarbons, Transformation.

A strategy developed by the Environmental Protection Agency for obtaining transport and fate information for aquatic pollutants is outlined. Studies are first conducted to determine whether degradation or transformation reactions occur and if their rates are fast enough to be environmentally significant. If the results are positive, detailed mechanistic and kinetic studies are then conducted. A final evaluative phase of the strategy involves observing the results of various competing or enforcing reactions. The various rate processes are described mathematically, and the resulting equations are coupled to form evaluative computer models. These models do not represent any particular aquatic system but are structured so that each important environmental factor can be varied within the ranges observed in nature. The model results can be presented as concentration and distribution profiles for parent compounds and for degradation products. Applications of the modeling strategy involving the prediction of vinyl chloride half-life in lake and river ecosystems and the degradation of the organophosphorus pesticide malathion in a river ecosystem are described. (See also W76-10637) (Kreager-FIRL)
W76-10665

REMOTE SENSING OF GROUND AND SURFACE WATER CONTAMINATION BY LEACHATE FROM LANDFILL,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W76-10666

MONITORING ESTUARINE CIRCULATION AND OCEAN WASTE DISPERSION USING AN INTEGRATED SATELLITE-AIRCRAFT-DROGUE APPROACH,
IIT Electro-Physics Lab., Inc., Columbia, Md.
For primary bibliographic entry see Field 5A.
W76-10671

SORPTION CAPABILITIES OF SOILS FOR PHOSPHATE REMOVAL,
Ontario Ministry of the Environment, Toronto. Applied Science Section.
For primary bibliographic entry see Field 5D.
W76-10673

WATER POLLUTION THROUGH RAIN OVERFLOWS FROM MIXED SEWERS (GEWASSERVERSCHMUTZUNG DURCH REGENUBERLAUFE AUS MISCHKANALISATIONEN),
A. G. Herik.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 529-549, 1976. 15 fig, 3 tab, 9 ref.

Descriptors: *Combined sewers, *Overflow, *Water levels, *Rain water, *Sewerage, Sewage sludge, Flow rates, Biochemical oxygen demand, Dissolved oxygen, Sewage bacteria, Nitrates, Phosphates.
Identifiers: Netherlands.

Experiments on water pollution through rainwater overflows from mixed sewers are described in connection with preliminary standards promulgated in the Netherlands. With a minimal water depth of 1.5 to 2.0 m in the recipient, a specific recipient surface of 4 sq m per inhabitant is required and is sufficient for the uptake of the rain overflow. The flow rate should be low enough to achieve settling rather than whirl-up of sludge by the storm runoff in the sewer. To minimize the sludge entrainment from the sewer system, the latter should be as short as possible, and straight pipes with steady slope and without changes in their cross-section should be used. After overflow, the water quality of the recipient is normalized in a relatively short time concerning the BOD load, oxygen content and the bacterial contamination, while the increased nitrate and phosphate contents may require the additional discharge of fresh water. (Takacs-FIRL)
W76-10688

WATER TRACING IN TROPICAL REGIONS, THE USE OF FLUOROMETRIC TECHNIQUES IN JAMAICA,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2F.
W76-10701

DENSITY CURRENT SURGES I--THEIR ROLE IN THE INITIAL DISPERSION OF A SURFACE FIELD,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
D. H. Bache.
Journal of Hydraulic Research, Vol. 14, No. 1, p 1-7, 1976. 3 fig, 12 ref.

Descriptors: *Density currents, *Dispersion, *Surges, *Turbulence, *Interfaces, Pollutants, Streamflow, Laboratory tests, Hydraulics, Model studies, Mixing, *Path of pollutants.
Identifiers: *Inviscid flow, Density gradient.

Buoyancy forces acting on a pollutant discharged into a stream cause a surface density field, transported at the local velocity. This density field is dispersed by density gradient instabilities and turbulence. The case of dispersion dominated by density gradient effects was considered, neglecting the action of turbulence. The early behavior of a density surge was developed on the basis of inviscid flow theory. Experiments to determine the effect of density difference on the transverse spreading of a surface field were performed in a broad tilting flume, using a recirculatory system. Laboratory results indicated that the dispersion in the initial phase is independent of turbulence. Agreement was satisfactory between the experimental and theoretical results at large density differences and at short time. Departures at small density differences and large times were attributed to the influence of turbulent mixing and simplifications used. (See also W76-10708) (Singh - ISWS)
W76-10707

DENSITY CURRENT SURGES II--THE MOVEMENT OF SURGES IN A TURBULENT ENVIRONMENT AND THEIR ROLE IN SURFACE FIELD DISPERSION,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
D. H. Bache.
Journal of Hydraulic Research, Vol. 14, No. 1, p 8-16, 1976. 6 fig, 2 tab, 8 ref.

Descriptors: *Density currents, *Dispersion, *Momentum equation, *Turbulence, *Intfaces, Streamflow, Model studies, Mixing, Laboratory tests, Hydraulics, Surges, Equations, Path of pollutants.
Identifiers: *Surface field dispersion, Momentum block.

The surge motion arises through a conversion of potential energy into kinetic energy and continues until turbulence dampens out such exchanges (lateral spreading of surface density field) or until the main supply of available energy becomes exhausted. The outward surge causes the field to

split into two momentum blocks. The size of the momentum block was defined in terms of a characteristic length and depth. These lengths reflect dynamically the amount of material carried within the momentum block. Experiments were performed to generate blocks possessing differing initial momenta and to vary the level of turbulence of the recipient flow. Freshwater was discharged through a rectangular surface source into an ambient stream whose density was varied. Levels of turbulence were varied by altering the slope and depth of the ambient flow. The study showed that a simplified view of blocks of momentum continuously mixing with their environment can adequately reflect the transverse spreading of a surface density field following the development of surges at the field edges. (See also W76-10707) (Singh - ISWS)
W76-10708

DISTRIBUTION OF STREAM POLLUTION IN LAKE WATER,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
R. W. Tew, S. S. Egdorf, and J. E. Deacon.
Journal of the Water Pollution Control Federation, Vol. 48, No. 5, p 867-871, May 1976. 1 fig, 2 tab, 14 ref.

Descriptors: *Bacteria, *Distribution patterns, *Model studies, Aquatic bacteria, *Path of pollutants, *Nevada, Population, Microorganisms, Thermophilic bacteria, Distribution, Estimating, Tracers, Spatial distribution, Tracking techniques, Water pollution, Analytical techniques, Lakes, Streams, Pollutants, Sampling, On-site investigations, Fluorescent dye.
Identifiers: *Bacterial tracers, *Lake Mead(Nev), Stream pollution, *Tracer techniques, Boulder Basin(Lake Mead), Inflowing stream.

A time-distance-depth distribution matrix of indigenous, oxidase-positive or yellow-orange bacterial population components was used to ascertain the fate of waters from a polluted stream in a reservoir of very large volume. Isolates were described sufficiently to identify population components as operational units; strict identification was not sought nor required. Precepts and conditions governing work with bacterial tracers were discussed. (Henley - ISWS)
W76-10712

NUTRIENT TRANSPORTS THROUGH LANCASTER SOUND IN RELATION TO THE ARCTIC OCEAN'S REACTIVE SILICATE BUDGET AND THE OUTFLOW OF BERING STRAIT WATERS.
Washington Univ., Seattle. Dept. of Oceanography.
L. A. Codispoti, and T. G. Owens.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-011 883, $3.50 in paper copy, $3.00 in microfiche. Limnology and Oceanography, Vol. 20, No. 1, p 115-119, January 1975. 4 fig, 1 tab, 17 ref. ONR N-00014-67-A-0103-0014.

Descriptors: *Nutrients, *Silicates, *Arctic Ocean, *Silica, Water transfer, Arctic, Chemical analysis, Nitrates, Water quality, Phosphates, Phosphorus, Sea water, Saline water, Salinity, Chemical properties, Oceans, Surface waters, Analytical techniques, Ammonium compounds, On-site investigations, *Path of pollutants, Canada.
Identifiers: *Nutrient transport, *Lancaster Sound, Reactive silicate, *Bering Strait, Reactive phosphorus.

Data from the Lancaster Sound region help balance the Arctic Ocean's reactive silicate budget, but a net removal is still indicated. The reactive phosphorus and reactive silicate concentrations in Lancaster Sound suggest an enrichment with Bering Strait waters. (Henley - ISWS)
W76-10717

CHARACTERIZATION AND TREATMENT OF BRINE WASTEWATERS FROM THE CUCUMBER PICKLE INDUSTRY,
North Carolina Univ., at Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 3E.
W76-10805

A SIMULATION MODEL OF TRITIUM KINETICS IN A FRESHWATER MARSH,
Ohio Cooperative Wildlife Research Univ, Columbus.
T. A. Bookhout, and G. C. White.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 761, $5.00 in paper copy, $3.00 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 487X, June 1976. 88p,p 18 fig, 9 tab, 38 ref. OWRT A-038-OHIO(1).

Descriptors: *Water pollution, *Tritium, *Freshwater marshes, *Simulation analysis, Radioecology, Lake Erie, Radioisotope, Aquatic environment, *Marshes, Computer models, *Model studies, Nuclear powerplants, *Ohio, Lakes, Monitoring, Crayfish.
Identifiers: Navarre Marsh(Ohio), Tritiated water.

A simulation model of tritium kinetics was developed from data collected in a Lake Erie marsh from November 1973 to October 1974. Approximately 11 Curies of tritiated water (HTO) were released into the marsh, and the loss of HTO was monitored for one year. Models were fitted to these data with nonlinear least squares to provide maximum likelihood estimates of parameters. The initial model of the marsh water was a simple differential equation whose solution was a boundary condition for the partial differential equation used to describe HTO kinetics in the sediment. A second model of the water-sediment was developed to allow environmental variations to influence tritium kinetics. A 31-compartment system was assumed. HTO concentration in the marsh water was affected by HTO levels in the atmosphere, marsh water temperature, marsh depth, and rate of change of marsh depth. Organisms were described by a two-compartment model, a body water compartment, and a tissue compartment, with interchange between compartments. Estimated parameters for crayfish (Procabarus blandingi) showed that much of the tritium in tissue comes from food. A new parameter estimation technique was developed which allowed both sampling error and variation in the observed process. This method removed the autocorrelation found in the residuals when the process variation was significant relative to the sampling error. Simulated data were used to verify the technique.
W76-10812

SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS: FINAL REPORT,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W76-10813

DEVELOPMENT OF A WATER QUAITY SIMULATION MODEL APPLICABLE TO GREAT SALT LAKE, UTAH,
Utah Center for Water Resources Research, Logan.
C. T. Jones, W. J. Grenney, C. G. Clyde, and J. P. Riley.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 718, $6.00 in paper copy, $3.00 in microfiche. Utah Water Research Laboratory, Publication PRJEW026-1, June 1976. 129 p, 55 fig, 9 tab, 48 ref, 2 append. OWRT A-025-UTAH(1), 14-31-0001-5045.

Descriptors: *Advection, *Diffusion, *Water quality, *Simulation analysis, Water balance, Salt balance, Dissolved oxygen, Water resources development, *Great Salt Lake, *Utah, *Model studies, Networks, Forecasting, Monitoring, *Distribution patterns, Path of pollutats, Water pollution.

The development of a model capable of predicting the long term (seasonal) distribution of water quality constituents within Great Salt Lake was undertaken as a portion of the ongoing Great Salt Lake project. This study provides a model capable of monitoring the long term distribution of quality constituents within the lake. This capability is a necessary component of the modeling framework since it will allow the investigation of the effects which alternative water quality management plans will have on the distribution of water quality constituents within the lake. The water quality model of the lake is based on the application of the advection-diffusion equation to the three-dimensional transport of a quality constituent. The modeling technique is formulated by discretizing the system as a network of nodes interconnected by channels in both the horizontal and vertical directions. In applying the model to Great Salt Lake, a two-layered vertical network was employed and the vertical transport was described by diffusion alone due to the physical characteristics of the system. Using observed total dissolved solids concentrations, a method was developed during the study for establishing the vertical diffusion coefficient as a function of depth. A unique feature of this water quality modeling technique is that it allows the seasonal distribution of a quality constituent to be studied without the necessity of developing a hydrodynamic model of the system.
W76-10815

AN INVESTIGATION OF EFFLUENT CONTROL STANDARDS AND PRACTICES (ATOMIC ENERGY PRODUCTION),
Douglas United Nuclear, Inc., Richland, Washington.
For primary bibliographic entry see Field 5G.
W76-10828

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS: FEEDLOT POINT SOURCE CATEGORY,
Environmental Protection Agency, Office of Air and Water Programs. Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10829

LIGNOSULFONATES AND NATURAL WATER-SOLUBLE LIGNIN IN THE LIELUPE RIVER (LIGNOSUL'FONATY I PRIRODNYI VODORASTVORIMYI LIGNIN V VODE R. LIELUPE),
Akademiya Nauk Latviiskoi SSR. Inst. of Wood Chemistry.
E. A. Aunin'sh, and A. D. Tupureine.
Khimiya Drevesiny, No. 6, p 91-97, November/December, 1975. 3 fig, 10 ref, 1 tab.

Descriptors: *Lignins, *Pulp wastes, *Water pollution sources, Wastes, Industrial wastes, Biochemical oxygen demand, Bacteria, Oxidation, Water temperature, Self-purification, Water purification, Water pollution, Water pollution effects, Path of pollutants.
Identifiers: *Lielupe River(Latvia), Lignosulfonic acids, Lignosulfonates, Sloka pulp and paper mill(Latvia), USSR.

The total lignin content in the waters of the Lielupe river in the area where effluents from the Sloka pulp and paper mill (Latvia) are discharged varies from 4 to 40 mg/liter. The increase in the 5-day BOD of the river water caused by lignosulfonic acids is 0.46-1.76 mg oxygen/liter, depending on the degree of dilution of the effluents by the river water. The annual downstream degree of river self-purification from total lignin, as well as from lignosulfonic acids and lignosulfonates,

averages about 50%, and fluctuates between 25% and 74%. The rate constant for down-stream self-purification from total lignin fluctuates from 0.0120 to 0.0800 during the course of a year. The values most frequently obtained are 0.0300-0.0450. Bacterial oxidation of total lignin and lignosulfonic acids took place more rapidly under natural conditions than in the laboratory. Water temperature had a smaller effect on oxidation under natural conditions than in the laboratory. (Stapinski-IPC)
W76-10835

LONG-TERM STABILITY OF WASTE LIGNINS IN AQUATIC SYSTEMS. PART 2. STABILITY IN SALINE WATER,
Swedish Water and Air Pollution Research Laboratory, Stockholm, Sweden.
H. O. Bouveng, and P. Solyom.
Svensk Papperstidning, Vol. 79, No. 7, p 224-228, April 25, 1976. 6 fig, 2 ref, 4 tab.

Descriptors: *Lignins, *Biodegradation, *Sea water, *Pulp wastes, *Bleaching wastes, Wastes, Industrial wastes, Water pollution sources, Sulfite liquors, Freshwater, Degradation(Decomposition), Stability, Saline water, Organic compounds, Flocculation, Sedimentation, Sorption, Sediments, Chlorination, Color, Carbon, Aquatic environment, Pine trees.
Identifiers: Spruce trees(Picea), Spent pulping liquors, Black liquor(Kraft-process), Kraft mills, Lignosulfonates, Chlorolignin.

Calcium-base spruce spent sulfite liquor, pine kraft black liquor, and effluents from the chlorination and alkaline extraction stages of pine kraft pulp bleaching were used to investigate the biodegradability of waste lignins in sea water. Tentative conclusions reached are as follows: The effluents of chemical pulp mills contain 2 organic fractions, viz., one readily biodegraded and one degraded only slowly or not at all (called 'waste lignin'). The ratio of these 2 fractions differs from one type of effluent to another, and may even differ between samples from the same type of effluent. The degradation of different waste lignins may differ in fresh vs. saline water. Any disappearance of waste lignin is due to a true degradation, not to flocculation/sedimentation or sorption by sediments. Kraft-process waste lignin, although almost completely degraded in freshwater, leaves a significant amount of a virtuall inert fraction in sea water. Conversely, the lignin dissolved during kraft pulp chlorination is degraded more readily in sea water than in freshwater. In general, a relatively larger fraction seems to remain undegraded in freshwater than in sea water, suggesting that certain structural elements of lignin are less amenable to degraation in freshwater. No direct correlation was noted between changes in dissolved organic carbon and in color. (See also W76-03078) (Brown-IPC)
W76-10838

STUDIES ON COAGULATION TREATMENT OF SPENT WATER FROM PULPING PROCESS. PART 2. COAGULATION CHARACTERISTICS OF HEMICELLULOSE (IN JAPANESE),
Tokyo University, Japan, Faculty of Agriculture,
For primary bibliographic entry see Field 5D.
W76-10839

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA. (3). DEGRADATION OF LIGNIN PREPARATION FROM WASTE LIQUOR OF OXYGEN-ALKALI PULPING (IN JAPANESE),
Nagoya University, Japan, Faculty of Agriculture.
For primary bibliographic entry see Field 5D.
W76-10840

LAND APPLICATION OF SEWAGE SLUDGE, III. NITRATE ACCUMULATION AND WHEAT GROWTH RESULTING FROM ADDITION OF SEWAGE SLUDGE AND WOOD WASTES TO SOILS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5E.
W76-10841

SOURCES OF POLYCHLORINATED BIPHENYLS IN WISCONSIN,
Wisconsin Department of Natural Resources, Madison.
S. J. Kleinert.
Wisconsin Natural Resources Bulletin, Vol. 41, No. 1, p 12-13, January/February, 1976. 1 illus.

Descriptors: *Polychlorinated biphenyls, *Wisconsin, Water pollution, Pollutants, *Water pollution sources, Lakes, Lake Michigan, Municipal wastes, Industrial wastes, Pulp and paper industry, Fallout, Recycling, Solubility, Adsorption, Fibers(Plant), Fish, Electrical equipment, Capacitors, Power transformers, Natural streams, Metals, Metallurgy.
Identifiers: Iron and steel foundries, Aluminum foundries, Waste paper, Dielectrics.

This is a perspective on the polychlorinated biphenyl (PCB) problem in Wisconsin. Studies have confirmed the presence of PCBs in fish in Lake Michigan and other waters of the state. The Wisconsin Department of Natural Resources has found PCBs in municipal waste water treatment plant effluents and in effluents from iron and steel foundries, aluminum foundries, and paper mills recycling waste paper. Because their solubility in water is low, it is believed that most of the PCBs discharged from paper mills are adsorbed on fibers and particulate matter removed in mill waste water treatment systems. Discharges of PCBs from pulp and paper mills recycling waste paper will diminish as the mills meet discharge permit requirements. The electrical industry also uses PCBs as dielectric fluids in some capacitors and transformers. Proper disposal and handling of these fluids and defective equipment are necessary to prevent their release to the environment. Fallout from the air is listed as another source of PCBs entering the environment. (Witt-IPC)
W76-10844

A TRANSFORMATIONS OF SULFATE TURPENTINE IN NATURAL WATERS (PROTSESSY PREVRASHCHENIYA SUL'FATNOGO SKIPIDARA V PRIRODNYKH VODAKH),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
T. P. Churilova, N. F. Troyan, and L. I. Nomikos.
Gidrokhimicheskie Materialy, Vol. 61, p 88-95, 1974. 9 fig, 12 ref, 2 tab.

Descriptors: *Organic compounds, *Natural streams, *Oxidation, *Pulp wastes, Water pollution sources, Wastes, Industrial wastes, Water properties, Water chemistry, Microorganisms, Light intensity, Chemical reactions, Bacteria, Color, Water quality, Water temperature, Nitrates, Alcohols, Organic acids, Amino acids, Phenols.
Identifiers: *Sulfate turpentine, Aldehydes, Ketones, Esters, Lake Baikal(USSR).

The rate of sulfate turpentine oxidation in natural waters, the oxidation products, and the effect of these products on the properties and chemical composition of water and its microflora were studied in the laboratory using freshly distilled sulfate turpentine and water from Lake Baikal. The oxidation rate was determined in samples of lake water containing 0.5, 1.0, and 5.0 mg turpentine/liter. The samples were exposed to diffuse daylight (1000 lux, corresponding to illumination of the surface of the lake during the summer); to 100 lux (conditions of summer illumination at a depth of 10-20 m); and in darkness (conditions at 50 m depth and more). The temperatures were 16-18 C, 8-10 C, and 2-4 C, respectively. The rate of sulfate turpentine oxidation dropped sharply at low temperature and in darkness. It was the highest under conditions of full illumination. Turpentine remained unchanged in samples kept in the dark at 2-4 C for 5 days. The oxidation products included aldehydes, ketones, alcohols, esters, resinous substances, phenols, and carboxylic and amino acids. Oxidation of sulfate turpentine in natural water caused its discoloration and increased its content of organic substances, nitrates, the total numbers of bacteria, and the numbers of saprophytic bacteria. (Stapinski-IPC)
W76-10845

EFFLUENTS FROM CHLORINATION AND ALKALINE EXTRACTION OF PINE SULFATE PULP,
Swedish Forest Products Research Lab., Stockholm.
C. J. Alfthan, H. Norrstrom, and G. Akerlund.
Svensk Papperstidning, Vol. 79, No. 6, p 180-186, April 10, 1976. 12 fig, 9 ref, 3 tab.

Descriptors: *Bleaching wastes, *Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Biochemical oxygen demand, Color, Temperature, Chlorination, Pine trees, Effluents, Organic loading.
Identifiers: *Kraft mills, Alkaline extraction, Kraft pulping, Kappa-number, Chlorine dioxide.

In a modern bleached kraft pulp mill, the effluents from the first two bleaching stages (chlorination and alkaline extraction) are the most serious water polluters. The effects of different unbleached pulp grades and of changed reaction conditions in these bleaching stages on the polluting character of effluents have been studied, considering only those operating conditions likely to be of commercial practicality. Prolonging the kraft cook to a lower than normal kappa-number led to a lower 7-day BOD and less color in the two effluents. On the other hand, raising the temperature and the chemical charge in the bleach plant dissolved more organic matter and increased the pollutant load of effluents (in terms of BOD and color). Adding chlorine dioxide to the chlorination stage reduced the pollution load by 10-20%, both under normal and extreme conditions. (Brown-IPC)
W76-10858

THE USE OF WASTE FIBERS AS ABSORPTION MATERIAL IN GRASS SILAGE,
Finnish Pulp and Paper Research Inst. Helsinki.
For primary bibliographic entry see Field 5E.
W76-10863

POLYCYCLIC AROMATIC COMPOUNDS IN NATURE,
Woods Hole Oceanographic Institution, Mass.
M. Blumer.
Scientific American, Vol. 234, No. 3, p 34-45, March, 1976. 13 illus.

Descriptors: *Aromatic compounds, *Environment, *Water pollution sources, Soils, Sediments, Grasslands, Forests, Burning, Coals, Oil, Oil spills, Wastes, Industrial wastes, Organic compounds, Pollutants, Organic matter.
Identifiers: Wood.

The occurrence and origin of polycyclic aromatic compounds in nature are discussed. Polycyclic aromatic molecular structures are formed whenever organic substances are exposed to high temperatures. It is suggested that the compounds found in soil and young marine sediments may have been formed by forest and prairie fires. This class of compounds also enters the environment from the incomplete combustion of wood, coal, and petroleum, and from the spillage of petroleum. (Buchanan-IPC)
W76-10865

ELECTROCHEMICAL PRODUCTION OF FREE RADICALS FOR WASTEWATER TREATMENT,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-10876

DDT IN WATER, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-10877

AGRICULTURAL RUNOFF, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 849, $9.25 in paper copy, $3.00 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 76-203, July 1976, 286 p.

Descriptors: *Agricultural runoff, *Bibliographies, *Farm wastes, *Feed lots, Waste disposal, Waste treatment, Water pollution sources, Water pollution control, Runoff, Path of pollutants.

This report, containing 187 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 95,781 abstracts covering SWRA through April 15, 1976 (Volume 9, Number 8). Author and subject indexes are included. The first volume (See W72-05840) was issued in January 1972 and covered the material announced in SWRA from October 1968 through December 1971. This volume covers the period from January 1972 through April 1976.
W76-10879

PARTICLE EMISSIONS FROM A LARGE KRAFT PAPER MILL AND THEIR EFFECTS ON THE MICROSTRUCTURE OF WARM CLOUDS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5A.
W76-10904

DISPERSION OF POLLUTANTS,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Sciences.
E. R. Reiter.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 157-187. 15 fig, 4 tab, 7 ref.

Descriptors: *Pollutants, *Dispersion, *Industrial wastes, *Air pollution, Industries, Mills, Powerplants, Winds, Cooling towers, Atmosphere, Stability, Measurement, Sampling, Chemistry of precipitation, Rainfall, Fallout, Path of pollutants, Sites, Meteorology.

The ever-increasing demand for our natural resources will bring about the development of more and more industrial plants which, only a few years ago, might have been deemed economically marginal, at best. Typical examples are the upsurge in the gold-mining industry, and the feasibility studies concerned with oil shale exploitation. Many of our newly developing industrial enterprises require the preparation of Environmental Impact Statements. A large proportion of these impact statements is concerned with aspects of air pollution. This discussion concentrated upon those aspects of the atmospheric environment which are fundamental to most air pollution problems. These problems as they arise from industrial siting, construction, and operation, were categorized as follows: (1) short-term effects of pollution, (2) long-term effects of pollution, (3) large-scale pollution problems, and (4) data and measurement requirements. (See also W76-10901) (Sims - ISWS)
W76-10907

PULSED DISPERSION OF TRACE CHEMICAL CONCENTRATIONS IN A SATURATED SORBING POROUS MEDIUM,
Oregon State Univ., Corvallis. Dept. of Statistics; and Oregon State Univ., Corvallis. Dept.of Mathematics.
F. T. Lindstrom.
Water Resources Research, Vol. 12, No. 2, p 229-238, April 1976. 5 fig, 22 ref. U. S. PHS ES-00040.

Descriptors: *Dispersion, *Mathematical models, *Distribution patterns, Saturated flow, Sorption, Porous media, Equations, Soil water, Theoretical analysis, Graphical analysis, Computers, Water chemistry, Trace elements, Mass transfer, Laplaces equation, *Path of Pollutants.
Identifiers: *Trace chemical concentrations, Pulsed dispersion, Free phase, Sorbed phase, Transport equations, Gaussian distribution.

A rather simple, yet complete, mathematical model for the pulsed dispersion of trace chemical concentrations in a water-saturated sorbing porous medium was stated, and the resulting integrodifferential equation of transport was solved via Laplace transform methods. A typical example of a soil water dispersion system was discussed with the aid of free and sorbed phase concentration distribution curves. (Visocky - ISWS)
W76-10915

LONGITUDINAL DISPERSION FOR FLOW OVER ROUGH BEDS,
New Brunswick University, Fredericton. Dept. of Civil Engineering.
N. D. A. El-Hadi, and K. S. Davar.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY4, Proceedings Paper 12049, p 483-498, April 1976. 9 fig, 2 tab, 24 ref, 2 append.

Descriptors: *Dispersion, *River beds, Bed load, Beds, Roughness(Hydraulic), Roughness coefficient, Channel flow, Hydraulics, Waste identification, *Path of pollutants.
Identifiers: Relative roughness, Bedload movement, Bed roughness, Dispersion process.

The longitudinal dispersion coefficient was evaluated on the basis of a one-dimensional analysis as affected by large bed roughness in a laboratory flume. The experimental results have shown that the dimensionless dispersion coefficient is a function of the relative roughness height and the relative roughness spacing. It was also found that dimensionless dispersion coefficient reaches a maximum value at a roughness density 0.111. The commonly used equation for estimating the longitudinal dispersion coefficient was also examined. It was found that this straight line relation between the longitudinal dispersion coefficient and the product of water depth and the bed shear velocity is no longer valid for this product greater than 0.1 sq ft per sec. (Lee - ISWS)
W76-10921

WATER QUALITY CHARACTERISTICS OF THE ILLINOIS RIVER AT PEORIA,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5A.
W76-10922

DEPOSITION IN UPPER PATUXENT ESTUARY, MARYLAND, 1968-1969,
Madison Coll., Harrisonburg, Va. Dept. of Geology.
For primary bibliographic entry see Field 4C.
W76-10925

MONSOONAL DEPOSITION OF SEA SALT AND AIR POLLUTANTS OVER BOMBAY,
Bhabha Atomic Research Centre, Trombay, Bombay (India). Air Monitoring Section.
R. Sequeira.
Tellus, Vol. 28, No. 3, p 275-282, 1976. 2 fig, 5 tab, 21 ref.

Descriptors: *Rainfall, *Air pollution, *Salts, *Asia, Monsoons, Pollutants, Rain, Rain water, Precipitation(Atmospheric), Sampling, Chemistry, Chemicals, Calcium, Hydrogen ion concentration, Salinity, Industrial wastes, Meteorology, *Path of pollutants.
Identifiers: *Bombay(India), India, *Sea salt.

Representative sampling of rainwater was carried out in Greater Bombay and its neighborhood during the southwest monsoon period of 1974. It was estimated that on the average, approximately 200 kg/ha sea salt is deposited each monsoon. A high 'excess' of calcium was observed throughout Bombay, including relatively unpolluted places. The source of this excess was seen to be non-marine. The mean pH, ionic balance, and salinity of rainwater was used to characterize different areas of Bombay in varying degrees of pollution. (Sims-ISWS)
W76-10932

THE IMPACT OF HIGHWAY CONSTRUCTION ON A NORTH FLORIDA WATERSHED,
Michigan State Univ., East Lansing. Inst. of Water Research.
T. M. Burton, R. R. Turner, and R. C. Harriss.
Water Resources Bulletin, Vol. 12, No. 3, p 529-538, June 1976. 5 tab, 15 ref.

Descriptors: *Highways, *Water quality, *Florida, Watersheds(Basins), Turbidity, Construction, Suspended solids, Phosphorus, Erosion control, Soil erosion, Sediments, Sampling, On-site investigations.
Identifiers: *Highway construction, *Tallahassee(Fla), *Meginniss Arm Tributary(Fla), Dissolved silicon, Control basins, Electrical conductivity, Chemical transport.

A 20-month study of some effects of highway construction on water quality was conducted during construction of Interstate 10 at Tallahassee, Florida. Highway construction resulted in significant increases in turbidity, suspended solids, total phosphorus, and dissolved silicon in downstream waters despite use of recommended procedures for erosion control. Highway construction did not result in significant increases in dissolved phosphorus or nitrogen. Although higher losses of sediment have been reported in the literature, the losses from this watershed were still sufficient to cause extensive problems in Lake Jackson, a 1620 ha downstream ecosystem. Turbidities reached over 500 Jackson Turbidity Units in the southern half of the basin following an unusually rainy period when over 40 cm of rain fell in a three to four week period. (Roberts - ISWS)
W76-10945

A TWO-DIMENSIONAL NUMERICAL MODEL OF ESTUARINE CIRCULATION: THE EFFECTS OF ALTERING DEPTH AND RIVER DISCHARGE,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
For primary bibliographic entry see Field 2L.
W76-10948

SOME WATER QUALITY ASPECTS IN A NASCENT IMPOUNDMENT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Peoria. Water Quality Section.
V. Kothandaraman, and R. L. Evans.
Transactions of the Illinois State Academy of Science, Vol. 68, No. 3, p 292-303, September 1975. 5 fig, 4 tab, 4 ref.

Descriptors: *Early impoundment, *Water quality, *Impoundments, *Chemical properties, *Physical properties, *Illinois, Water analysis, Chemical analysis, Water chemistry, Nutrients, Reservoir storage, Impounded waters, Eutrophication, Water temperature, Stratification, Seasonal, Analytical techniques, Chlorides, Sulfates, Dissolved oxygen, Sampling, Water temperature.
Identifiers: *Nascent impoundments, Lake Evergreen(Ill), Six-Mile Creek(Ill), Mineral quality, Dissolved minerals.

A detailed 3-year study was performed to delineate the water quality aspects of the newly created Lake Evergreen. Some physical and chemical characteristics of the impoundment and its major tributary, Six-Mile Creek, were examined. An effort to detect significant relationships between the waters of a free-flowing stream and the impoundment of the waters was not productive. Dissolved oxygen stratification suggests that man-made impoundments may be 'old', limnologically speaking, from the day of their creation. (Henley - ISWS)
W76-10950

DESIGN OF ALTERNATING DIFFUSER PIPES,
Skopje Univ. (Yugoslavia).
For primary bibliographic entry see Field 8B.
W76-10952

A MODEL FOR WATER AND PHOSPHORUS DISTRIBUTION ON THE ISLAND OF GOETEBORG, (IN SWEDISH),
Uppsala Univ. (Sweden).
E. Eriksson, and H. Peippo.
Vatten 31(2); p 106-119, 1975.

Descriptors: *Path of pollutants, *Model studies, Europe, *Distribution patterns, *Phosphorus, Estuaries, Clays, Rivers, Sewage, Suspended solids.
Identifiers: *Sweden(Goeteborg Island).

A fairly simple compartment model of a typical estuary, River Gota Alv (Sweden) and adjacent coastal parts, based on data on salinity distribution and river discharge and supported by actual observations of currents in the area is presented. The fluxes of water between compartments are computed on the basis of conservation of water and salinity. When these fluxes are used with average total P concentrations and known sources of P from land, the fate of P added to the river can be studied. A great deal is apparently precipitated when freshwater with suspended clay mixes with seawater. If the precipitated amounts are assumed to be proportional to concentrations, the P status in the water at various alternatives of release of treated sewage water in the river can be simulated. Estuaries are probably important sink areas for P, not only in muddy freshwater but also for P in ocean water mixing with freshwater in estuaries.--Copyright 1976, Biological Abstracts, Inc.
W76-10963

A BIOLOGICAL STUDY ON THE POLLUTION OF THE SAI-GAWA RIVER AND ITS TRIBUTARIES, ISHIKAWA PREFECTURE, (IN JAPANESE),
Kanazawa Univ. (Japan). Biology Inst.
H. Kamijo, and T. Watanabe.
Jpn J Limnol 36(1), p 16-22, 1975.

Descriptors: Asia, Water pollution, Rivers, Tributaries, Biota.
Identifiers: *Japan(Sai-gawa river).

The pollution of water was studied using attached organisms on the submerged stones in the Sai-gawa River and its 2 tributaries, the Fushimi-gawa and Juhnin-gawa Rivers (Japan). Both the tributary streams are polluted by industrial and other wastes (alpha-mesosaprobic to beta-polysaprobic). A noticeable difference in the degree of pollution as assessed by the biota is found between the upper and lower surface of the submerged stones. Using their upper surface, the degree of pollution is smaller in the upper reaches of the Sai-gawa River than at the junction of the 2 tributaries. That of the under surface indicates that the pollution progresses from the bottom layer of water. Below the junction of the 2 streams, the pollution becomes heavier and the difference between the upper and lower surfaces of the submerged stones is not as great as in the upper reaches.--Copyright 1976, Biological Abstracts, Inc.
W76-10973

UPTAKE, TRANSLOCATION AND ELIMINATION OF INDIVIDUAL CHLOROBIOPHENYLS BY OYSTERS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-11000

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME II.
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-11007

THE OCCURANCE AND AMOUNT OF PELAGIC TAR IN THE OPEN OCEAN,
J. N. Butler.
In: Background Papers for a Workshop on Inputs, Fates and Effects of Petroleum on the Marine Environment, Vol. II, May, 1973. p. 375-399, 1 tab., 8 fig., 26 ref.

Descriptors: *Oil, *Oil water, :Oceans, Water quality, Surface waters, Atlantic Ocean, Gulf of Mexico, *Oil spills, Water pollution, *Path of pollutants.
Identifiers: Mediterranean Sea, Caribbean Sea *Pelagic tar lumps, Canary Current, North Equatorial Current, Sargasso Sea.

Observations of pelagic tar lumps on the open ocean have been made consistently since 1965, and quantitative measurements have been made since 1969 in a number of areas of the Mediterranean Sea, Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. The amount of pelagic tar may vary from less than 0.1 mg/m2 to over 500 mg/m2 depending on the location. Variations of a factor of 10 in samples taken at the same location at the same time are not unusual. The largest amounts of tar are found in the central Mediterranean, the Canary Current, the North Equatorial Current, and the Sargasso Sea. In the Caribbean, Gulf of Mexico, and the coastal areas of North America, the levels appear to be more than a factor of ten lower than in the Sargasso Sea. (See also W76-11007) (Katz)
W76-11008

SOME MECHANISMS OF WEATHERING OF PETROLEUM HYDROCARBONS ON MARINE WATERS: COMPETITIVE PATHWAYS TO FATE AND DISPOSITION OF PETROLEUM POLLUTION,
M. H. Feldman.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 431-450, 7 tab., 1 fig., 38 ref.

Descriptors: *Oily water, *Oil pollution, *Oil spills, *Weathering, Determination, *Aging, *Temperature, *Light, Physical, Detritus, Weather effects, Photoactivation, Sedimentation, Marine waters.
Identifiers: Photosynthesis, *Petroleum hydrocarbons, Trace materials, Trace material interactions.

Weathering of petroleum hydrocarbons which are spread on the sea changes the character of these substances. Among weathering mechanisms discussed are photolysis, trace material interactions on the surface layers and sedimentation processes. (See also W76-11007) (Katz)
W76-11010

THE SURFACE ACTIVITY OF PETROLEUM AND ITS INFLUENCE ON THE BEHAVIOR OF OIL AT SEA,
W. P. Garret.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 451-461, 1 tab., 1 fig., 7 ref.

Descriptors: *Oily water, *Oil pollution, *Oil spills, *Weathering, *Oil-water interfaces, *Evaporation, Marine waters, Organic matter, Marine organisms, Chemical wastes, Boundary processes, Environmental effects, Polarity.
Identifiers: *Polar-active constituents, *Spreading, *Oil surface-to-volume ratio, *Semi-solid residues, Tars.

The polaractive constituents of petroleum which are responsible for spreading enhance the weathering process by increasing the surface to volume ratio of the oil, thereby producing a greater exposure to air and underlying water. Modification of fluid petroleum to form non-fluid or semi-solid residues is due primarily to spreading and evaporative processes, although other chemical, physical and biological factors are operative to a lesser extent. (See also W76-11007) (Katz)
W76-11011

SEDIMENTATION PROCESSES INVOLVING HYDROCARBONS IN THE MARINE ENVIRONMENT,
C. D. Gebelein.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 462-474, 20 ref.

Descriptors: *Oily water, *Oil pollution, *Marine environment, *Sedimentation, *Weathering, *Evaporation, *Absorption, *Adsorption, Oil water, Boundary processes, Deterioration, Sedimentation rates, Underwater, Coasts, Mud-water interface.
Identifiers: *Tar balls, *Oil slicks, *Low energy, *Shorelines, Liquid hydrocarbons.

Deposition of oil in subtidal environments involves an increase in the density of oil sufficient to allow it to sink to the bottom. Processes leading to increased density include (a) modification of slicks by evaporation and dissolution of lighter materials, (b) uptake of particulate matter by the oil, (c) agglutination of dispersed particles, and (d) adsorption of dissolved species into particulate matter. (See also W76-11007) (Katz)
W76-11012

CHEMICAL COMPOSITION: A CONTROL ON THE PHYSICAL AND CHEMICAL PROCESSES ACTING ON PETROLEUM IN THE MARINE ENVIRONMENT,
C. B. Koons.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 475-484.

Descriptors: *Marine environment, *Weathering, Determination, *Evaporation, *Physical proper-

ties, Chemical analysis, Oily water, Oil pollution, Marine waters, Oil spills, Oil-water interfaces, Chemical wastes, Environmental effects, Aquatic microbiology, Microbial degradation, Marine microorganisms, Absorption.
Identifiers: *Tar balls, *Saturated hydrocarbons, Aromatic hydrocarbons, Polar compounds.

The chemical composition of petroleum or petroleum products released into the marine environment by spills, chronic low-level discharges, or by natural seepages controls to a very large extent the processes, both physical and chemical, which transform the petroleum material. Physical processes (evaporation, solution, and absorption) are most important during the period just following the release of oil into the marine environment. Chemical (autooxidation) and biological (microbial degradation) processes, in contrast, are long-range and become increasingly important as time goes on. Tar balls or lumps found in the open ocean and on beaches are weathered products of petroleum or petroleum products. Analytical chemical studies of these tar balls provide excellent information on the source, degree of weathering, and relative importance of different weathering processes. (See also W76-11007) (Katz)
W76-11013

BIOLOGICAL FATE OF PETROLEUM HYDROCARBONS IN AQUATIC MACROORGANISMS,
For primary bibliographic entry see Field 5C.
W76-11014

MICROBIAL INTERACTION WITH OIL IN THE MARINE ENVIRONMENT,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W76-11015

SOME REFLECTIONS ON THE BIODEGRADATION OF MINERAL OILS IN THE MARINE ENVIRONMENT,
Biologische Anstalt Helgoland (West Germany).
W. Gunkel.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973, p. 516-540, 1 tab, 48 ref.

Descriptors: *Marine environment, *Laboratory techniques, *Microbial degradation, *Deterioration, *Modes of action, *Oxygen demand, *Nutrients, *Nitrogen, *Phosphorous, Marine microorganisms, Oil spills, Water pollution, Microbiology, Oil-water interactions, Oil pollution, Persistence, Laboratory studies.
Identifiers: Oil decomposing bacteria, Hydrocarbon clastic microorganisms, Oil slicks.

The main problems in the pursuit of knowledge regarding the biodegradation of mineral oils in the marine environment are outlined. The difficulties of experimental studies on microbial degradation and the factors that limit oil decomposition are discussed. (See also W76-11007) (Katz)
W76-11016

FATES OF PETROLEUM IN THE SEA: BIOLOGICAL ASPECTS,
For primary bibliographic entry see Field 5C.
W76-11017

OIL IN THE MARINE ENVIRONMENT,
B. H. Ketchum.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 709-738, 4 tab., 32 ref.

Descriptors: *Oil, *Oil pollution, *Marine environment, *Marine biota, *Regulations, *Management, Legislation, Water policy, *Oil spills, Marine microorganisms, Water pollution effects, Toxicity.
Identifiers: *Oil spill prevention, Oil slick, Oil persistence, Petroleum hydrocarbons.

A general review is presented of oil pollution in the marine environment, and specific recommendations for procedures to be followed to minimize damage to the marine biota are listed. Additional suggestions to protect marine wildlife are also listed. (See also W76-11007) (Katz)
W76-11025

THE IMPORTANCE OF OIL POLLUTION IN THE NORTH SEA,
P. Korringa.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 739-743.

Descriptors: *Oil pollution, *Water pollution effects, *Marine organisms, Toxicity, Atlantic Ocean, *Marine environment, *Benthic organisms, *Oil spills.
Identifiers: *North Sea, *Torrey Canyon disaster, Behavior of oil, Chemical control, Sinking of oil.

Oil pollution in the North Sea is discussed, with emphasis on the behavior of oil in the sea and the biological effects of oil in the marine environment. The hazards of chemicals used to clean up oil spills are emphasized. (See also W76-11007) (Katz)
W76-11026

POLYNUCLEAR AROMATIC HYDROCARBON POLLUTION OF THE MARINE ENVIRONMENT,
M. J. Suess.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 801-808, 18 ref.

Descriptors: Oil, *Oily water, *Oil pollution, *Marine environment, *Phytoplankton, *Industrial wastes, Marine flora, Productivity, Chemical wastes, Sewage, Water pollution sources, Oil spills.
Identifiers: *Polynuclear aromatic hydrocarbons, Aliphatic hydrocarbons, Aromatic hydrocarbons, Carcinogens, 3-4 Benzpyrene.

Many polynuclear aromatic hydrocarbons are present, at least in minute concentrations in all marine waters, most probably because they are produced by aqueous flora. Coastal waters are continuously being further polluted with PAH from municipal and industrial effluents, atmospheric precipitation and fallout, runoff, and oil spillage in harbors and from ships. (See also W76-11007) (Katz)
W76-11030

NATURE AND BEHAVIOR OF MANURE,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
J. R. Miner.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 8 p.

Descriptors: *Farm wastes, *Water pollution sources, *Feed lots, *Runoff, Odor, Organic matter, Biochemical oxygen demand, Chemical oxygen demand, Nutrients, Microorganisms, Hogs, Gases, Confinement pens, *Path of pollutants.

This outline was prepared as a study aid to the registrants at the Iowa State University Animal Waste Management Conference. Major topics outlined are: (1) Manure as a potential water pollutant, (2) Feedlot runoff, and (3) Odors. (See also W76-11032) (Cartmell-East Central)
W76-11038

WASTE APPLICATION TO SOILS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11042

BEEF CATTLE FEEDLOTS: IMPACT ON UNDERLYING SOIL,
Agricultural Research Service, Ft. Collins, Colo.
F. A. Norstadt, and H. R. Duke.
In: Proceedings of the 87th Annual Research Conference, Colorado State University, Fort Collins, Colorado, Number 218, p. 86, 1974.

Descriptors: *Soil profiles, *Groundwater, *Feed lots, Air pollution, Water pollution, *Farm wastes, Soils.
Identifiers: Manure pack.

Studies on commercial and experimental installations were made to determine changes in soil profiles and ground water beneath earth-surfaced beef cattle feedlots. The kinds and amounts of soil gases as well as the chemical constituents of the soil solutions are influenced by the depth and water content of a manure pack and seasonal soil temperatures. An experimental feedlot has been built to evaluate schemes to minimize both air and water pollution. A feedlot, with intact manure pack and under continuous use at a sufficient stocking rate, does not appear to be a pollution hazard to soil and underground water. (Cameron-East Central).
W76-11047

SEEPAGE LOSS FROM HOLDING PONDS,
Soil Conservation Service, Temple, Tex.
W. B. Moody.
In: Soil Conservation Service Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 34 p, 3 fig.

Descriptors: *Seepage control, *Permeability, Soil analysis, Darcys law, *Lagoons, Groundwater, Water pollution sources, Bedrock, Soil water movement.
Identifiers: *Holding ponds.

Detailed calculations are given for a typical analysis of seepage losses from a proposed pond. Such losses may be estimated following an investigation of soil and bedrock characteristics and laboratory testing of the soils. Construction and protection of relatively impervious blankets are discussed. (East Central)
W76-11051

LYSIMETER STUDIES WITH LONG TERM APPLICATION OF SWINE LAGOON EFFLUENT,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. L. Parker, J. Wang, M. R. Overcash, and F. J. Humenik.
Presented at the 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, Paper No. 74-4036, 13 p. 10 tab.

Descriptors: *Lagoons, *Effluents, *Application rates, *Lysimeters, *Nitrogen, *Phosphorus, Oxygen demand, *Hogs, Water pollution sources, Path of pollutants, *Farm wastes.
Identifiers: Organic carbon.

The application of swine waste lagoon effluent to lysimeters exposed to weather conditions up to a hydraulic rate of 1 inch per week and a process load of about 3000 lbs. nitrogen/acre/year continuously for over two years has resulted in essentially complete removal of phosphorus and excellent reduction of oxygen demand and organic carbon. Investigation of lysimeters with water table control showed that additional nitrogen reduction, specifically lower nitrate concentrations, can be achieved without supplemental carbon addition

and with no decrease in the associated removal of organic carbon and oxygen demand. Removals of organics and nitrogen were reduced when the soil surface remained saturated either due to poor infiltration or control of the water table too near the soil surface. It was determined that controlled denitrification could provide for nitrogen reduction of soil water, and if the land disposal site were properly located and managed, a significant lowering of groundwater nitrate concentrations could be obtained before the flow left the owners property. (Cartmell-East Central)
W76-11055

EFFECT OF A LIVESTOCK WINTERING OPERATION ON A WESTERN MOUNTAIN STREAM,
Montana State Univ., Bozeman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-11059

DECISION MAPPING - TOOL FOR UNDERGROUND WASTE MANAGEMENT,
Little (Arthur D.), Inc., Cambridge, Mass.
C. M. Mohr, and P. J. O'Brien.
In: Second International Symposium on Underground Waste Management and Artificial Recharge, September 26-30, 1973. New Orleans, Louisiana, p 731-737, 3 fig.

Descriptors: *Waste disposal, *Chemical degradation, *Deep wells, *Mathematical models, Groundwater basins, Aquifer characteristics, Cost analysis, Groundwater, Arid climates, Industrial wastes, *Decision making, Underground waste disposal.
Identifiers: *Waste management, Economics of waste disposal, Subsurface environment, *Deep-Well disposal, Decision model, Individual disposal wells, Centralized disposal wells, Transportation costs, Decision mapping.

Serious concern must be given to the degrading effects on the subsurface environment of deep-well disposal. Detailed investigations must be made of possible geohydrologic basin sites before injection of waste materials begin. Deep-well disposal is usually the least expensive disposal method when compared to high-temperature incineration, encapsulization and others. The comparison of individual disposal wells versus centralized disposal wells must be considered. The economic advantages of centralized processing must be balanced against transportation costs of wastes to the centralized facility. An optimal configuration of the centralized system depends on these costs. An additional advantage of centralized waste disposal is the greater effectiveness with which local, state, and federal development and operating regulations may be enforced. A general mathematical model expressed in terms of a decision map indicates the optimal configuration to serve distributed sources of waste. Application of this model provides input to the waste-management authority to help integrate the data with environmental factors to produce a final recommendation. (See also W74-03222) (Heiss-NWWA)
W76-11063

GROUND WATER QUALITY MONITORING FOR CALIFORNIA'S NEEDS,
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5A.
W76-11065

CONSTRUCTION AND TESTING OF TWO WASTE-INJECTION MONITOR WELLS IN NORTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla.
C. A. Pascale.
Available from the National Technical Information Service Springfield, Va 22161, as PB-254 507, $4.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-1, February 1976. 42 p, 16 fig, 5 tab, 12 ref.

Descriptors: *Monitoring, *Waste disposal, *Injection wells, *Path of pollutants, *Groundwater, *Florida, Aquifer characteristics, *Waste disposal wells, Hydraulic conductivity, Transmissivity, Limestone, Porosity, Sampling, Data collections, Hydrologic data, Test wells.
Identifiers: Northwest Florida.

Two test wells were constructed by the U. S. Geological Survey into an injection zone at site 1, 22 miles east and site 2, 17 miles northeast of an active injection system to monitor the injection zone and to provide additional data for evaluating the regional effects of deep-well waste injection. Test wells 1 and 2 are cased to a depth of 1,220 ft and 985 ft below land surface and are completed open hole in limestone to 1,500 ft and 1,290 ft, respectively. Total porosity of the lower limestone was 21 percent at test well 1 and 18 percent at test well 2; effective porosity was 13 and 14 percent, respectively. Calculated values of transmissivity ranged from 3,530 to 5,040 ft squared per day at test well 1 and from 232 to 519 ft squared per day at test well 2. All major chemical constituents of water in the lower limestone of the Floridan aquifer were in greater concentrations in test well 1. Water at test well 2 was fresh and contains dissolved solids and chloride in concentrations of less than 1,000 and 330 mg/liter, respectively. Water level was 65 ft above sea level in test well 1, and 118 ft in test well 2. (Woodard-USGS)
W76-11070

MODELING SOLUTE TRANSPORT IN GROUND WATER,
Geological Survey, Denver, Colo.
L. F. Konikow.
Reprint from International Conference on Environmental Sensing and Assessment, Volume 2, Technical Session 20-3, held in Las Vegas, Nevada, September 14-19, 1975: Institute of Electrical and Electronics Engineers, Inc., 1976. 6 p, 7 fig, 18 ref.

Descriptors: *Path of pollutants, *Groundwater, *Model studies, *Computer models, Groundwater movement, Water pollution sources, Hydrologic data, Hydrogeology.
Identifiers: *Solute-transport models.

A solute-transport model has been developed to predict the movement of dissolved chemicals in flowing ground water. The model accurately reproduced the observed 30-year history of contamination at the Rocky Mountain Arsenal, Colorado, where liquid industrial wastes seeped out of unlined disposal ponds and spread for many square miles in an underlying alluvial aquifer. The computer model was developed by coupling a finite-difference solution to the ground-water flow equation and the solution to the solute-transport equation using the method of characteristics. (Woodard-USGS)
W76-11076

VARIATION IN CONCENTRATION OF SELECTED WATER-QUALITY CONSTITUENTS IN THE SACRAMENTO RIVER AT BEND BRIDGE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-11078

WATER-QUALITY DATA FOR CANALS IN EASTERN BROWARD COUNTY, FLORIDA, 1969-1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-11081

APPLICATION OF SIMPLE DAM BREAK ROUTING MODEL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-11084

DISPERSION OF DYED SEA-WATER DISCHARGED FROM MOVING VESSELS IN COASTAL WATERS,
Dobrocky Seatech Ltd., Victoria (British Columbia).
D. Farmer, and D. Lemon.
Institute of Ocean Sciences, Patricia Bay, Pacific Marine Science Report 75-3, August, 1975. 59 p, 15 fig, 15 ref.

Descriptors: *Dispersion, *Sewage effluents, *Continental Shelf, *Waste disposal, *Water pollution, *Dye dispersion, Ships, Coasts, Environmental effects, *Path of pollutants.
Identifiers: *Outer Continental Shelf, Ocean dumping.

This report consists of a summary of necessary theoretical background, which includes the development of a wake in a stratified fluid, and the spread of a passive, conservative scalar due to turbulent diffusion. It is followed by a description of the experiment and the treatment of the data. These observations are then compared to the theories and a predictive model based on the experimental results is chosen from the available theories. Finally, certain formulae which are intended to provide a predictive capability for application to problems of practical concern in coastal waters are derived. An appendix lists a recommended sequence of steps to be followed in applying the results of this report to particular pollution situations. (Sinha-OEIS)
W76-11086

BARIUM IN SOUTHERN CALIFORNIA COASTAL WATERS: A POTENTIAL INDICATOR OF MARINE DRILLING CONTAMINATION,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W76-11089

DISTRIBUTION OF SUSPENDED OIL PARTICLES FOLLOWING THE GROUNDING OF THE TANKER ARROW,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
W. D. Forrester.
Journal of Marine Research, Vol 29, No 2, p 151-170, May 15, 1971. 5 fig, 3 tab, 2 ref.

Descriptors: *Continental Shelf, *Canada, *Oil spills, *Oil pollution, Water pollution sources, *Water pollution effects, Resources development, Water resources, Fossil fuels, Distribution, Dispersion, Model studies, *Path of pollutants, Bays.
Identifiers: *Outer Continental Shelf, Nova Scotia, Bunker oils, Chedabucto Bay, Tanker Arrow.

While taking oceanographic observations in Chedabucto Bay, Nova Scotia, following the grounding of the tanker ARROW on February 4, 1970, small (5 micron to 1 or 2 mm) oil particles were found in the water column. The particles were collected with plankton nets and water bottles. This paper discusses the origin of the particles, their distribution in size and in depth, and the transport of particles out of Chedabucto Bay into the open ocean. A simple steady-state model has been employed to relate turbulent-energy distribution to oil-particle distribution over corresponding ranges of wavelength and particle size. The particles were detected as far as 250 km from their source and provided evidence of a current flowing southwestward along the Nova Scotia Coast at a speed of about 8 km/day. (Sinha-OEIS)

W76-11096

OIL IN SEA ICE,
Department of the Environment, Victoria (British Columbia). Frozen Sea Research Group.
E. L. Lewis.
Pacific Marine Science Report 76-12, June 1976. 26 p, 12 fig.

Descriptors: *Continental Shelf, *Oil spills, *Oil pollution, *Sea ice, *Environmental effects, *Blowouts, Water resources, Resource development, Offshore platforms, Paths of pollution.
Identifiers: *Outer Continental Shelf, Environmental impacts, Offshore technology, Beaufort Sea.

Proposed industrial exploration in Canadian Arctic offshore waters made the rapid acquisition of environmental information concerning those waters essential. The most urgent need was to obtain data from the Beaufort Sea, north of the Mackenzie Delta, N.W.T., where oil companies are engaged in drilling exploratory wells from artificial islands and intend to move further offshore utilizing drill ships. Although modern drilling techniques make a large scale leakage of oil into the environment unlikely, such a possibility must be considered as it has been suggested by some authors that the consequences of even a few major oil spills could be very serious. At a less catastrophic level the biological effects of contamination of shoreline and feeding grounds of various mammals, birds and other creatures had to be assessed and this also required an understanding of the behaviour of crude oil in sea ice. Following a discussion on the formation and structure of sea ice, details are given on the movement of spilled oil from the sea bed to the sea surface, oil at the ice/water interface, the migration of oil through the ice, oil at the ice surface, and effects of blowouts. (Sinha-OEIS)
W76-11098

5C. Effects Of Pollution

PERIPHYTIC AND PLANKTONIC ALGAE OF THE LOWER FRASER RIVER IN RELATION TO WATER QUALITY CONDITIONS,
British Columbia Univ., Vancouver. Westwater Research Centre.
T. G. Northcote, G. L. Ennis, and M. H. Anderson.
Technical Report No. 8, November 1975. 61 p, 22 fig, 8 tab, 70 ref, 4 append.

Descriptors: *Water pollution effects, Aquatic environment, *Algae, Water quality, *Periphyton, *Phytoplankton, Sampling, Measurement, Diatoms, Chaldophora, *Pollutant identification, *Canada.
Identifiers: *Fraser River(Canada), Achnanthes minutissima.

Algae can be useful in assessing water quality conditions of rivers, and in some rivers algae form important parts of ecosystem. During 4 periods of early autumn, 1972, and late summer 1973, algal communities growing on wood surfaces (periphyton) along the river bank and suspended in the midstream surface water (phytoplankton) were sampled at 14 stations. Species composition, distribution, abundance, diversity, and total bimass of major groups were examined in relation to seasonal and spatial changes in water conditions, particularly discharge, temperature, turbidity, nutrients and chemical parameters. Diatoms were usually dominant in the attached group of algae (112 different species, of which 20 were common). Numbers ranged between 0.5 to 4.5 million cells/sq cm. Green algae (22 species, of which 11 were common) were the second most abundant group. Diatom cell densities appeared high in relation to other bodies of water, but would probably be lower on other substrates which were not sampled. Some algae specis, such as achnanthes minutissima, were widely distributed over the length of the river and are indicative of relatively unpolluted well-oxygenated systems. However the occurrence of Cladaphora glomerata in the lower-most reaches may indicate incipient problems due to excessive nutrient additions there. Diversity of periphyton species (15 to 30 species/station) was moderately high and characteristic of relatively unpolluted freshwater systems. None of the species known to be pollution tolerant was common in the Fraser, giving a very low Palmer pollution index rating. Diversity indexes of the phytoplankton generally between 2 and 3, are well above levels common in severely polluted streams. (Smith-North Carolina)
W76-10504

CHLORINATED HYDROCARBON RESIDUES IN FISHES FROM THE LOWER FRASER RIVER,
British Columbia, Vancouver. Westwater Research Centre.
N. T. Johnston, L. J. Albright, T. G. Northcote, P. C. Oloffs, and K. Tsumura.
Technical Report No. 9, November 1975. 31 p, 7 fig, 2 tab, 53 ref, append.

Descriptors: *Water pollution effects, *Polychlorinated biphenyls, Aquatic environment, Fish, *Fish toxins, *Pesticides, *DDT, Sampling, Measurement, Agricultural chemials, Dieldrin, Organic compounds, *Canada, *Chlorinated hydrocarbon pesticides, Pollutant identification.
Identifiers: *Fraser River(Canada), Organochlorine compounds.

At 14 stations along the lower Fraser, located to reflect the gradient in land use, fish species were regularly sampled betwen summer 1972 and autumn 1973. Concentrations of 11 common organochlorine compounds were measured in the tissues of 183 fish (representing 12 groups). It is not surprising that aldren, heptachlor and lindane were not present because of changes which these chemicals are known to undergo. However, the absence of alpha-chlordane and gamma-chlordane, which do not undergobiological degradation, indicates low inputs into the system. Other compounds which are known to accumulate in sediments were found in the fish tissues, as would be expected. In the case of dieldrin, its low levels (about 2 ppb) and infrequent occurrence (4 of 183 samples) are in contrast to results from most North American inland waters. p,p'-DDT and its metabolities were the most commonly occurring organochlorine compounds, found in over 80% of all specimens. However, levels of DDT seem low compared to other North American urban-agricultural regions. Polychlorinated binphenyls showed the highest concentrations of all compounds found in muscle tissues. In estuary areas frequency of occurrence and mean levels were higher in several species (rainbow trout, northern squawfish) than in the upstream portions of the river which probably reflects the role of urban Vancouver as a source of these compounds. Low levels of chlorinated hydrocarbons found in most fish suggest that these compounds do not present serious problems, though low level concentrations may impact eggs and young fish. The large volume of flow has contributed to low concentrations found. (Smith-North Carolina)
W76-10505

CHRONIC TOXICITY OF ATRAZINE TO SELECTED AQUATIC INVERTEBRATES AND FISHES,
EG and G, Bionomics, Wareham, Mass.
K. J. Macek, K. S. Buxton, S. Sauter, S. Gnilka, and J. W. Dean.
Report EPA-600/3-76-047, May, 1976, 49 p, 17 tab., 41 ref.

Descriptors: *Toxicity, *Bioassay, *Invertebrates, *Aquatic insects, Freshwater fish, *Brook trout, *Daphnia, *Pesticides, *Minnows, Methodology, Lethal limit, Water pollution effects, Sunfishes.
Identifiers: *Atrazine, Daphnia magna, Midge, Chironomus tentans, Scud, Gammarus fasciatus, Bluegill sunfish, Lepomis macrochirus, Fathead minnow, Pimephales promelas, Salvelinus fontinalis, Flowing-water bioassay, Maximum accepted toxicant concentration, MATC, Incipient LC50, Application factors.

Representatives of the aquatic invertebrate species of water flea (Daphnia magna), midge (Chironomus tentans), and scud (Gammarus fasciatus); and the fish species bluegill (Lepomis macrochirus), fathead minnow (Pimephales promelas), and brook trout (Salvelinus fontinalis) were chronically exposed to various concentrations of atrazine in separate flowing-water systems. Maximum acceptable toxicant concentrations (MATC) of atrazine for the selected species in soft water were estimated using survival, growth, and reproduction as indicators of toxic effects. The MATC was estimated to be between 0.11 and 0.23 mg/l for midges, between 0.14 and 0.25 mg/l for water fleas, and between 0.06 and 0.14 for the scud. The MATC was estimated to be between 0.09 and 0.50 mg/l for bluegills, between 0.21 and 0.52 mg/l for fathead minnows, and between 0.06 and 0.12 mg/l for brook trout. The incipient-LC50 for fishes and the 48-hour LC50 for invertebrates were estimated from acute exposures and were used to calculate application factors (MATC limits/LC50). For aquatic invertebrates and atrazine the estimated application factors were between 0.15 and 0.32 for midges, between 0.02 and 0.04 for water flea, and between 0.01 and 0.02 for scud. Application factors were estimated between 0.01 and 0.07 for bluegills between 0.01 and 0.03 for fathead minnows, and between 0.01 and 0.02 for brook trout. (Katz)
W76-10517

ECOLOGICAL VARIABILITY OF BREAM IN LITHUANIAN WATERS: 2. AGE AND GROWTH RATE, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parizitologii.
A. I. Orlova.
Liet Tsr Mokslu Akad Darb Ser C Biol Mokslai. 2, p 113-125, 1974.

Descriptors: Lakes, Trophic levels, *Fish population, Fish reproduction, *Fish genetics, Diptera.
Identifiers: Abramis-Brama, *Bream, *Lithuania, USSR.

According to the age data of 4567 bream (Abramis brama (L.)) found in 45 lakes of east and southeast Lithuania bream of the same age grew differently in various ecological types of lakes. The broods grow slowly in thermally deep lakes and in lakes with the mean thermal depth and a narrow littoral. They grow better in eutrophic lakes with a wide littoral zone. The older bream grow quickly in lakes with abundant zoobenthos where chironomids dominate. One of the main reasons for this slow growth is irregular and light fishing, especially in lakes with developed spawning grounds for phytophilous fish. This leads to the very large populations of these fish. The bream are divided into 5 growth categories according to rate of growth: very good, above average, mean, slow and very slow. They mature sexually at 6-9 yr and are of very different sizes.--Copyright 1976, Biological Abstracts, Inc.
W76-10519

SOME DATA ON ZOOPLANKTON OF RESERVOIRS IN THE MARY AND CHARDZHOU REGIONS OF THE TURKMEN SSR, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 2H.
W76-10520

LIBRARY U. OF A. ARCHIVES

A FIN ROT DISEASE OF MARINE AND EURYHALINE FISHES IN THE NEW YORK BIGHT,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Sport Fisheries Marine Lab.; and National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center.
J. B. Mahoney, F. H. Midlige, and D. G. Deuel.
Trans Am Fish Soc. 102(3), p 596-605, 1973.

Descriptors: *Fish diseases, Fish, New York, Marine fish, Pseudomonas, Epizootiology, Water pollution effects.
Identifiers: Aeromonas-Spp, Bluefish, *Euryhaline fish, Flounder, Rot, Vibrio-Spp, Weakfish, *Fin rot disease(Fish), *New York Bight.

A fin rot diseae reached epizootic proportions in 1967 among at least 22 species of marine and euryhaline fishes in the New York Bight and has continued to occur annually to the present time. Fin necrosis was the consistent external sign of the disease; other external pathological changes included skin hemorrhages, skin ulcers and, occasionally, blindness. Bluefish, summer flounder, winter flounder and weakfish were the principal species affected. Results of these studies indicate a bacterial cause. Bacteria of 3 genera, Aeromonas, Vibrio and Pseudomonas are likely implicated. Similar epizootics among freshwater fishes were associated with unsanitary conditions in aquaria and with water pollution in nature. The epizootic primary center, lower New York Harbor is grossly polluted with sewage and industrial wastes. Pollution may have a role in the disease.--Copyright 1974, Biological Abstracts, Inc.
W76-10524

REPORT OF KELLY'S FALLS POND, HILLSBOROUGH COUNTY, NEW HAMPSHIRE,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Working Paper No. 13, August 1974. 34 p. 1 fig., 4 ref.

Descriptors: *Lakes, *New Hampshire, *Water pollution control, Eutrophication, Nutrients, Phosphorus, Nitrogen, Watersheds(Basins), Water quality, Basic data collections, Municipal wastes.
Identifiers: Kelly's Falls Pond(NH), Piscataquog River(NH), STORET 3305.

Kelly's Falls Pond is eutrophic as indicated by mean chlorophyll-a concentrations and low Secchi disc transparencies. Nutrient concentrations are indicative of a somewhat better trophic condition as its very short hydraulic retention time is suppressing the effect of very high nutrient loading rates. Phosphorus was limited at the time the assay sample was collected but nitrogen was limiting at the other sampling times. During the sampling year, the Pond received a total phosphorus load at a rate over six times greater than the rate proposed by Vollenweider as euthrophic. When a regional waste treatment plant facility becomes operational, the total phosphorus load to the Pond will only be reduced to about 200 lbs/acre/yr (still about five times greater than a eutrophic rate) because of non-point phosphorus sources. Even if the phosphorus export of the Piscataquog River at Kelly's Falls Pond had been a very low 30 lbs/sq mi/yr, the drainage area/pond area/ratio of 1,060/1 would have ensured a non-point source loading rate of more than 5 g/sq m/yr (i.e., in excess of a eutrophic rate). This first evaluation stage of a series of selected lakes and their drainage basins is designed to provide state environmental agencies with specific information for basin planning and clean lakes. (Jones-Wisconsin)
W76-10525

REPORT ON POWDER MILL POND, HILLSBOROUGH COUNTY, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Working Paper No. 14, August 1974. 44 p. 1 fig., 8 ref.

Descriptors: *Lakes, *New Hampshire, *Water pollution control, Impoundments, Eutrophication, Water quality, Rooted aquatic plants, Nutrients, Phosphorus, Nitrogen, Municipal wastes, Watersheds(Basins), Basic data collections.
Identifiers: Mill Pond(NH), Contoocook River(NH), STORET 3302.

Powder Mill Pond is an impoundment of the Contoocook River near Bennington, New Hampshire. Survey data and other records show that it is eutrophic. Although algal blooms are rare, rooted aquatic vegetation is common to abundant in the shallower parts. Apparently, the short hydraulic retention time suppresses trophic responses to relatively high nutrient loading rates. At the time the algal assay sample was collected it was phosphorus limited; however, data obtained in June and August indicate it was nitrogen limited at those times. It received a total phosphorus load at a rate well in excess of that proposed by Vollenweider as a 'dangerous' eutrophic rate. It is estimated that the Town of Jaffrey contributed nearly 32% of the load, and the Town of Peterborough contributed about 20%. Whether the degree of improvement due to reduction in phosphorus loading would be commensurate with the costs of the high level of phosphorus removal required is questionable. The mean tributary nutrient exports were quite low during the sampling year. This first evaluation stage of a series of selected lakes and their drainage basins is designed to provide state environmetal agencies with specific information fro basin planning and clean lakes. (Jones-Wisconsin)
W76-10526

REPORT ON GLEN LAKE, HILLSBOROUGH COUNTY, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Working Paper No. 12, August 1974. 37 p. 1 fig., 5 ref.

Descriptors: *Lakes, *New Hampshire, *Water pollution control, Eutrophication, Water quality, Nutrients, Phosphorus, Nitrogen, Municipal wastes, Watersheds(Basins), Basic data collections.
Identifiers: *Glen Lake(NH), Piscataquog River(NH), STORET 3306.

Glen Lake is a small eutrophic impoundment of the Piscataquog River at Goffstown. It exhibited hypolimnetic oxygen depletion, had moderately high mean nutrient concentrations, and only fair Secchi disc transparency during sampling. Algal assay results indicated it was phosphorus limited at time of collection. However, data show that at times it may be only narrowly phosphorus limited, or even nitrogen limited. It received an annual total phosphorus load more than three times that proposed by Vollenweider as 'dangerous'--a eutrophic rate. Goffstown contributed about 50%. A regional waste treatment plant at Manchester with an interceptor to Goffstown eliminating discharge to Glen Lake is proposed to reduce the total phosphorus load. The reduced rate will be somewhat in excess of a eutrophic rate but should result in a persistent phosphorus limitation and a significant reduction in algal blooms. The rather low phosphorus export of the Piscataquog River indicates that if there are point sources in the drainage basin, they are relatively minor. This first evaluation stage of a series of selected lakes and their drainage basins is designed to provide state environmental agencies with specific information for basin planning and clean lakes. (Jones-Wisconsin)
W76-10527

REPORT ON SEBASTICOOK LAKE, PENOBSCOT COUNTY, MAINE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Working Paper No. 9, June 1974. 40 p. 1 fig., 18 ref.

Descriptors: *Lakes, *Maine, *Water pollution control, Eutrophication, Nitrogen, Watersheds(Basins), Water quality, Phosphorus, Basic data collections.
Identifiers: *Sebasticook Lake(Me), Sebasticook River(Me), STORET 2312.

The Sebasticook Lake watershed is primarily rolling hills, and the vegetation cover is mainly mixed soft- and hardwood forests. Uses are boating, domestic water supply, fishing, hunting, trapping, and swimming. Nuisance agal blooms have occurred periodically for many years and it is considered eutrophic. The algal assay results and lake data indicated Sebasticook Lake was nitrogen limited at the time the assay sample was collected and at other sampling periods. Surveys indicated the communities of Dexter and Corinna contributed about 70% of the total annual phosphorus load. If 80% removal of total phosphorus at these two point sources was instituted, the total annual phosphorus load would be reduced to 44% of its present level. This degree of reduction of the total phosphorus load would result in a persistent phosphorus limitation and would reduce or eliminate nuisance algal blooms. Of the total non-point source input, the greatest contribution is made by drainage from the East Branch of the Sebasticook River which inputs 15% of the annual phosphorus load and 32% of the annual nitrogen load. This first evaluation stage of a series of selected lakes and their drainage basins is designed to provide state environmental agencies with specific information for basin planning and clean lakes. (Jones-Wisconsin)
W76-10528

REPORT ON LAKE WINNEPESAUKEE, CARROLL AND BELKNAP COUNTIES, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Working Paper No. 11, May 1974. 82 p. 1 fig., 7 ref.

Descriptors: *Lakes, *New Hampshire, *Water pollution control, Oligotrophy, Eutrophication, Water quality, Nutrients, Phosphorus, Nitrogen, Municipal wastes, Watersheds(Basins), Basic data collections.
Identifiers: *Lake Winnipesaukee(NH), STORET 3303.

At this time the main body of Lake Winnipesaukee is considered oligotrophic. Generally, water quality is excellent, but Wolfeboro Bay, Center Harbor Bay, Alton Bay, Gilford Bay, Melvin Bay, and Meredith Bay are areas with excessive nutrient loadings. Results of the algal assays show that Lake Winnipesaukee was phosphorus limited at the time the samples were collected. Approximately 45% of the total annual phosphorus input to the lake originates from point sources from four municipalities and 33% originates from tributaries and the lake's immediate drainage. No single tributary contributes a significant percentage of the load and land use controls would be of little value in further reducing the phosphorus input from non-point sources. Approximately 40% of the total nitrogen load originates from non-point sources in the watershed. The estimated nitrogen load in direct precipitation on the lake surface accounts for 40% of the total input. Removal of phosphorus from all waste treatment plant discharges to Lake Winnipesaukee would benefit the lake. This first evaluation stage of a series of selected lakes and their drainage basins is designed to provide state environmental agencies with specific information for basin planning and clean lakes. (Jones-Wisconsin)
W76-10529

WATER QUALITY IN A RECIRCULATING RACEWAY SYSTEM FOR FISH CULTURE,
Coastal Plain Experiment Station, Tifton, Ga. Dept. of Entomology and Fisheries.
For primary bibliographic entry see Field 5G.
W76-10546

PHYSICAL GROWTH AND BEHAVIORAL DEVELOPMENT OF MICE RECEIVING CHLORINE AND FLUORINE,
Connecticut Univ., Storrs.
R. A. Lewis.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 478 $4.50 in paper copy, $3.00 in microfiche. Master of Science Thesis, 1973. 54 p, 7 fig, 7 tab, 19 ref, 5 append. OWRT A-043-CONN(1).

Descriptors: *Chlorine, *Fluorine, *Behavior, *Growth rates, *Additives, Water supply, Water consumption, Animal growth, Laboratory animals, Mammals.
Identifiers: *Learning ability, Physical development, Behavioral evaluation, Mice, Measures of learning, Water maze.

The use of chlorine and fluorine is widespread in public water supply; chlorine as a water purifier and fluorine to reduce dental caries. To investigate the relationship between these water additives and the growth and behavioral development of organisms, two inbred strains of mice (C57BL/6J and A/J) were used as experimental animals. The superior learning ability of the C57BL/6J strain over the A/J strain was used to evaluate the effects of chlorine and fluorine upon a developing organism. The concentrations of the additives ranged from 2 ppm to 8 ppm and the development was examined from 25 days to 75 days of age of the mice. The dependent variables were weight and water consumption by the mice and learning ability measured in a water maze at 75 days of age. The results showed that chlorine and fluorine at 2-8 ppm produced no effects on growth, water consumption, or two of three measures of learning (latency and number of errors). (Katz)
W76-10551

WATER QUALITY ANALYSIS, IOWA-CEDAR RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W76-10576

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, CONNECTICUT RIVER.
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 5G.
W76-10577

ANATOMY OF AN OIL SPILL,
For primary bibliographic entry see Field 5B.
W76-10597

LITERATURE REVIEW: MOVEMENT OF SPILLED OIL AT SEA,
Mathematica, Inc. Philadelphia, Pa. Regional and Environmental Studies,
For primary bibliographic entry see Field 5B.
W76-10599

FLOW OF TOXIC METALS IN THE ENVIRONMENT,
Pan American Health Organization, Mexico City.
For primary bibliographic entry see Field 5B.
W76-10638

ENVIRONMENTAL LEVELS OF PCB'S,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5A.
W76-10641

POLYCHLORINATED BIPHENYLS OFF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, D. J. McDermott, and T. C. Heesen.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-1-1 - 4-1-5. 6 fig, 2 tab, 10 ref.

Descriptors: *Polychlorinated biphenyls, *Water pollution, *Water pollution effects, *California, *Coasts, Pollutant identification, Treatment facilities, Waste water treatment, Municipal wastes, Outlets, Marine animals, Monitoring, Bioindicators, Crabs, Mussels, Fish, Sediments, Harbors.
Identifiers: Chlorinated hydrocarbons, Bights, Flatfish.

Data on polychlorinated biphenyl contamination of the marine ecosystem off southern California are presented. Municipal waste water and aerial fallout dominate the known inputs of polychlorinated biphenyls to the southern California bight. More than 5 metric tons of 1242 and 1254 polychlorinated biphenyls were discharged during 1974 from the five major treatment plants in the area. Maximum concentrations of biphenyl found in bottom sediments off Palos Verdes Peninsula were 10 ppm, with values falling 100-fold to baseline readings over a depth of 20 cm. Muscle tissue from benthic crabs and flatfish collected from discharge regions also exhibited 100-fold increases in 1254 polychlorinated biphenyl levels. Numerous harbors in the bight also show relatively high levels of polychlorinated biphenyl contamination. Intertidal bay mussels contained up to 20 times more 1254 bphenyl than corresponding specimens collected nearby along the open coast. An offshore biomonitoring system which utilizes the intertidal coastal mussel (M. californianus) has been developed. This mussel appears to offer good potential for indicating zones of greatest biological availability of synthetic pollutants released from submarine outfalls. (See also W76-10637) (Kreager-FIRL)
W76-10647

POLLUTIONAL EFFECTS OF SUSPENDED, SEDIMENTED AND ERODED PARTICULATE MATERIAL IN THE AQUEOUS ENVIRONMENT,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
H. H. Hahn, and R. Klute.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 14-5-1 - 14-5-10. 6 fig, 1 tab, 25 ref.

Descriptors: *Suspended solids, *Sediment transport, *Sediment distribution, *Water pollution effects, *Rivers, Model studies, Heavy metals, Toxicity, Photosynthesis, Sorption, Sedimentation, Erosion, Aggregates.

The adverse effects of suspended and sedimented particulate matter on aqueous environments are reviewed to illustrate the inadequacy of monitoring for dissolved pollutants only. Suspended particulates are capable of limiting light penetration through natural waters, thus restricting photosynthetic activity. Particulate matter is capable of indirectly affecting water quality through its ability to sorb toxic heavy metals such as cadmium. Processes responsible for the transport and distribution of particulate material include aggregation, sedimentation, erosion, and aggregate destruction; the relative effect of these processes on transport and distribution depends on hydrodynamic and physicochemical factors. A simple mass balance and a dynamic model of the transport and distribution of cadmium in the Neckar River are presented to show that significant amounts of cadmium are transported in forms other than the dissolved form. Cadmium removal is shown to occur as a result of its adsorption on aggregating and sedimenting material, while reactivation is shown to occur via erosion and desorption. (See also W76-10637) (Kreager-FIRL)
W76-10663

A STRATEGY FOR AQUATIC POLLUTANTS FATE AND TRANSPORT DETERMINATION,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5B.
W76-10665

NUTRIENT TRANSPORTS THROUGH LANCASTER SOUND IN RELATION TO THE ARCTIC OCEAN'S REACTIVE SILICATE BUDGET AND THE OUTFLOW OF BERING STRAIT WATERS.
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W76-10717

DREDGED MATERIAL DISPOSAL--EFFECTS AND ALTERNATIVES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W76-10724

PCB'S IN THE ENVIRONMENT,
Natural Resources Defense Council, N. Y., New York.
A. K. Ahmed.
Environment, Vol. 18, No. 2, p. 6-11 (1976). 6 p, 2 photo, 1 dwg, 1 tab.

Descriptors: *Chemical wastes, *Polychlorinated biphenyls, *Toxins, *Lethal limit, *Bioindicators, Pollutant identification, Hydroelectric plant, Industrial wastes, Waste water treatment, Water quality, Pesticide toxicity, Fishkill, Human pathology, Animal diseases, Regulation, Federal jurisdiction, State jurisdiction, International law.
Identifiers: *FWPCA Amendments of 1972, Administrative regulations.

Polychlorinated biphenyls (PCBs) have been widely used industrial chemicals for nearly 45 years. Until recently, however, the buildup of PCBs in marine animals, aquatic birds, bottom sediment of water courses, and even poultry and dairy products was unknown. PCB residues have been found in Holland, Germany, Scotland and Baltic Sea areas as well as in the United States. Most residues are found in areas of high industrialization. PCBs are toxic and are suspected as the cause of severe skin and neurological disorder in human being known as 'yusho syndrome'. The substance also appeared to affect reproduction in some birds and animals. Governmental response to the problem has been poor. The Food and Drug Administration tolerance limitations are dangerously high while the Environmental Protection Agency has not yet promulgated effluent standards. Several states, however, have taken measures to control PCB pollution, and the International Organization for Economic Cooperation and Development has urged restrictions on PCB usage. (Comer-Florida)
W76-10739

TROPIC STATUS OF SELECTED NORTHERN NEW MEXICO LAKES,
New Mexico Univ., Albuquerque. Dept. of Biology.
G. V. Johnson, and L. L. Barton.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 715, $7.50 in paper copy, $3.00 in microfiche. OWRT A-053-NMEX(1). New Mexico Water Resources Research Institute, Las Cruces, Report No. 074, June 1976, 178 p, 38 fig., 65 tab.,12 ref, append.

Descriptors: *Eutrophication, *Lakes, *Limnology, *Water chemistry, *Primary productivity, *Aquatic microbiology, Aquatic algae, Aquatic productivity, Nutrients, Nitrogen, Phosphorus, Lake stages, Oligotrophy, Tropic level, Water quality, Rocky Mountain Region, *New Mexico, Sodium, Potassium, Magnesium, Alkalinity, Hydrogen ion concentration, Calcium, Anabaena.
Identifiers: Eagle Nest Lake, Fenton Lake, Hopewell Lake, Lagunitas Lakes, Shannon-Wiener Index, Transparency, Aphanizomenon, Elodea.

A characterization of the algae, the bacteria, and the chemical and limnological conditions in Fenton Lake, Hopewell Lake, the Lagunitas Lakes, and Eagle Nest Lake was conducted to determine the tropic status of these northern New Mexico Lakes. The investigation was initiated after algal blooms were reported regularly during the summer on these lakes which represent different physical and biological environments. Special attention was given to conditions preceding the algal blooms and to the biological and chemical characteristics of the bloom. The algal studies included primary productivity measurements, species identification, and species enumeration. An examination of the dissolved and suspended nutrients was used to determine the contribution of nitrogen and phosphorus to production of blooms. The contribution of bacteria to blooms was examined. The tropic status for each lake was assessed based on primary productivity, nutrient levels, and predominant phytoplankton genera. (Hain-New Mexico State)
W76-10808

STUDIES ON THE TOXICITY OF AMMONIA, NITRATE AND THEIR MIXTURES TO THE COMMON GUPPY,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
A. J. Rubin, and M. A. Elmaraghy.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 721, $4.50 in paper copy, $3.00 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 490, June 1976. 47 p, 14 fig, 7 tab, 29 ref. OWRT A-033-OHIO(1).

Descriptors: *Toxicity, *Ammonia, *Nitrates, Fish, Bioassay, Kinetics, Water pollution effects, Fry, Lethal limit, Equations.
Identifiers: Common Guppies, Chick's Law, *Ammonia/nitrate ratio.

Common guppies were raised under controlled conditions. The toxicities of ammonia and potassium nitrate solutions to their fry were estimated by establishing the 24 and 96 hour median tolerance limits. Then the joint toxicity of the two were estimated at different NH3/NO3 ratios. The toxicities are additive. Evaluated also were the applicability of several disinfection laws to fish toxicity. These included the equations of Chick, Watson, Hom, and Chen and Selleck.
W76-10811

ABUNDANCE AND BIOMASS OF ZOOPLANKTON DURING THE SYNOPTIC INVESTIGATION OF THE SHALLOW INLETS TO THE SOUTH OF THE ZINGST PENINSULA (SOUTH BALTIC) DURING MAY/JUNE, 1972. (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
W. Schnese, and F. Fischer.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10), p 1115-1118, 1973.

Descriptors: *Biomass, *Zooplankton, Copepods, Europe, *Synoptic analysis, Estuaries, Shallow water, Sampling.
Identifiers: Abundance, Zingst, *Baltic Sea, East Germany.

During a synoptic investigation of the shallow inlets from May 29th-June 3rd, 1972, 123 zooplankton samples were taken and evaluated both qualitatively and quantitatively. The mean biomass fluctuated between 0.6-17.9 g fresh weight at the 4 stations in the eastern part of the chain of shallow inlets to the S of Darss-Zingst (Barthe estuary and the Barther Bodden (East Germany). Copepods accounted for 99% of the biomass of the zooplankton.--Copyright 1976, Biological Abstracts, Inc.
W76-10817

STUDIES FOR WILDLIFE ON ENERGY AREAS,
Utah State Div. of Wildlife Resources, Salt Lake City.
For primary bibliographic entry see Field 6G.
W76-10820

AQUATIC MACROINVERTEBRATE WATER QUALITY, AND FISH POPULATION CHARACTERIZATION OF THE WHITE RIVER, UINTAH COUNTY, UTAH,
Brigham Young University, Provo, Utah.
For primary bibliographic entry see Field 6G.
W76-10821

RAPTOR STUDY OF UTAH OIL SHALE AREA,
Utah University, Salt Lake City.
For primary bibliographic entry see Field 6G.
W76-10822

NONGAME MAMMAL INVENTORY OF THE UTAH OIL SHALE AREA,
Natural History State Museum, Vernal, Utah.
For primary bibliographic entry see Field 6G.
W76-10823

STUDIES ON THE LEAST CHUB (IOTICHTHYS PHLEGETHONTISCOPE) IN GEOTHERMAL ACTIVITIES AREA OF SNAKE AND TULE VALLEYS, UTAH,
Utah State Univ., Logan.
For primary bibliographic entry see Field 6G.
W76-10824

MARINE MOLYSMOLOGY: THE PRIMARY PRODUCTION OF EXPERIMENTAL ECOSYSTEMS SET UP IN THE RANCE RIVER ESTUARY. EFFECT OF CRUDE OIL,
Marine Laboratory of General and Comparative Physiology, Paris, France.
J. C. LaCaze.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 777T, $3.50 in paper copy, $3.00 in microfiche. EPA Translation EPA-TR-86-75. November 1974. 8 p. Translated from Comptes Rendus Academie Sciences, Paris, Vol. 278, May 13, 1974.

Descriptors: Laboratory analysis, *Toxicity, *Bioassay, *Primary productivity, Oil, *Oil pollution, *Inhibition, Experimental streams, *Oil wastes, Ecosystems, Methodology, Water pollution effects, Organic compounds, Estuaries.
Identifiers: *Primary production inhibition, Kuwait crude oil, *River Rance(France), Marine molysmology.

When crude oil (Kuwait) was discharged into experimental ecosystems a sharp 50% decrease in primary production resulted the day after pollution; this began to lessen the following day (25%) and disappeared on the third day. The fourth day marked the onset of toxicity which gradually increased until primary production was almost totally inhibited one week after pollution. This inhibition phase lasted ten days. During the rest of the experimental period, the primary production of the polluted ecosystems was approximately half that of the control ecosystems. (Katz)
W76-10830

EFFECTS OF THREE EMULSIFYING AGENTS AGAINST CRUDE OIL ON THE PRIMARY PRODUCTIVITY OF AN EXPERIMENTAL COMMUNITY OF BENTHIC DIATOMS,
Laboratoire de Physiologie des Etres Marins de l'Institut Oceanographique, Paris, France.
J. C. Lacaze.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 812-T, $3.50 in paper copy, $3.00 in microfiche. EPA Translation EPA-TR-S6-75. 1974. 17 p Translated from Vie Milieu, Vol. 23, part 1, Series B, 1972-1973.

Descriptors: *Bioassay, *Toxicity, *Primary productivity, *Diatoms, *Benthos, *Emulsifiers, Aquatic productivity, *Benthic flora, Oil, Aquatic algae, Laboratory tests, Phytoplankton, Aquatic environment, Water pollution effects, Taxonomy, Emulsions, Pollutant identification.
Identifiers: Taxonomic composition, *Benthic diatoms, *Gamasol, Anti-oil nonylphenols, Corexit 7664.

Study was made of modifications in the taxonomic composition and the primary production of a micro-community of benthic diatoms following acute pollution by various anti-oil emulsifying agents. This micro-community is settled on supports of polished glass, immersed in a brackish ecosystem in the laboratory. One of the reagents, the Gamasol, used extensively at the time of the shipwreck of the 'Torrey-Canyon' is shown to be particularly dangerous since a 30 minutes-exposure to a concentration of 40 mg/l completely destroys the community. (Katz)
W76-10831

FOAM SEPARATION FOR DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5D.
W76-10855

DETERMINATION OF THE BIOMASS AND DETRITUS CONTENT FROM NATURAL PHYTOPLANKTON SCOOP SAMPLES, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W76-10864

BENTHOGENIC PHYTODETRITUS IN EUTROPHIC COASTAL WATERS AS AN ENERGY SOURCE FOR SECONDARY PRODUCERS, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
H. D. Nagel, P. Spittler, J. A. Von Oertzen, and R. Kreutzmann.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10), p 1129-1134, 1973.

Descriptors: *Algae, *Detritus, *Eutrophication, Coasts, Protozoa, Invertebrates, Growth rates, Energy, *Chara, Phytoplankton, Food chains.
Identifiers: *Characeae, *Enteromorpha.

Investigations regarding the food-biological valency of detritus obtained from Characeae and Enteromorpha in comparison with algae were carried out using protozoa and invertebrate cultures. The growth of the population was used as a criterion for the effectiveness of these foods. Feeding with detritus from Enteromorpha was more effective than feeding with algae for the majority of the species investigated. Chara detritus was usuable but

less effective.--Copyright 1976, Biological Abstracts, Inc.
W76-10866

DDT IN WATER, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 850, $18.75 in paper copy, $3.00 in microfiche.
Water Resources Scientific Information Center, Report OWRT/WRSIC 76-202, July 1976, 790 p.

Descriptors: *DDT, *Bibliographies, Abstracts, Chlorinated hydrocarbon pesticides, DDD, DDE, Pesticides, Pesticide residues, Pesticide toxicity, Endrin, Dieldrin, Insecticides, Polychlorinated biphenyls, Pollutant identification, Toxicity, Path of pollutants, Water pollution.

This report, containing 486 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). The first volume (See W72-14431) was issued in October 1971 and covered the material announced in SWRA from October 1968 through October 1971. At the time of search for this bibliography, the data base had 95,781 abstracts covering SWRA through April 15, 1976 (Volume 9, Number 8). Author and subject indexes are included.
W76-10877

RED CRAB (GERYON QUINQUEDENS) AND SNOW CRAB (CHIONOECETES OPILIO) RESISTANCE TO INFECTION BY THE LOBSTER PATHOGEN AEROCOCCUS VIRIDANS (VAR.) HOMARI,
Fisheries and Marine Service, Halifax (Nova Scotia). Dept. of Environment.
J. W. Cornick, and J. E. Stewart.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 5, 1975, p 702-706, 3 tab, 1 fig, 15 ref.

Descriptors: *Pathology, *Disease resistance, Pathogenic bacteria, Hosts, *Crabs, Lobsters, Temperature, Mortality.
Identifiers: Red crab, Snow crab.

Temperature tolerance data showed that red crabs can withstand water temperatures up to 14 degrees C without excessive mortality. Results of the pathogenicity studies indicated that while deaths occurred in both crab species, the numbers of microorganisms in the hemolymph were too low to have caused death. Reisolation from both crab species and inoculation into a group of 10 lobsters resulted in death to the lobsters. The mean time to death of 12 days indicated no loss of virulence while the microorganisms were in the crabs. It was concluded that the lobster pathogen is capable of existing in crabs and possibly other marine species in a viable state for extended periods of time. (Chilton-ORNL)
W76-10882

BEHAVIOURAL THERMOREGULATION AND ACTIVITY PATTERNS IN THE GREEN SUNFISH, LEPOMIS CYANELLUS,
Wisconsin Univ., Madison. Dept. of Zoology; and Wisconsin Univ., Madison. Lab. of Limnology.
T. L. Beitenger, J. J. Magnuson, W. H. Neill, and W. R. Shaffer.
Animal Behaviour, Vol. 23, 1975, p 222-229, 4 fig, 1 tab, 28 ref.

Descriptors: *Environmental effects, *Temperature, *Sunfishes, Diel migration, Thermal stress, Fish behavior.
Identifiers: Thermoregulation, Lepomis cyanellus.

In addition to examining thermoregulatory behaviour and diel locomotory activity patterns of individual green sunfish, a particular effort was made to identify possible diel changes in preferred temperatures and in the relationship between locomotory activity and temperature regulation in the experimental apparatus. Active avoidance of temperatures outside the range of 26.5 to 30.3 degrees C with a median preferred temperature of 28.2 degrees C were observed. Temperature preferenda did not differ significantly between day and night but more variation occurred at night. A crepuscular locomotory activity pattern occurred. Changes in illumination levels at dawn and dusk stimulated changes in activity. (Chilton-ORNL)
W76-10883

THE ANOMALOUS INFLUENCE OF SALINITY ON TEMPERATURE TOLERANCES OF SUMMER AND WINTER POPULATION OF THE COPEPOD EURYTEMORA AFFINIS,
Maryland Univ. Baltimore County, Baltimore. Dept. of Biological Sciences.
B. P. Bradley.
Biological Bulletin, Vol. 148, February 1975, p 26-34, 5 tab, 12 ref.

Descriptors: *Environmental effects, *Salinity, *Temperature, Resistance, *Copepods, Aquatic populations, Laboratory tests, Osmosis, Water pollution effects.
Identifiers: *Eurytemora affinis.

Thermal tolerances of populations of Eurytemora affinis were measured at various salinities with and without acclimation. Using a shock-recovery assay method (temperature shocking at 34.5 degrees C, observing time to succomb (TS) and time to recover (TR) over a 30 minute period) produced repeatable and significant difference in tolerance between populations collected in March and August as well as between salinities. Average tolerances and differences between populations increased with salinity. The distinction between populations in thermal tolerance was greater when the animals were osmotically acclimated for 24 hours. (See also W75-11046)(Chilton-ORNL)
W76-10884

TEMPERATURES SELECTED AND AVOIDED BY FISH AT VARIOUS ACCLIMATION TEMPERATURES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
D. S. Cherry, K. L. Dickson, and J. Cairns, Jr.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 4, 1975, p 485-491, 2 fig, 2 tab, 12 ref.

Descriptors: *Environmental effects, *Thermal pollution, Fish, Temperature, Limiting factors, Thermal stress, Fish behavior, Water pollution effects.

Temperature responses of 13 species of fish acclimated at temperatures from 6-30 degrees C with 3 degree increments were studied. The level of thermal acclimation directly affected the range of selected temperature in that the difference between the acclimation temperature and the selected temperature increased in all species. Correlation coefficients of preference versus acclimation temperature were high for most species, allowing for a predictive ability at acclimation temperatures not tested within the 30-6 degree C range. The range between the upper and lower avoidance temperature provided information relative to natural distribution of fish populations. Eurythermal species with a relatively wide difference (9-21 degrees C) between upper and lower avoidance temperatures were flexible in adjusting to a wide range, including the maximum 8 degree C differential between heated discharge channels and unaffected areas. (Chilton-ORNL)
W76-10885

BACTERIAL GROWTH RATES AND TEMPERATURE OPTIMA IN A STREAM WITH A FLUCTUATING THERMAL REGIME.
Academy of Natural Sciences of Philadelphia, Avondale, Pa. Stroud Water Research Center; and Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
T. L. Bott.
Limnology and Oceanography, Vol. 20, No. 2, March 1975, p 191-197, 2 tab, 2 fig, 15 ref.

Descriptors: *Environmental effects, Aquatic animals, *Bacteria, *Growth rates, *Temperature, Streams, Adaptation, Population.

Periphytic bacterial growth rates were studied directly in a natural stream at different seasons of the year. The stream had wide seasonal temperature variation (0.1-23 degrees C annual range) and diurnal fluctuations of as much as 10 degrees C. Doubling times of unicellular and filamentous populations were found to be 42-51 hours at water temperatures of 0-5 degrees C, 8.4-10.8 hours at water temperatures of 11-16 degrees C, and 2.8-6.0 hours at water temperatures of 16.5 -21.0 degrees C. Populations were optimally adapted to temperatures 5-20 degrees C higher that the prevailing stream water temperature. (Chilton-ORNL)
W76-10886

LIFE HISTORY AND ECOLOGY OF MEGARCYS SIGNATA (PLECOPTERA: PERLODIDAE), MILL CREEK, WASATCH MOUNTAINS, UTAH,
Utah Univ., Salt Lake City. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W76-10887

ENVIRONMENTAL REGULATION OF THE ANNUAL REPRODUCTIVE SEASON OF STRONGYLOCENTROTUS PURPURATUS (STIMPSON),
California Univ., Los Angeles. Dept. of Biology.
R. C. Cochran, and F. Engelmann.
Biological Bulletin, Vol. 148, June, 1975, p 393-401, 1 fig, 5 tab, 14 ref.

Descriptors: *Environmental effects, *Environmental control, *Reproduction, *Temperature, Seasonal, Aquatic animals, Photoperiodism, Temperature, Oceans.
Identifiers: *Sea Urchins, Strongylocentrotus purpuratus.

The annual reproductive cycle of a subtidal population of S. purpuratus correlated with seasonal changes in ocean temperature: a rise above 17 degrees C in June coincides with cessation of gamete production and storage. Sea urchins maintained at 13 degrees C retained gametes nearly two months beyond the date when the field population had spawned out. When the field population was reproductively active, the spawning capability of a laboratory group was terminated by three weeks of warm water temperature(19 degrees C). Spawning capability was not affected by photoperiod. (Chilton-ORNL)
W76-10888

THE RESPIRATORY STRATEGIES OF TWO SPECIES OF FRESHWATER GASTROPODS (ANCYLUS FLUVIATILIS MULL AND PLANORBIS CONTORTUS LINN) IN RELATION TO TEMPERATURE, OXYGEN CONCENTRATION, BODY SIZE AND SEASON,
Glasgow Univ. (Scotland). Dept. of Zoology.
P. Calow.
Physiological Zoology, Vol. 48, No. 2, 1975, p 114-129, 11 fig, 5 tab, 34 ref.

Descriptors: *Environmental effects, *Temperature, *Gastropods, *Oxygen, Seasonal, Size, Respiration, Water pollution effects.
Identifiers: Ancylus fluviatilis.

Under conditions of temperature disturbance Anylus fluviatilis and Planorbis contortus showed cclimatory responses in the respiratory rates. In . fluviatilis the rates of conditioned to 4 or 18 egrees C and then transferred to 10 degrees C noved at a progressively reducing rate on to a taret level. In P. contortus the rates of the high and ow temperature cohorts initially overshot the taret before moving on to it. These differences inicate that A. fluviatilis is adapted to low and apidly fluctuating conditions while P. contortus is dapted to higher and gradually fluctuating temerature conditions. To a limited extent, both speies were able to regulate their respiratory rates uring reductions in oxygen concentrations. This esponse was more complete in P. contortus. In oth species the relationship between respiratory ate and body weight expressed in terms of ashree dry fraction was allometric with a power alue of .67, implying a functional relationship etween respiration and body surface area. Neither species showed diurnal differences in espiratory rate but both showed seasonal effect. Chilton-ORNL)
W76-10889

SURVIVAL OF HUMAN PATHOGENS IN THE MARINE ENVIRONMENT,
Maryland Univ., College Park. Dept. of Microbiology.
R. R. Colwell, and F. M. Hetrick.
Annual Report for Office of Naval Research, Period June 1974-May 1975, 23 p, 13 fig. N-00014-67-A-0239-0035.

Descriptors: *Bacteriology, *Pathology, *Viruses, *Enteric bacteria, *Human diseases, Aquatic environment, Temperature, Salinity, Laboratory tests, On-site investigations, Estuarine environment, Water pollution effects.

It was apparent from the results of the virus studies that enteric viruses survive for relatively long periods of time in estuarine and marine salinities when the water temperature is 25 degrees C or lower. Of the three enteroviruses tested, Coxsackie B-5 virus has been the most stable one with ECHO-6 virus being intermediate and polio 1 the least stable virus. This was true both in controlled laboratory experiments and in situ and is probably indicative of the diversity in stability one would encounter if all of the human enteroviruses were studied. While the salinity of the water may have a minor effect on enterovirus stability, clearly the most important factor affecting virus viability was the temperature of the water. (Chilton-ORNL)
W76-10890

TECHNIQUES DE DETERMINATION RADIDE DES EFFETS DE SYNERGIE RADIONUCLEIDES - POLLUANTS, (TECHNIQUES FOR RAPID DETERMINATION OF EFFECTS OF SYNERGY BETWEEN RADIONUCLIDES AND POLLUTANTS),
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
For primary bibliographic entry see Field 5A.
W76-10891

TRACE ELEMENT INTERACTIONS IN THE ESTUARINE ZONE OF THE ANASCO RIVER, PUERTO RICO,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
D. A. Wolfe, W. O. Forster, R. McClin, and F. G. Lowman.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/18. p 155-178, 6 fig, 7 tab, 25 ref.

Descriptors: *Environmental effects, Chemistry, *Radioactivity, Estuaries, *Puerto Rico, *Trace elements, Particle size, Salinity, Freshwater, Sea water, Sediments.
Identifiers: Anasco River estuary(PR).

Data are presented on trace elements in suspended particulate matter and sediments from the stratified estuarine zone of the lower river channel. Stable Fe, Mn, Al, Sc, and Co were analyzed by neutron activation in the sediment cores and in suspended particulate matter. The bulk of the particulate matter contains concentrations of Mn, Al, Fe, Sc, and Co similar to those found in fresh water samples. These concentrations are higher than those found in the marine sediments. Al, Sc, and Fe concentrations in finely divided suspended matter were inversely related to salinity. Co and Mn showed no consistent relationship to salinity. Mn, Al, Fe, Sc, and Co concentrations on 0.45 micron suspended fraction were higher during the wet season than dry due to a change toward larger mean particle size. Sb125 remained largely soluble in river water-seawater mixtures irrespective of salinity or concentration of particulate matter. Mn54, Fe59, Zn65 Ag110 and Eu 155 showed lower fractional solubilities at higher contents of suspended material and increased in solubility as salinity increased. River water-seawater mixtures suggested desorption of absorbed radioactivity from suspended particulate material as salinity increases to 8%, or the formation of particulate material at low salinities. (See also W76-09490) (Chilton-ORNL).
W76-10892

INCIDENCE DE LA CHARGE POLLUANTE DES EAUX SUR LE COMPORTEMENT DES RADIONUCLEIDES, (EFFECT OF THE POLLUTANT BURDEN OF WATER ON THE BEHAVIOUR OF RADIONUCLIDES),
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses (France).
P. Bovard, A. Grauby, A. Saas, and R. Schaeffer.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/14. p 179-190, 7 fig, 5 ref.

Descriptors: *Water pollution effects, *Radioisotopes, Chemistry, Chemical oxygen demand, Biochemical oxygen demand, Behavior, Hydrogen ion concentration.

One example of pollution effects on the transfer of radionuclides which is presented is the change in chemical equilibrium of iodine as a function of pH value. Other examples include variations in the mobility of several elements under the influence of COD and the means by which the mobility potential of some radionuclides evolves from the point of release up to the irrigation limit. Interactions between irrigation water and ground water are discussed. Types of factors capable of leading to synergistic effects are identified as physical factors such as pH and temperature, chemical factors such as saline burden and COD, micro-biological factors as BOD, and extrinsic factors such as water regime and utilization. (See also W76-09490) (Chilton-ORNL)
W76-10893

METABOLISM OF MERCURY COMPOUNDS IN MICROORGANISMS,
Maryland Univ., College Park.
R. R. Colwell, and J. D. Nelson, Jr.
Environmental Protection Agency, Report EPA-600/3-75-007, October, 1975, 84 p., 25 tab., 29 fig., 80 ref.

Descriptors: *Marine microorganisms, *Mercury, Metals, *Sediments, *Chesapeake Bay, Aquatic microorganisms, Marine bacteria, Physiology, Public health, Dissolved oxygen, Water temperature, Annual succession, Estuaries, *Metabolism, *Heavy metals, Estuarine environment, Water pollution effects.
Identifiers: Mercury-resistant bacteria, Mercury metabolizing bacteria, Bacterial physiology, Mercury metabolite, Mercury mobilization.

The physiology and ecology of mercury-resistant and mercury-metabolizing bacteria from Chesapeake Bay are described. From the results of a survey of elemental mercury production among a group of randomly selected, HgCl2-resistant bacteria and mixed natural microbial populations, it was established that the enumeration of mercury-resistant bacteria by plate counting is a valid index of potential Hg2+ metabolism in situ. The distribution of mercury-resistant bacteria was significantly different in water and sediment, from station to station, and seasonally; the proportion of Hg2+-resistant bacteria among the total, viable, heterotrophic bacterial population reached a reproducible maximum in spring and was positively correlated with water turbidity, dissolved oxygen concentration, and mercury concentration in the sediment. These findings suggest that bacteria may contribute substantially to the mobilization and transformation of mercury from existing deposits in the aquatic environment. (Katz)
W76-10894

CHRONIC TOXICITY OF LINDANE TO SELECTED AQUATIC INVERTEBRATES AND FISHES,
EG and G, Bionomics, Wareham, Mass.
K. J. Macek, K. S. Buxton, S. K. Derr, J. W. Dean, and S. Santer.
Environmental Protection Agency, Report EPA-600/3-76-046, May, 1976. 50 p, 19 tab., 40 ref.

Descriptors: *Toxicity, *Bioassays, *Pesticides, *Freshwater fish, Diptera, Laboratory animals, Laboratory methods, Invertebrates, Minnow, Brook trout, Daphnia, Crustaceans, Midges, Water pollution effects, Sunfishes, Pollutant identification.
Identifiers: *Lindane, Scud, Gammarus, Fathead minnow, Pimephales promelas, Maximum accepted toxicant concentrations, Application factors.

Water fleas (Daphnia magna), midge (Chironomus tentans), scud (Gammarus fasciatus), bluegill (Lepomis macrochirus), fathead minnow (Pimephales promelas) and brook trout (Salvelinus fontinalis) were chronically exposed to various concentrations of lindane in separate flowing water systems. Maximum acceptable toxicant concentrations (MATC) of lindane for the selected species in soft water were estimated using survival, growth, and reproduction as indicators of toxic effects. The MATC was estimated to be between 2.2 and 5.0 ppb/l for midges, between 11 and 19 ppb/l for the water flea, and between 4.3 and 8.6 ppb/l for the scud. For fishes the MATC was estimated between 9.1 and 12.5 ppb/l for bluegills, between 9.1 and 23.5 ppb/l for fathead minnows, and between 8.8 and 16.6 ppb/l for brook trout. The incipient median lethal concentration (LC50) for fishes and the 48-hour LC50 for invertebrates was estimated from acute exposures and used to calculate application factors (MATC/LC50). For aquatic invertebrates and lindane the estimated application factors were between 0.010 and 0.024 for midges, between 0.020 and 0.029 for water flea, and between 0.11 and 0.22 for scud. Application factors were between 0.30 and 0.42 for bluegill, 0.13 and 0.34 for fathead minnows, and 0.34 and 0.64 for brook trout. (Katz)
W76-10895

TOXICITY OF CHLORINATED POWER PLANT CONDENSER COOLING WATERS TO FISH,
Michigan Water Resources Commission, East Lansing; and Michigan Bureau of Water Management, East Lansing.
R. E. Basch, and J. G. Truchan.
Environmental Protection Agency, Report EPA-600/3-76-009, April, 1976, 105 p., 47 tab., 10 fig., 35 ref.

Descriptors: *Chlorination, Water Purification, *Bioassay, *Electric powerplants, *Thermal powerplants, Chlorine, Toxicity, Water quality,

Freshwater fish, Laboratory tests, On-the-site investigations, Aquatic animals, Brown trout, Minnows, Industrial effluents, Mortality, Water pollution effects, *Thermal pollution, *Cooling water, *Waste water treatment.
Identifiers: Condenser cooling water, Fathead minnows, Residual chlorine, Live cage studies.

Studies were conducted during 1972 at five Michigan power plants in which caged brown trout (Salmo trutta) and fathead minnows (Pimephales promelas) were held for 96 hr in the intake and condenser cooling water discharge channels. Also, caged fish were held in condenser cooling water dechlorinated with sodium thiosulfate at the same time that fish in the discharge channel were subjected to 30-min chlorination periods. Total residual chlorine levels as low as 0.05 mg/liter were lethal to brown trout below four of the five plants. Total residual chlorine concentrations lethal to 50 percent (ILC-50) of the caged brown trout at two plants averaged from 0.02 to 0.18 mg/liter during the chlorination periods. Fathead minnow deaths in all studies could not be attributed to the total residual chlorine. Residident fish were observed in distress at two plants during 1972. These behavioral symptoms were noted at maximum total residual chlorine concentrations ranging from 0.2 to 0.5 mg/liter. Studies were repeated in 1973 at one plant with brown trout and other salmonid species. No deaths of test fish occurred during these tests that could be attributed to chlorine concentrations. The inconsistent results may be related to interactions between chlorine, temperature, and dissolved oxygen saturation in the discharge channel. (Katz)
W76-10896

COMPARATIVE TOXICITY OF SEWAGE-EFFLUENT DISINFECTION TO FRESHWATER AQUATIC LIFE,
Environmental Research Lab., Duluth, Minn.
J. W. Arthur, R. W. Andrew, V. R. Mattson, D. T. Olson, and G. E. Glass.
Environmental Protection Agency, Report EPA-600/3-75-012, November, 1975, 62 p., 18 tab., 4 fig., 29 ref.

Descriptors: *Chlorination, *Water purification, *Bioassay, *Toxicity, Chlorine, Sewage treatment, Water quality, Freshwater fishes, Minnows, Daphnia, Methodology, Amphipods, Aquatic animals, Ozone, Laboratory methods, *Sewage effluents, Waste water treatment, Water pollution effects, Pollutant identification.
Identifiers: Flow-through bioassays, Chlorine toxicity, Ozone toxicity, Residual chlorine, Residual ozone.

Flow-through laboratory bioassays were conducted with a domestic secondary sewage effluent that had been disinfected by chlorination, by chlorination followed by dechlorination, and by ozonation. Short-term (7-day) exposures were conducted with 13 species (seven fish and six invertebrates), and long-term (generation) tests were performed with three species (one fish and two invertebrates). In both series of tests the chlorinated effluent was lethal at appreciably lower concentrations than any of the other three effluent treatments. Fish were more sensitive than the invertebrates to the chlorinated effluent in 7-day tests. The respective 7-day TL50 values of total residual chlorine to fish and invertebrates ranged from 0.08 to 0.26 and 0.21 to >0.81 mg/1. Residual ozone rapidly decreased in the treated effluent and was not measurable in the test tanks. When special short-term test procedures and shorter retention times for the ozonated effluent were used, measured residual ozone was about as lethal to fathead minnows as residual chlorine. The highest mean total residual chlorine concentrations having no long-term adverse effect on fathead minnows, amphipods, and Daphnia were 14, 12, and 2-4 ug/1, respectively. No daphnids survived at approximately 10 ug/1, mean total residual chlorine, a concentration that corresponds to a chlorinated sewage concentration of about 2.5%. (Katz)
W76-10898

EFFECTS OF MIREX, METHOXYCHLOR AND MALATHION ON DEVELOPMENT OF CRABS,
Duke Univ., Beaufort, N. C.
C. G. Bookhout, and J. D. Costlow, Jr.
Environmental Protection Agency, Report EPA 600/3-76-007, March 1976. 86 p, 33 tab., 5 fig., 60 ref.

Descriptors: *Bioassay, *Toxicity, *Pesticides, *Crabs, *Reproduction, Crustacea, Organic pesticides, Lethal limit, Laboratory methods, Laboratory animals, *Chlorinated hydrocarbon pesticides, Organophosphorus pesticides, Water pollution effects, *Pollutant identification.
Identifiers: *Mirex, *Methoxychlor, *Malathion, Larval development, Callinectes sapidus, Rhithropanopus harrisii, Pesticide residues.

Laboratory experiments were conducted to determine the effects of mirex, methoxychlor and malathion on the larval development of Callinectes sapidus from the time of hatching until the first crab stage is reached. For comparison, similar investigations were made to ascertain the effects of methoxychlor and malathion on larval development of Rhithropanopeus harrisii. The effect of a range of concentrations of each insecticide on survival of larvae of C. sapidus and R. harrisii was determined, as well as concentrations which were sublethal and lethal. Zoeal and total development to the first crab stage of R. harrisii and C. sapidus was prolonged in relation to increased concentrations of methoxychlor and malathion. Other sublethal effects of methoxychlor and malathion included abnormal development of the pleopods of male R. harrisii and male C. sapidus early crab stages, and autotomy of the legs of R. harrisii megalopa and early crab stages. The developmental stages in with larvae are particularly sensitive vary in the two species and with the three insecticides. Mirex residues of C. sapidus larvae reared in different concentrations of mirex, and methoxychlor residues of R. harrisii and C. sapidus larvae reared in concentrations of methoxychlor were determined. (Katz)
W76-10899

ACUTE TOXICITY OF SELECTED TOXICANTS TO SIX SPECIES OF FISH,
Chemico Process Plants Co., El Monte, Calif. Envirogenics Systems.
R. D. Cardwell, D. G. Foreman, T. R. Payne, and D. J. Wilbur.
Environmental Protection Agency, Report EPA-600/3-76-008, March, 1976. 117 p, 52 tab., 6 fig., 80 ref.

Descriptors: *Bioassay, *Toxicity, Methodology, *Arsenic compounds, Beryllium, Lead, Freshwater fish, Water quality, Water pollution effects, Laboratory animals, Channel catfish, Brook trout, Minnow, Sunfishes, Sodium arsenite, Sodium compounds, Fish types, Water pollution effects, *Pollutant identification.
Identifiers: *Sodium pentachlorophenate, *Selenium dioxide, *Beryllium sulfate, *Lead chloride, Flagfish, Goldfish, Fathead minnow, Sodium cyanide.

The relationship between median lethal concentration and exposure time was determined for five chemicals and up to six species of freshwater fish in a flow-through system. The lowest median lethal concentrations found were 0.114 mg/l for sodium cyanide, 0.118 mg/l for sodium pentachlorophenate, 2.9 mg/l for selenium dioxide, 18.0 mg/l for sodium arsenite, 25.4 mg/l for beryllium sulfate, and greater than 100 mg/l for lead chloride. Toxicity curves relating median lethal concentration to exposure time were of three types. One curve, resembling a rectangular hyperbola, characterized the toxicity of sodium cyanide, while another curve, sigmoid in shape, characterized the toxicity of selenium dioxide. Both types of curves were observed in toxicity tests with sodium pentachlorophenate, sodium arsenite and beryllium sulfate. Linear toxicity curves were recorded for some fish species exposed to selenium dioxide, sodium arsenite and beryllium sulfate, but these were usually encountered when exposure times were less than 96 hr. (Katz)
W76-10900

USE OF A TROPHODYNAMIC CHAIN OF THE BENTHIC TYPE FOR THE STUDY OF TRANSFERS OF METALLIC POLLUTANTS, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert, R. Bittel, F. Laumond, M. Barelli, and M. Gauthier.
Rev Int Oceanogr Med 39/40; p 117-152, 1975.

Descriptors: *Trophic level, Metals, Pollutants, *Benthos, *Food chains, Path of pollutants.
Identifiers: Marine animals, *Metallic pollution, Trophodynamic chains.

To assess the hazards of pollution presented by metallic pollutants discharged into marine environment, either for marine organisms or for consumers of marine products, the method of marine trophic chains reproduced in the laboratory was used. The in vitro study of concentration phenomena and the transfers of different metals at each level of a benthic trophic chain were carried out. Five metals were considered: Cu, Zn, Cr, Pb and Hg, in an ionic form or associated with organic compounds generally found in effluents.--Copyright 1976, Biological Abstracts, Inc.
W76-10944

BACTERIOPLANKTON AND ITS SIGNIFICANCE IN THE BIOPRODUCTIVITY OF THE RESERVOIRS, (IN RUSSIAN),
D. Z. Gak.
Nauka: Moscow, USSR. 1975, 253 p.

Descriptors: *Bacteria, Plankton, *Productivity, Reservoirs, *Zooplankton, Biomass.
Identifiers: Ukrainian-SSR, USSR, *Bacterioplankton.

Results of experimental studies on the bacterioplankton of Dneiper (ukranian SSR, USSR) reservoirs are presented and the literature on the microbiology of water reservoirs is reviewed. Data on the abundance size and biomass of the bacteria found in the river and its reservoirs is presented. Bacterial population dynamics, reproduction rate and rate of bacteria consumption by zooplankton are discussed. Materials and methods of investigations are described, especially methods for estimation of bacterial production. The Kiev, Kremenchug, Dneiprodzerzhinsky, Zaporozksky and Kakhovsky reservoirs are the sites investigated. The last 2 chapters covered bacterial production of reservoirs and the role of bacteria in bioproductivity of reservoirs. An English summary is provided.--Copyright 1976, Biological Abstracts, Inc.
W76-10969

A BIOLOGICAL STUDY ON THE POLLUTION OF THE SAI-GAWA RIVER AND ITS TRIBUTARIES, ISHIKAWA PREFECTURE, (IN JAPANESE),
Kanazawa Univ. (Japan). Biology Inst.
For primary bibliographic entry see Field 5B.
W76-10973

MARKED DIMINUTION OF DISSOLVED OXYGEN IN THE HYPOLIMNION OF LAKE BIWA IN AUGUST, 1973, (IN JAPANESE),
Nara Women's Univ. (Japan). Zoological Inst.
M. Tsuda, and I. Morishita.
Jpn J Limnol 36(1), p 31-32, 1975.

LIBRARY U. OF I. URBANA-CHAMP.

Descriptors: *Dissolved oxygen, Eutrophication, *Hypolimnion, Lakes, Water pollution effects, Asia.
Identifiers: *Japan(Lake Biwa).

Determinations of the vertical distribution of dissolved O2 (DO) were done in Lake Biwa (Japan) on Aug. 23rd, 1973. There was greatly diminished DO, as little as 4% saturation in the bottom water at a depth of 93m off the island of Chikubushima. There was probably a small depression on the bottom. At 2 other stations, 85m and 76m deep, respectively, O2 deficiency in the hypolimnion was also observed. The results may indicate progressive eutrophication in Lake Biwa, which has been considered oligotrophic.--Copyright 1976, Biological Abstracts, Inc.
W76-10976

THE USE OF FLOWING BIOLOGICAL SYSTEMS IN AQUACULTURE, SEWAGE TREATMENT, POLLUTION ASSAY AND FOODCHAIN STUDIES,
Woods Hole Oceanographic Institution, Mass.
J. H. Ryther.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 529, $10.50 in paper copy, $3.00 in microfiche. Report No. NSF-RA-E-74-038, July 15, 1974. 368 p. NSF-RANN GI-32140.

Descriptors: *Feasibility studies, *Aquiculture, *Sewage treatment, *Recycling, *Food chains, Tertiary treatment, Nutrient removal, Marine algae, Viruses, Cooling water, Growth rates, Heavy metals, Oysters, Clams, Molluscs, Water temperature, Shellfish, Fish, Lobsters, Marketing, Bioassay.
Identifiers: Sea food farming.

The efficiency and feasibility of a combined tertiary sewage treatment and marine aquaculture system was investigated keyed to the growth of a single-celled marine algae in a secondary sewage effluent-seawater mixture to remove nutrients by algal assimilation. The algae would be fed to molluscs, which would remove the algae from suspension. Dissolved mollusc wastes would be removed by the red seaweed, Chondrus crispus. Solid wastes produced by the shellfish would serve as a food for worms or other invertebrates, and in turn would be consumed by flounder or lobsters. Investigations detail the effect of temperature on algal growth, algal nutrient transformations, nutrient removal, growth rates, marketing problems of waste-food recycling systems, the use of cooling water, permissible levels of heavy metals, integrated and polyspecies aquaculture systems, food chain dynamics, virus survival, and uptake and elimination of chlorobiphenyls in oysters. This wastewater treatment system would be suitable in coastal communities whose sewage is primarily domestic wastes, which have secondary treatment facilities close to the sea, and which have about an acre of land/1000 inhabitants available. While oyster growth did not meet expectations, results of laboratory experiments and a pilot-scale system equalled or surpassed original projections of performance and reliability. (See also W76-10987 thru W76-11000; and W76-06441, W76-03566, W76-10889) (Auen-Wisconsin)
W76-10986

A KINETIC APPROACH TO THE EFFECT OF TEMPERATURE ON ALGAL GROWTH,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman, and E. J. Carpenter.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 27-56. 4 fig., 1 tab., 44 ref. NSF GI-32140, GA-37993.

Descriptors: *Water temperature, *Algae, *Growth rates, *Model studies, Nutrients, Kinetics, Environmental effects, Competition, Equations, Diatoms, Chlorophyta.
Identifiers: Arrhenium equation, Monod model.

A model is developed which incorporates the combined effects of temperature and nutrient limitation on algal growth rate. The temperature function is described by the Arrhenius equation and the nutrient relationship with the Monod model. The Arrhenium equation was inserted into the Monod model to determine maximum growth rate, as described by the product of temperature and nutrient concentrations. There was insufficient data to test the validity of the complete model, but the Arrhenium equation's usefulness in describing the effect of temperature on the maximum phytoplankton growth rate was tested. Using data from the literature on continuous culture experiments with freshwater and marine algae, it was found that the Arrhenium model describes the relationship between maximum growth rate and temperature. Use of the model may be limited to laboratory studies, but its general concepts may be used in natural water situations to help understand the role of temperature in controlling algal growth and species diversity. Combined effects of temperature and limiting nutrient concentration are described for various situations to show how interactions of environmental factors can influence algal growth and species competition. Models must be carefully used; the complete applicability and restrictions of this model are not yet known. (See also W76-10986) (Buchanan-Davidson--Wisconsin)
W76-10987

REMOVAL OF INORGANIC NITROGEN IN AN INTEGRATED FOOD CHAIN SYSTEM,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman, J. H. Ryther, and C. E. Gifford.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 91-109. 5 fig., 10 ref. NSF GI-32140.

Descriptors: *Waste water treatment, *Nutrient removal, *Nitrogen compounds, *Food chains, *Aquiculture, Growth rates, Marine algae, Diatoms, Oysters, Worms, Aquatic plants, Successions, Temperature.
Identifiers: Seaweeds.

An outdoor process was developed consisting of growth systems for marine algae (diatoms), oysters, polychaete worms (Nereis virens and Capitella capitata), and seaweeds (Chondrum crispus and Ulva lactuca). About half the influent nitrogen was transformed to particulate nitrogen. When ammonia nitrogen/total nitrogen was high, ammonia was released to the atmosphere and pH rose. For maximum nitrogen removal, nitrification at treatment plants must be prevented. Under steady-state conditions, particulate nitrogen and carbon decreased linearly as dilution rates increased, and nitrogen removal decreased. Higher dilution rates and wastewater fractions decreased particulate nitrogen, reduced oyster production, and increased nitrogen load to the seaweed system. Seaweed system efficiency in removing nitrogen and need for seaweed instead of oysters would determine the design and operation of the algal system. Particulate carbon production and pH varied with light; nitrogen removal and particulate nitrogen production were independent of time of day. Algal succession varied from pennates to diatoms as temperatures increased. Nitrogen removal was similar in algal and seaweed systems. U. lactuca has a reproductive stage so is unstable compared to C. crispus. C. crispus contains carrageenin. This process could solve wastewater pollution and protein shortage problems. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-10988

RELATIVE GROWTH OF DIFFERENT SPECIES OF MARINE ALGAE IN WASTEWATER-SEAWATER MIXTURES,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman, and H. I. Stanley.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 110-145. 3 fig., 5 tab., 28 ref. NSF-RANN GI-32140.

Descriptors: *Growth rates, *Marine algae, *Waste water treatment, *Sea water, Diatoms, Dominant organisms, Aquiculture, Nutrient removal, Tertiary treatment, Shellfish, Carbon, Nitrogen, Nitrates, Ammonia, Temperature, Competition, Waste dilution.
Identifiers: *Sea food farming, Skeletonema costatum, Monochrysis lutheri, Tetraselmis, Phaeodactylum tricornutum, Dunaliella tertiolecta, Thallassiosira pseudonana.

To understand diatom dominance in an outdoor mass cultivation system for marine algae which was part of a combined nutrient removal-marine aquaculture process for tertiary treatment of wastewater and production of commercially important shellfish, sixteen species of marine algae were grown in continuous monoculture under laboratory conditions simulating the outdoor experiments. Skeletonema costatum, Monochrysis lutheri, and Tetraselmis were never dominant in outdoor cultures but grew as well in monoculture as Phaeodactylum tricornutum, a diatom often dominant outdoors. When monocultures of Dunaliella tertiolecta and Thallassiosira pseudonana were contaminated with P. tricornutum, P. tricornutum, P. tricornutum rapidly became dominant. Probably a complex interaction of environmental factors is responsible for dominance of a particular species. Under conditions of almost complete nitrogen assimilation, the algal carbon/nitrogen ratio was high with nitrate-nitrogen and low with ammonium-nitrogen as the major nitrogen source. When algal growth was low so there was a large amount of inorganic nitrogen, the carbon/nitrogen ratio was low, ragardless of the nitrogen source. Algal species in large cultivation systems may be controlled by manipulating operating parameters (temperature, depth, dilution rate, mixing nutrient source, etc.) (See also W76-10986) (Buchanan-Davidson--Wisconsin)
W76-10989

HEAT EXCHANGERS FOR USE IN THE CULTURING OF MARINE ORGANISMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-10990

SOCIAL, POLITICAL, REGULATORY AND MARKETING PROBLEMS OF MARINE WASTE-FOOD RECYCLING SYSTEMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-10991

THE USE OF POWER PLANT WASTE HEAT IN MARINE AQUACULTURE,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W76-10992

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. I. MONITORING DURING PILOT OPERATION,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5D.
W76-10993

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A

COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. II. DEVELOPMENT OF GUIDELINES BY METHODS, OF ADDITIONS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5D.
W76-10994

NEAR SURFACE SAMPLER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-10995

INTEGRATED SYSTEMS OF MOLLUSK CULTURE,
Woods Hole Oceanographic Institution, Mass.
J. H. Ryther, and K. R. Tenore.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 276-193. 10 ref.

Descriptors: *Aquiculture, *Mollusks, *Nutrient requirements, *Water temperature, Growth rates, Domestic wastes, Cooling water, Environmental effects, Sea water, Sewage effluents, Pilot plants, Powerplants, Dilution, Pollutants, Public health, Hazards, Economic feasibility, Technology.

Environmental factors necessary for mollusk growth are proper water temperature and availability of enough microscopic food organisms. Depending on the species and its value, a powerplant might produce enough warm water and food for a small, commercially viable shellfish industry. Intake water temperature could be increased 5-25C, depending on the cooling water system design. Usefullness of powerplant cooling water for molluscan culture depends on temperature of cooling and intake water, the thermal tolerances of the cultured species and control of toxic waste products in the cooling water. There may be legal constraints on marketing mollusks produced because of possible contamination. Powerplant shutdowns could be disastrous. Mollusks can withstand heat and cold shock. Thermal water pollution control constraints may interfere with beneficial use of cooling water. Lack of adequate food may be more disastrous in heated water; extremely eutrophic water, however, can become anoxic, abiotic, and inefficient with respect to food utilization by mollusks. Fertilization of water with nitrogen and phosphorus or use of nutrient-rich ocean water can be expensive. Domestic wastes could provide nourishment, but contamination by heavy metals, organic compounds, and human pathogens may occur. A pilot study using sewage effluents has been started. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-10996

POLYSPECIES AQUACULTURE SYSTEMS: THE DETRITAL TROPHIC LEVEL,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
K. R. Tenore, M. G. Browne, and E. J. Chesney.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 294-309. 2 fig., 14 ref.

Descriptors: *Aquiculture, *Mollusks, *Productivity, *Benthic fauna, *Food chains, Energy transfer, Algae, Sewage effluents, Sea water, Annelids, Oysters, Standing crops, Digestion, Worms.
Identifiers: *Polyspecies aquiculture, Detrivores, Nereis virens, Biodeposits, Capitella capitata.

Food chain dynamics of a polyspecies aquaculture system were studied, using algal and invertebrate tanks. Species belonging to the detrital trophic level were produced with flowing, filtered seawater and controlled phytoplankton addition to tanks containing oysters. The average algal pond phytoplankton concentration was 21 mg carbon/l and the standing crop biomass was 48 g carbon. Each invertebrate tank received carbon from the algal culture and filtered sea water. Oysters received a daily food ration approximately 20% their biomass, removed 83% of available food, and their standing crop grew from 29.4-72.2 g carbon in 40 days, with an ecological efficiency of 9.8%. Oyster fecal biodeposits and pseudofeces supported a nereid polychaete (Nereis virens) or a mixed community of capitellid polychaete (Capitella capitata) and the amphipod (Corophium) on the tank bottom. The number of nereid worms decreased but the average weight increased threefold. The oyster tank seeded with caplitellids had a high macrofauna standing crop. The culture of these macrofauna on the biodeposits of oysters results in both increased efficiency of energy utilization and increases and diversifies the rearing of commercially important species. The worms are a valuable bait for sport fisheries, and the Capitella-Corophium can serve as a food source for species at the carnivore trophic level. (See also W76-10986) (Buchanan-Davidson--Wisconsin)
W76-10997

COMPARISON OF THE FOOD CHAIN DYNAMICS OF THE POLYCHAETE, NEREIS VIRENS CULTURED ON ANIMAL TISSUE AND DETRITUS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
K. R. Tenore, and U. K. Gopalan.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies, 'Report No. NSF-RA-E-038, July 15, 1974, p. 310-323. 2 tab., 13 ref. NSF GI-32140, GA-39911.

Descriptors: *Annelids, *Aquiculture, *Diets, *Detritus, Productivity, Growth rates, Oysters, Clams, Worms, Digestion, Marine animals, Benthic fauna.
Identifiers: Nereis virens, *Polyspecies aquiculture.

Knowledge of the nutritive value of detritus for facultative detrital feeders such as Nereis virens would help determine the importance of detritus in marine food chains. Growth rates of the clam worm, Nereis virens, grown on biodeposits of oysters and tissue of the clam, Mercenaria mercenaria, were compared. Worms grown on biodeposits ingested more than six times the weight of detritus compared to those fed clam tissue. The mean dry weight of worms fed biodeposits increased 48% in 42 days, compared to a 31% increase in worms cultured on clam tissue. Nereis produced about 0.01 g dry weight of mucous material per week per gram dry worm. Excluding mucous production, the ecological efficiency of worms fed on biodeposits was 5.7% compared to 18.0% for worms cultured on clam tissue; including mucous production, the values were 7.0 and 29.9%, respectively. The assimilation efficiency, including mucous production, was 28.8% for worms fed biodeposits and 77.3% for worms cultured on clam tissue. Biodeposits in both natural and aquaculture environments could be used as a food source for Nereis. This commercially valuable bait worm is a possible species for a polyculture system. (See also W76-10986) (Buchanan-Davidson--Wisconsin)
W76-10998

VIRUS SURVIVAL PATTERNS IN A TERTIARY SEWAGE TREATMENT-AQUACULTURE MODEL SYSTEM,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W76-10999

UPTAKE, TRANSLOCATION AND ELIMINATION OF INDIVIDUAL CHLOROBIOPHENYLS BY OYSTERS,
Woods Hole Oceanographic Institution, Mass.
V. Vreeland.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 347-356. 7 ref. NSF-RANN GI-32140.

Descriptors: *Pesticide residues, *Aquiculture, *Oysters, *Polychlorinated biphenyls, Absorption, Translocation, Phytoplankton, Equilibrium, Chlorination, Analytical techniques, Sewage effluents.
Identifiers: Depuration.

Oysters were fed mixed phytoplankton plus chlorobiphenyls with 2 to 6 chlorine atoms/molecule in seawater. After a month, accumulations reached a plateau; accumulated amounts were directly proportional to amounts added to the water. More highly chlorinated chlorobiphenys accumulated in greater proportions. Factors such as heavy epiphytic growth reduced the concentration factor of more highly chlorinated chlorobiphenyls. Uptake patterns indicated that uptake was partitioned between oysters and water, with equilibrium depending on the number and arrangement of chlorine atoms on the chlorobiphenyl and on the nature of oyster lipids. There was no correlation between chlorobiphenyl concentration and oyster hexane-extractable lipid content. Oysters exposed to carbon-14-pentachlorobiphenyl in water for 5-6 hours showed individual variations depending on whether they pumped during uptake. More radioactivity was in gills, then viscera; after flushing, more radioactivity was in viscera and little in gills. Chlorobiphenyls with 5-6 chlorine atoms showed little depuration the first week. Chlorobiphenyls in food were localized in intestinal epithelium and those in water concentrated in gills and ciliary tracts. After flushing, labelling was also found in heart, circulatory system, and phagocyte cytoplasm. The results can be used to interpret chlorobiphenyl levels in oysters in an experimental food chain where they are fed phytoplankton grown on sewage effluents. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-11000

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME II.
National Academy of Sciences, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-783 990, $12.50 in paper copy, $3.00 in microfiche. May 1973. p. 375-824.

Descriptors: *Oil spills, *Oily waters, *Water pollution effects, *Marine environment, Analytical techniques, Chemical analysis, Statistical analysis, Weathering, Dispersion, Biodegradation, Marine organisms, Beaches, Public health.

Contributions are presented from experts working to quantify the effects of petroleum on the marine environment. Different analytical techniques both chemical and biological are described and the reliability criteria for these techniques are presented. The fate of petroleum in the ocean as affected by such processes as weathering, dispersement, biodegradation and biological uptake is described. The effects of catastrophic spills on coast lines, coastal biota, marine resources and human health are presented. (See W76-11008 thru W76-11031) (Katz)
W76-11007

THE OCCURANCE AND AMOUNT OF PELAGIC TAR IN THE OPEN OCEAN,
For primary bibliographic entry see Field 5B.
W76-11008

PELAGIC TAR IN THE NORTH PACIFIC OCEAN,
For primary bibliographic entry see Field 5A.
W76-11009

SOME MECHANISMS OF WEATHERING OF PETROLEUM HYDROCARBONS ON MARINE WATERS: COMPETITIVE PATHWAYS TO FATE AND DISPOSITION OF PETROLEUM POLLUTION,
For primary bibliographic entry see Field 5B.
W76-11010

THE SURFACE ACTIVITY OF PETROLEUM AND ITS INFLUENCE ON THE BEHAVIOR OF OIL AT SEA,
For primary bibliographic entry see Field 5B.
W76-11011

SEDIMENTATION PROCESSES INVOLVING HYDROCARBONS IN THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5B.
W76-11012

BIOLOGICAL FATE OF PETROLEUM HYDROCARBONS IN AQUATIC MACROORGANISMS,
R. C. Clark.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 485-506, 47 ref.

Descriptors: *Marine environment, *Oil pollution, *Marine organisms, Lobsters, Crabs, Oysters, Mussels, *Toxicity, Animal physiology, Crustacea, Marine fisheries, Clams, Organic compounds.
Identifiers: *Barnacles, Hemigrapsus nudus, Mitella, Tetraclita, Mercenaria mercenaria, Mytilus.

Until the metabolic fate of the various classes of hydrocarbons present in petroleum, in the food web, and in the aquatic microorganism is examined, it will be impossible to evaluate the effects of persistent low-level petroleum pollution in the marine environment. The rates of uptake and turnover and the mechanisms of these processes must be determined experimentally. A discussion is presented of observations of petroleum hydrocarbon uptake by organism type. A detailed discussion of the characteristic differences between biogenic and petroleum hydrocarbons is also given. (See also W76-11007) (Katz)
W76-11014

MICROBIAL INTERACTION WITH OIL IN THE MARINE ENVIRONMENT,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
G. D. Floodgate, D. F. Gibb, and K. P. Pugh.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 507-515, 5 ref.

Descriptors: *Oil pollution, *Marine environment, *Waste disposal, *Microbiology, *Nitrogen, *Phosphorous, *Light, *Marine fungi, *Photo-oxidation, Marine microorganisms, Waste water treatment, Water pollution, Weathering, Oil-water interface, Protozoan.
Identifiers: *Photooxidation, Rates of degradation, Calanus finmarchius.

The destruction of crude oil and its derivatives by microorganisms in the marine environment has been studied with two separate aims. These are: (1) The deliberate use of microorganisms as a means of removing spilt oil, by seeding the surface of the water with a high concentration of selected strongly hydrocarbonoclastic strains of bacteria. (2) To examine the rates and mode of action of natural populations of microorganisms on oil spilt at sea under vaious hydrographic and climatic conditions. While it appears that most factors which can change the chemistry of oil in the marine environment are known, there is a need to quantify the rates of change and assess their importance to the marine environment in general. (See also W76-11007) (Katz)
W76-11015

SOME REFLECTIONS ON THE BIODEGRADATION OF MINERAL OILS IN THE MARINE ENVIRONMENT,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5B.
W76-11016

FATES OF PETROLEUM IN THE SEA: BIOLOGICAL ASPECTS,
R. F. Lee, and A. A. Benson.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 541-551, 24 ref.

Descriptors: *Phytoplankton, *Zooplankton, *Fish, *Benthic organisms, Laboratory studies, Oil, *Oily water, Animal physiology, *Metabolism, *Biochemistry, *Mode of action, Laboratory animals, Mussel, Lobster.
Identifiers: *Uptake, Physical-chemical factors, Discharge, *Storage of hydrocarbons, Mytilus edulis.

Laboratory studies using selected species of phytoplankton, zooplankton, fish and benthic invertebrates have been used for uptake studies of dissolved hydrocarbons. Sea water suspensions and solutions of radioactive hydrocarbons were also used. (See also W76-11007) (Katz)
W76-11017

ACCUMULATION, RELEASE, AND RETENTION OF PETROLEUM HYDROCARBONS BY THE OYSTER, CRASSOSTREA VIRGINICA,
J. M. Teal, and J. J. Stegman.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 571-602, 3 tab., 5 fig., 20 ref.

Descriptors: *Oysters, *Oily water, *Oil spills, *Absorption, *Biological uptake, Water pollution, Penetration, Animal physiology, *Degradation, Molluscs, Analytical methods, Gas chromatography, Bioassay, Lipids.
Identifiers: *Lipid content, *Hydrocarbon accumulation, Hydrocarbon discharge, Non-biogenic hydrocarbons, Aliphatic hydrocarbons.

Two oyster populations differing in fat content were experimentally exposed to a complex petroleum hydrocarbon fraction. The hydrocarbons in this mixture were accumulated by both groups of oysters, and the lipid content of the animals as well as the concentration of hydrocarbon in the water were found to affect the rate and extent of accumulation. Hydrocarbons accumulated were rapidly, though incompletely, discharged when the oysters were transferred to an uncontaminated system. Amounts of hydrocarbons discharged and amounts retained after discharge are probably related to the level of contamination. The data can be interpreted as indicating that equilibration and the occurrence of multiple compartments where hydrocarbons can reside are major factors involved in the uptake and accumulation of nonbiogenic hydrocarbons. The petroleum hydrocarbons contained in the oysters differed from the contaminating oil by showing a greater aromatic content. In addition, gas-liquid chromatograms of aliphatic fractions of the hydrocarbons in the oysters rapidly showed a degraded appearance; the possibility that the oysters themselves are modifying the oil cannot be excluded. (See also W76-11007) (Katz)
W76-11018

BIOLOGICAL EFFECTS OF CHRONIC OIL POLLUTION ON COASTAL ECOSYSTEMS,
D. S. Boesch.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 603-618, 22 ref.

Descriptors: *Oil, *Oily water, *Oil pollution, *Marine environment, *Estuarine pollution, Water pollution effects, Toxicity, Bioassays, Primary production, Photosynthesis, Animal behavior, Food chains, Marshes, Salt marsh, Marsh plants.
Identifiers: Mangrove marshes, Sublethal effects.

Petrochemical waste receiving systems are characterized by extremely variable rates of photosynthesis and respiration due to local concentrations of highly toxic materials which depress metabolism on one hand and then stimulate metabolism by decomposed waste products on the other. It appears that petroleum hydrocarbons can be transferred via feeding but there is no convincing evidence for biological magnification as documented for chlorinated hydrocarbons. The biological effects of petroleum on estuaries and wetlands are discussed. (See also W76-11007) (Katz)
W76-11019

IMPACT OF CHRONIC AND ACUTE OIL POLLUTION ON SEA BIRDS,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
R. B. Clark.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 619-631, 5 tab., 45 ref.

Descriptors: *Oil, *Marine environment, *Oil pollution, *Birds, Oil-water interfaces, *Water birds, *Waterfowl, Wildlife, *Mortality, Water pollution effects, *Oil spills, Coasts.
Identifiers: *Jackass penguin, Chronic oil pollution, *Acute oil pollution, *Sea birds, *Mortality estimates, Population changes, Oil spill prevention, Oil spill treatment, *Treatment of oiled birds, *Seabird conservation, Beached bird surveys, British coast, Netherlands coast.

The only organisms damaged directly by oil pollution on a sufficient scale to affect the world, or generally even local populations are seabirds. Of these, only relatively few species are severely damaged. These birds are vulnerable to oil pollution because they spend much or almost all their lives on the water, they dive to collect their food, and they are weak fliers or are flightless (penguin). Losses of seabirds from oil pollution near coasts of countries (chiefly north-west Europe) where there has always been a strong amateur interest in birds have caused concern for more than 50 years following the conversion from coal to oil-fired ships and growth of the automobile industry since 1915-1920. (See also W76-11007) (Katz)
W76-11020

TOWARDS A MODEL OF THE EFFECTS OF OIL ON MARINE ORGANISMS,
S. F. Moore.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 635-654, 4 tab., 24 ref.

Descriptors: *Oil pollution, *Model studies, *Toxicity, Probabilities, Mathematical studies, Graphical analysis, Mathematical models, Physiology, Behavior, Absorption.
Identifiers: *Sublethal effects, Tainting, Acute toxicity, Coating of organisms, Habitat changes, Petroleum discharge impact, Oil composition, Behavioral changes.

The model approach is especially useful for two reasons: (1) gaps in understanding are more explicitly defined and therefore recommendations

for additional research are improved; and (2) a concise and systematic framework is available for challenging, questioning and reconciling various hypotheses regarding the effects of oil, leading to a better overall understanding of the problem. Such a model is summarized. (See also W76-11007) (Katz)
W76-11021

AN ANALYSIS OF THE MAIN SCIENTIFIC PAPERS DEALING WITH LONG TERM LOW LEVEL EFFECTS OF OIL POLLUTION,
C. P. Onuf.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 655-670, 5 fig., 20 ref.

Descriptors: *Oil pollution, Aquatic populations, *Fish populations, *Shrimp, *Marine fish, Oil, Oil pollution effects, Industrial effluents, On-the-site studies, Environmental effects, Productivity, Salt marsh, Laboratory studies, Toxicity.
Identifiers: *Refining wastes, *Natural oil seeps, *Sublethal effects, Coal Oil Point.

Demonstrable effects of long term pollution by oil are very local and often associated with concentrations that approach acutely toxic levels. Where more general effects have been suggested, confounding factors have not been satisfactorily discriminated. The fact that a long period of large scale oil extracting activities has not reduced the productivity of major fisheries along the Gulf Coast of Louisiana suggests that many populations in offshore regions can accommodate long term, low level intrusions of oil. The case for estuaries cannot be so succinctly stated nor dismissed. No respectable field experiments have been reported. (See also W76-11007) (Katz)
W76-11022

SOME CONSIDERATIONS OF THE CHRONIC EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT,
L. S. St. Amant.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 671-689, 2 tab., 44 ref.

Descriptors: Oil, *Oil pollution, *Water pollution effects, *Aquatic productivity, *Louisiana, *Gulf of Mexico, *Oil industry, *Oil wastes, *Toxicity, Productivity, Gulf Coastal Plain, Marine organisms, Oil spills, Marine environment, Estuarine pollution.
Identifiers: *Chronic toxicity, Chronic pollution, Taste and odor problems.

Any attempt to evaluate the chronic effect of petroleum pollution and/or production activities on the marine environment immediately leads into a morass of unknown factors, nonstandardized research procedures, less than satisfactory field observations and tests and widely varying and incomplete conclusions about the effects of oil on the marine ecosystem. This appears to be a result of difficulties in measuring the effects of low levels of oil on the marine system, the greater attention given infrequent short-term spectacular spills and the apparent ability of marine nursery areas to continue to produce high densities of marine organisms in spite of long-term chronic petroleum pollution. (See also W76-11007) (Katz)
W76-11023

UPTAKE AND DEPURATION OF SPECIFIC HYDROCARBONS FROM OIL BY THE BIVALVES RANGIA CUNEATA AND CRASSOSTREA VIRGINICA,
J. W. Anderson.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 690-708, 7 tab., 1 fig.

Descriptors: *Oil, *Oil pollution, *Oil-water interfaces, *Clams, *Oysters, Animal physiology, Laboratory animals, Laboratory tests, Environmental effects, Degradation(Decomposition), *Metabolism, Physiological ecology, Gas chromatography, Infrared spectrophotometry.
Identifiers: Rangia cuneata, Crassostrea virginica, *Tissue hydrocarbon control, Oil-derived hydrocarbons, *Depuration, South Louisiana Crude Oil, *Number 2 Fuel Oil.

To test the assumption that petroleum hydrocarbons were retained in the tissues of molluscs for long periods, groups of clams, Rangia, and oysters, Crassostrea, were subjected to oil-water emulsions of four test-oils for long periods of time. The molluscs were analyzed for specific hydrocarbons. Findings indicated that the hydrocarbons are released from the tissues rapidly. (See also W76-11007) (Katz)
W76-11024

OIL IN THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5B.
W76-11025

THE IMPORTANCE OF OIL POLLUTION IN THE NORTH SEA,
For primary bibliographic entry see Field 5B.
W76-11026

A LITERATURE REVIEW OF THE BIOLOGICAL IMPACT OF OIL SPILLS IN MARINE WATERS,
E. W. Mertens.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 744-757, 46 ref.

Descriptors: *Oil, *Oil pollution, *Marine environment, Reviews, Water pollution effects, Environmental effects, *Oil spills, *Bioassays, *Toxicity, Marine organisms.
Identifiers: *Major oil spills, *Torrey Canyon, *Oil dispersants, Literature reviews, Sublethal effect.

Selected literature regarding the biological impact of oil on the marine environment is reviewed. Emphasis is on the observed environmental effects of oil spills and bioassays to determine the toxicity of oils to marine organisms. (See also W76-11007) (Katz)
W76-11027

POSITION PAPER ON THE EFFECTS OF ACUTE OIL SPILLS,
W. J. North.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 758-777, 2 tab., 2 fig., 53 ref.

Descriptors: *Oil, *Oil spills, *Water pollution effects, *Toxicity, *Oily water, Marine flora, Benthic organisms, Intertidal areas, *Kelps, Marine organisms, Aquatic habitat, Reviews, Rooted aquatic plants.
Identifiers: West Falmouth Spill, Tampico Maru Spill, Subtle effects, *Giant kelp, Macrocystis, Sea Urchins.

Studies indicate that oil spills cause relatively limited disturbances that do not overtax recovery potentials of the ecosystem. However, since ecological change may require very long recovery periods, this factor alone would justify substantial effort and expense to prevent acute oil spills. (See also W76-11007) (Katz)
W76-11028

SOME BIOLOGICAL EFFECTS RELATED TO THE WEST FALMOUTH OIL SPILL,
H. L. Sanders.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 778-800, 6 fig, 12 ref.

Descriptors: *Oil, *Oily water, *Benthic organisms, *Environmental effects, *Oil spill, *Sediments, Toxicity, On-the-site observations, Benthic fauna, Marine animals, Littoral, Mortality, *Water pollution effects, Molluscs, Gastropods, Crustaceans.
Identifiers: No. 2 Fuel oil, West Falmouth(Mass), Subtidal benthos, Capitella capitata.

Observations on the biological effects of a spill of No. 2 fuel oil off West and North Falmouth have been made. After the spill emulsifiers were added to remove the oil. Detailed observations of the subtidal and intertidal fauna were made. (See also W76-11007) (Katz)
W76-11029

POLYNUCLEAR AROMATIC HYDROCARBON POLLUTION OF THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5B.
W76-11030

IS OUR APPROACH TO THE OIL POLLUTION PROBLEM TOO CRUDE,
J. B. Sullivan.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 809-824, 5 tab, 1 fig, 24 ref.

Descriptors: *Oil, *Oil spills, *Marine environment, *Public health, Transportation, Water pollution effects, Toxicity, Oily water, Morbidity, Mortality, Water quality, Solubility, Ships.
Identifiers: *Carcinogens, *Toxic petroleum based compounds.

Crude oils contain substances that have carcinogenic properties. Many of the more toxic petroleum-based compounds are water soluble and readily enter the marine environment. A discussion is presented on the amount of carcinogenic material in product and in crude oil. (See also W76-11007) (Katz)
W76-11031

ZOOPLANKTON OF LAKES OF THE BOL'SHEZEMEL-SKAYA TUNDRA, (IN RUSSIAN),
Ministerstvo Selskogo Khozyaistva, Moscow (USSR).
N. V. Vekhov.
Zool Zh 54(2), p 181-187, 1975.

Descriptors: *Zooplankton, Lakes, *Rotifers, Biomass, Mesotrophy, Crustaceans, *Copepods, Eutrophication.
Identifiers: Bolshezemelskaya, *Conochilus-Unicornis, Tundra, USSR.

Lakes in the E Bolshezemelskyaya tundra (Russian SFSR, USSR), were studied. Small lakes are characterized by an almost complete absence of pelagic rotifers, except Conochilus unicornis. Plankton consists almost exclusively of copepods. In drainage lakes, channels and Yanei-Ty Lake, plankton is much richer. In drainage lakes and channels rotifers are less numerous than in Yanei-Ty lake. Rotifers or copepods predominate in population density, and cladocerans, more rarely copepods, in biomass. The ratio of biomass of predatory to non-predatory forms often exceeds 1; cladocerans predominate by biomass, the total biomass is high. The lakes can be considered mesotrophic according to the trophic classification for lakes of the middle belt.--Copyright 1976, Biological Abstracts, Inc.
W76-11056

OXICITY OF AGRICULTURAL CHEMICALS O LARVIVOROUS FISH IN KOREAN RICE IELDS,
lational Inst. of Health, Seoul (Republic of Korea).
. C. Shim, and L. S. Self.
rop Med. 15(3), p 123-130, 1973.

escriptors: *Agricultural chemicals, Chemicals, ish, Mosquitoes, Phenols, *Rice, *Toxicity, sia, Herbicides, Water pollution effects.
dentifiers: *Korea, *Larvivorous fish, *Zaccolatypus, *Aplocheilus latipes.

n important consideration regarding the mainenance or increase of fish populations in rice field reas in relation to Japanese encephalitis is hether the agricultural chemicals applied to rice ields are harmful to fish. The herbicide PCP entachlorophenol), which is commonly used in outh Korea during the rice-transplanting period, highly toxic to Aplocheilus latipes and Zacco latypus. Both species are larvivorous and offer romise in integrated (mosquito) vector control. ertain organophosphorus materials applied for ice pest control and the herbicide, 2,4-D were not oxic to fish populations.--Copyright 1974, Biological Abstracts, Inc.
W76-11095

ISTRIBUTION OF SUSPENDED OIL PARTICLES FOLLOWING THE GROUNDING OF HE TANKER ARROW,
edford Inst. of Oceanography, Dartmouth (Nova cotia). Atlantic Oceanographic Lab.
or primary bibliographic entry see Field 5B.
W76-11096

IL IN SEA ICE,
epartment of the Environment, Victoria (British olumbia). Frozen Sea Research Group.
or primary bibliographic entry see Field 5B.
W76-11098

DENTIFICATION AND POTENTIAL BIOLOGICAL EFFECTS OF THE MAJOR COMPONENTS IN THE SEAWATER EXTRACT OF A BUNKER FUEL,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5A.
W76-11099

THE ROLE OF DISPERSION IN FUEL OIL BIOASSAY,
Battelle Pacific Northwest Lab., Richland, Wash. Marine Research Lab.
J. R. Vanderhorst, C. I. Gibson, and L. J. Moore.
Bulletin of Environmental Contamination and Toxicology, Vol 15, No 1, p 93-100, 1976. 1 fig, 4 tab, 12 ref.

Descriptors: *Bioassay, *Mortality, *Separation techniques, *Toxicity, *Fossil fuels, *Oil pollution, *Environmental effects, *Oil spills, Continental Shelf, Shrimp, Oil-water interfaces, *Dispersion, Water pollution effects.
Identifiers: *Outer Continental Shelf, Fuel oil, Depuration, Pandalus danae.

Mortality of coon stripe shrimp (Pandalus danae) has been investigated in flowing water aquarium systems receiving measured 'spills' of fuel oil with differing methods of seawater delivery and analytical characterization. The results obtained offer a data base for discussion of the influence of seawater delivery methods and dispersion on bioassay systems. The specific objective in the research was to measure aqueous phase concentrations of No. 2 fuel oil and mortality of shrimp when three different methods of oil-seawater contact were used. The studies clearly demonstrated that differing measured concentrations of fuel oil in the water column may be produced depending on the method of fuel oil-seawater contact. The dependence of water column concentration on the method of contact is so great that data presented in terms of oil-seawater ratios alone preclude meaningful discussion of toxicity. Mortality was produced in these studies at soluble aromatic concentrations an order of magnitude below concentrations in which similar shrimp survived in the earlier studies. Thus, the current findings emphasize the need to account for a wider range of compounds in the bioassay of petroleum. (Sinha-OEIS)
W76-11100

5D. Waste Treatment Processes

RECYCLING OF LIQUID DIGESTED SEWAGE SLUDGE ON DREDGED RIVER SAND,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
V. K. Chawla, J. Yip, and D. B. Cohen.
Technology Development Report EPS 4-WP-76-3, Environmental Protection Service, April, 1976, 44 p., 7 fig., 50 ref., 10 tab.

Descriptors: *Sewage sludge, Bacteria, Liquid wastes, Sludge, Rivers, Sand, Incineration, Land, Disposal, Landfills, Heavy metals, Nutrients, Dredging, Seepage, Infiltration, *Recycling, Water pollution, Waste disposal, *Sludge treatment, Sludge digestion.
Identifiers: Sea dumping, Liquid sludge.

An 18 month study to investigate the recycling of primary digested sewage sludge on sand was conducted at the Iona Island Sewage Treatment Plant in Vancouver, B. C. A four-plot site with a total areas of 0.4 hectares was used for the investigation. In October 1972, liquid primary digested sludge was applied once to plots 2, 3 and 4 at rates of 1435, 2635, and 5705 metric tons per hectare (1560, 2860 and 6190 kg TKN/ha), respectively. Plot 1 was used as a control. Total dry matter yields of grass harvested during the period April to December 1973 were 67, 1175, 1125 and 2170 kg/ha for plots 1, 2, 3 and 4, respectively. Total dry matter yield increased with sludge application rate. With the exception of iron, the concentration of chemical elements in plant tissues grown on sludged plots increased with sludge application rate, but no plant metal toxicity was observed. Leachate samples were collected over the study period and monitored for bacterial content as well as nutrient and metals. Very high mean leachate concentrations of TKN, NO3-N, NH3-N, occurred at the highest sludge application rates compared to the control. For plots 3 and 4, the maximum mean monthly values for ammonia and nitrate nitrogen were 81 and 195 mg NH3-N/l and 238 and 159 mg NO3-N/l, respectively. For the highest sludge application, the mean monthly metal concentrations in the leachate were within the maximum permissible limits for drinking or irrigation water (0.16 mg/l copper, 0.05 mg/l zinc, 0.03 mg/l lead, 0.32 mg/l nickel and 0.03 mg/l cadmium). The coliform count fell from 11 MPN/.01 ml to 2MPN/100ml in the first six months of application. (Environment Canada)
W76-10501

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE - 1970 (1974 SUPPLEMENT),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley Pa.
For primary bibliographic entry see Field 5G.
W76-10508

SAMPLING TECHNIQUES IN URBAN RUNOFF QUALITY STUDIES,
Canada Centre for Inland Waters, Burlington, Ontario, Hydraulic Div.
For primary bibliographic entry see Field 5A.
W76-10509

MUNICIPAL WASTEWATER TREATMENT WORKS, MODEL FACILITY PLAN FOR A SMALL, RURAL COMMUNITY.
Environmental Protection Agency, Washington, D. C. Office of Water Program Operations.
EPA Report MCD-08, September 1975, 36 p. 3 fig, 13 tab, append.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Rural areas, Alternative planning, Oxidation lagoons, Repairing, Retention, Waste water disposal, Land use.

The pollution problems in Brant, South Dakota, are typical of those facing many small communities. Brant has a population of about 475 and no industry. Its sewage treatment plant, including a lift station, Imhoff tank, trickling filter, final settling tank, and sludge drying beds, was constructed in 1950. These facilities need major repairs to become operable; currently untreated sewage is discharged to a confined area. It was determined that excessive infiltration and inflow do not exist. The present system is not meeting state and Federal regulations, and the discharge of untreated sewage causes public health hazards and odor problems. The treatment alternatives considered were remodeling the existing treatment plant, replacing it with a 3-cell stabilization pond system, retention of all sewage in lagoons with no discharge, installing a waste treatment package plant, and applying treated waste water to land by spray irrigation. On the basis of environmental effects, monetary costs, effluent requirements, operational considerations, and the probable effects on the environment, the stabilization pond system was recommended. (See also W76-05075) (Snyder-FIRL)
W76-10511

HOW TO DESIGN AERATED LAGOON SYSTEMS TO MEET 1977 EFFLUENT STANDARDS SYSTEM DESIGN,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
L. G. Rich, and S. C. White.
Water and Sewage Works, Vol. 123, No. 5, p 88-89, May, 1976. 2 fig, 4 ref.

Descriptors: *Waste water treatment, *Biochemical oxygen demand, *Treatment facilities, *Aerated lagoons, *Design, Effluents, Suspended solids, Suspension.
Identifiers: Retention time.

The total biochemical oxygen demand (BOD) in aerated lagoon effluent is the soluble BOD in the effluent plus 0.54 times the volatile suspended solids in the effluent. Assuming no algae in the effluent, about 20 mg/liter suspended solids is expected; therefore, the soluble BOD should be 20 mg/liter or less and probably 10 mg/liter or less to allow a margin for error. A partially suspended lagoon following a completely suspended lagoon requires less total volume than a single lagoon does to achieve the same soluble effluent BOD concentration, and an equation makes it possible to calculate the BOD in the first lagoon when the combined area is a minimum. Once this value has been computed, the required hydraulic retention times can be estimated for the lagoons. Total retention times were determined as a function of the soluble BOD in the effluent from the first lagoon for waste waters with different kinetic coefficients. The minimum hydraulic retention time in the first cell to prevent washout of all biomass solids can be calculated, and is equal to .60 d for most domestic waste waters. The minimum retention times for both solids removal and soluble BOD should control the system design. The hydraulic retention time in the partially suspended cell should not exceed 3 days, to prevent growth of algae. The possibility of sludge accumulation in this cell and its disposal should be considered in designing the system. (Snyder-FIRL)
W76-10512

FACTORS IN THE PURIFICATION OF FLOWING SEWAGE AND ACTIVATED SLUDGE PROCESS - PART 2,
Indian Inst. of Science. Bangalore. Dept. of Biochemistry.
S. C. Pillai, E. G. Srinath, C. V. Viswanathan, B. M. Bai, and G. K. Viswanath.
Water and Waste Treatment, Vol. 18, No. 10, p 42, 44, October, 1975. 1 fig, 42 ref.

Descriptors: *Sewage treatment, *Protozoa, *Aerobic treatment, *Activated sludge, *Municipal wastes, Waste water treatment, Pollutant identification, Biological treatment, Microorganisms, Evaluation.
Identifiers: Epistylis, Carchesium, Vorticellid protozoa.

Factors affecting the purification of flowing sewage discharged from Bangalore into two main natural channels on the outskirts of the city were compared with those affecting activated sludge processes. A common factor to both processes was the development of similar protozoa, particularly the Epistylis and Carchesium species of Vorticellid protozoa. The time necessary for the purification of sewage flowing in the channels ranged from about 4-6 hr which is comparable to that required for sewage purification via the activated sludge process. When samples of the sewage were agitated by a continuous air current for 24 hr and the supernatant liquids examined at hourly intervals during this period, there was no appreciable purification. However, when the Vorticellid protozoan Epistylis was grown on a glass tube which was used for aeration of the sewage, the supernatant liquid showed a degree of purification comparable to that caused by an activated sludge in a parallel set of experiments. The influence of the protozoa on sewage purification was further confirmed by the application of a fluidization technique. (See also W76-05795) (Kreager-FIRL)
W76-10513

RESIDUAL ORGANIC MATTER IN ACTIVATED SLUDGE PROCESS EFFLUENTS VIII. SEPARATION BY MOLECULAR WEIGHTS ON SEPHADEX COLUMNS (ZBYTKOVE LATKY PO AKTIVACNIM PROCESU VIII. DELENI PODLE MOLEKULOVYCH HMOTNOSTI NA SEPHADEXECH),
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
For primary bibliographic entry see Field 5A.
W76-10514

RESIDUAL ORGANIC MATTER IN ACTIVATED SLUDGE PROCESS EFFLUENTS. IX. ISOLATION FROM WATER, FRACTIONATION ON ALUMINUM OXIDE COLUMNS AND ATTEMPTS OF IDENTIFICATION (ZBYTKOVE LATSY PO AKTIVACNIM PROCESU. IX. IZOLACE Z VODNEHO PROSTREDI, DELENI NA KYSLICNIKU HLINITEM A POKUSY O IDENTIFIKACI),
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
For primary bibliographic entry see Field 5A.
W76-10515

REGINA TERTIARY TREATMENT PLANT STUDY AND DESIGN, (PART II),
M. J. Stewart, and D. H. Lewis.
Water and Pollution Control, Vol. 114, No. 5, p 34, 36-40, May, 1976. 13 fig. 4 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Turbidity, *Phosphates, *Nutrient removal, Lime, Efficiencies, Tertiary treatment.
Identifiers: *Alum.

Test results showed that turbidity and phosphates decrease as alum dosage increases, but treatment effectiveness decreases rapidly for alum dosages beyond 150 to 200 mg/liter. It may be possible to achieved higher process efficiencies in summer, but the difference is not always pronounced. The only breakdown in process effectiveness found for lime treatment was with respect to turbidity. The greatest turbidity and phosphorus removals occurred during warm weather. The relative effectiveness of pilot plant operation with and without the settling tube module was compared. Although variability in influent characteristics caused a few aberrant results, the settling tube module was more effective than the conventional clarifier design. This research concentrated on clarification capacity, but it is equally important that the allowable solids loading rate on the bottom of the clarifier not be exceeded. The first stage of a possible future complete treatment plant was built, containing both lime and alum addition facilities operating on a split stream mode to produce a neutralized plant effluent prior to discharge. The plant can treat 20 Imgd from the stabilization ponds. Lime is delivered and stored in pebbled form; alum is transported in liquid form. The chemical clarifiers are interchangeable for either lime or alum feed. One storage basin for lime sludge and two for alum sludge are provided. Clarifier influents and effluents and the combined effluent mixing chamber are automatically sampled. (Snyder-FIRL)
W76-10516

ROUNDING UP RUNOFF: REFLECTIONS IN WASTE HANDLING SYSTEMS,
M. Lane.
Feedlot Management, Vol. 17, No. 12, p. 13-15, December, 1975. 3 fig.

Descriptors: *Feed lots, Planning, *Design, *Agricultural runoff, *Cost sharing, Waste treatment, Farm wastes, Agricultural runoff.
Identifiers: *Runoff control.

In order to participate in Soil Conservation Service programs, a feedlot owner must sign an agreement as a cooperator in the local soil conservation district or must be receiving Agricultural Stabilization and Conservation Service cost-sharing funds. Once one of these qualifications is met, expert planning assistance is at the feedlot owner's disposal through consultation with the SCS. SCS usually assists in small projects such as construction of farm ponds or terracing to prevent erosion, but it may also be called upon to assist in planning a whole feedlot design, giving guidance concerning runoff control measures. The design of all runoff control systems contains 3 basic elemets - a lagoon; a diversion around the feedlot to direct water falling inside the lot into the lagoon; and a clean water diversion, which keeps water running into the feedlot from becoming polluted. Instances of SCS assistance and planning are cited to illustrate how specific feedlot problems were overcome. Over the years, SCS has built up a knowledge of soils and drainage and altering water pathways. This places SCS in a better position than most to help control runoff from feedlots. (Merryman-East Central)
W76-10530

EPA'S NEW FEEDLOT DISPOSAL PLAN,
Calf News, Vol. 9, p. 49, 62, August, 1971.

Descriptors: *Feed lots, *Agricultural runoff, *Waste treatment, Phosphates, Nitrogen, Farm wastes, Filters, Biological treatment, Filtration, Waste disposal.
Identifiers: Biological filter, Retention ponds.

EPA's Robert S. Kerr Water Research Center in Ada, Oklahoma, is attempting to perfect a process wherein a colony of micro-organisms will purify the effluent from a 12,000-head feedlot on 8 to 10 acres of grassy slope. Using a 2-to-6 percent slope, with terraces, on soil too heavy to irrigate, the process removes better than 80% of the phosphate and about 95% of the nitrogen. A two-pond system is used with effluent being pumped from the second pond after 2 or 3 days retention. Start-up requires about six weeks to allow the colony to establish itself. The water supply must be nearly continuous. (East Central)
W76-10532

WATERWAY CLEANS FEEDLOT RUNOFF,
Beef, Vol. 11, No. 11, p. 2, July, 1975. 1 fig.

Descriptors: *Agricultural runoff, *Feed lots, *Nebraska, Farm wastes, Waterways, Waste disposal.
Identifiers: *Runoff control, Field sink, *Serpentive waterway.

Holding ponds are not entirely satisfactory for handling feedlot runoff. Odor, weed growth, and threat to safety are problems that often accompany their use. Some states do not consider feedlot runoff a water pollution hazard if the runoff flows a relatively long distance overland before reaching a stream. Consequently, USDA's Agricultural Research Service is evaluating two direct disposal systems on farms in Nebraska -- 'field sink' and a serpentine waterway. The 160 x 325-foot field sink with a 0.1% slope was installed between a feedlot and a creek. A one-foot dike was built around it. Feedlot runoff collects in a broad basin terrace and discharges to the field sink via a riser intake and underground pipe. The system functioned well with above normal precipitation in fall, 1973-June, 1974. Under conditions of severe drought, the sink produced 60 bushels of corn per acre, when much of the nearby crop was a failure. The serpentine or switchback waterway was established below a 3-acre feedlot near Gretna, Nebraska. The waterway zigzags with 8 sharp turns. In effect, the 2,600-foot waterway moves the feedlot back 2,200 feet from a stream that is about 400 feet from the edge of the feedlot. The waterway channel slopes to prevent ponding and is seeded in brome and alfalfa to retard flow. Runoff passes through debris basins before entering the channel. Only a major storm will cause an appreciable amount of effluent to enter the stream. (Merryman-East Central)
W76-10537

DISPOSAL OF CATTLE FEEDLOT WASTE IN AN ANAEROBIC LAGOON ON THE ORGANIC SOILS OF SOUTH FLORIDA--PRELIMINARY RESULTS,
Agricultural Research and Education Center Belle Glade, Fla.
For primary bibliographic entry see Field 5E.
W76-10540

WATER QUALITY AND MANAGEMENT CHARACTERISTICS OF FEEDLOT RUNOFF HOLDING PONDS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
E. C. Dickey, and D. H. Vanderholm.
Presented at the 1975 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 15-18, 1975, Paper No. 75-4568, 12 p. 6 fig, 3 tab, 8 ref.

Descriptors: *Water quality, *Feed lots, *Agricultural runoff, *Illinois, Rainfall-runoff relationships, Nitrogen, Phosphorus, Potassium, Farm wastes, Waste treatment, Water pollution sources.
Identifiers: *Holding ponds, Land application.

A study was initiated in 1974 to evaluate installed runoff control facilities in terms of their management requirements, operator acceptability, and their effectiveness in preventing water pollution. Six commercial livestock operations in central and northern Illinois--beef, dairy, and swine facilities--were monitored for two years. Findings directly related to characteristics and management of the holding ponds are presented. Each runoff control system consisted of a concrete settling basin with a gravity-drain or a pumped outlet, holding pond,

nd pumping equipment for holding-pond dewaterng. Rainfall and runoff data were collected at all ocations. Five holding ponds were sampled nonthly; the sixth was sampled weekly. The quali-y of holding-pond water is highly variable. Large ariations in nitrogen, phosphorus, and potassium oncentrations in the water were observed. Nitrogen concentration exhibited a definite easonal trend: low concentrations during the ummer months, increasing in late fall and winter, eaching a peak in late winter, and decreasing in he spring. Major factors affecting holding-pond vater quality are the management of the lot surace, the number of animals in the system, and hanges in annual rainfall patterns. In order to gain ptimum nutrient benefits, dewatering of the holdng pond should occur in the spring. However, dewatering in the fall is still recommended in most ituations to provide capacity for winter runoff torage. (Cameron-East Central)
W76-10545

AN ECONOMIC APPRAISAL OF ALTERNATIVE DAIRY WASTE MANAGEMENT SYSTEMS DESIGNED FOR POLLUTION CONTROL,
Economic Research Service, East Lansing, Mich. Farm Production Economics Div.
J. B. Johnson, C. R. Hoglund, and B. Buxton.
Journal of Dairy Science, Vol. 56, p 1354-1366, October, 1973. 8 tab, 27 ref.

Descriptors: *Dairy industry, *Economics, *Agricultural runoff, Feed lots, Confinement pens, Liquid wastes, *Farm wastes, Pollution abatement, Water pollution control, *Alternative planning, Management.
Identifiers: *Waste management, Land spreading.

Enforcement of existing and proposed legal environmental controls will necessitate adjustments in manure handling practices on many dairy farms in the United States. The cost of these adjustments will depend on dairy herd size and type of production system currently in use. Stanchion or stanchion-switch systems generally would have an exercise lot and/or a feeding lot exposed to precipitation. Runoff can be controlled by diverting around lots uncontaminated waters from areas above the lots and directing lot runoff into a detention facility. Similar control facilities could be used for open-lot housing systems. Runoff from manure spreading operations can be reduced by applying manure to soils only twice a year. Each measure mentioned requires the addition of a storage facility. Open-lot systems which use a tractor scraper-loader-spreader system for daily manure spreading can add a storage facility or can convert to a tractor scraper-lagoon-aerator-irrigation system. Covered housing systems which currently use solid manure handling systems can usually add storage facilities to eliminate daily field spreading. Covered housing using liquid manure handling systems can add a mechanical scraper to the conventional tractor scraper-storage-loader-liquid-spreader. To eliminate field odor problems in liquid manure spreading, soil injector units can be added to liquid spreaders. Some of these adjustments will reduce costs, but most will increase costs and reduce net dairy income. (Cannon-East Central)
W76-10547

FINAL REPORT, MATERIAL EVALUATION AND DEVELOPMENT PROGRAM, OSW SAN DIEGO TEST FACILITY,
Burns and Roe Construction Corp., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W76-10552

FINAL REPORT, HORIZONTAL SPRAY FILM (HTEX) AND VERTICAL TUBE (VTEX) EVAPORATOR, OSW SAN DIEGO TEST FACILITY.
Burns and Roe Construction Corp., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W76-10553

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, METAL FINISHING INDUSTRY,
Lancy Labs., Zelienople, Pa.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-248 808, $16.25 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/24, October 1975. 609 p, 12 fig, 67 tab, 114 ref. WQ5AC007.

Descriptors: *Pollution abatement, *Estimated costs, Capital costs, Costs, Industrial wastes, Waste water treatment, *Treatment facilities, Industrial water, Metals, Operating costs, Maintenance costs, Federal Water Pollution Control Act, Water pollution control.
Identifiers: *Metal finishing industry, *Federal Water Pollution Control Act Amendments of 1972, National Commission on Water Quality, Water pollution abatement technology.

Pollution abatement technologies and costs are developed for the metal finishing industry, including job shops (SIC 3471) as well as captive operations that are part of other industry categories. Eight levels of abatement are studied including those promulgated or proposed by the U.S. Environmental Protection Agency under the Federal Water Pollution Control Act of 1972 (P.L. 92-500). Total estimated costs (in 1973 dollars) to achieve the 1977 BPT level are $10.88 billion capital and $2.44 billion/yr O and M. Incremental added costs (also in 1973 dollars) to achieve the 1983 level are $10.84 billion capital and $1.7 billion/yr O and M. Also developed are residuals generated, and energy and other non-financial resource requirements. An estimated 70,000 facilities are identified under this industry category of which 4,000 are job shops. Over 70% discharge to publicly owned treatment works. (NCWQ)
W76-10555

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, IRON AND STEEL INDUSTRY,
McKee (Arthur G.) and Co., Cleveland, Ohio.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-249 661, $16.25 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/25, November 1975. 621 p, 309 ref. WQ5AC005.

Descriptors: *Pollution abatement, *Waste water treatment, *Costs, *Industrial wastes, Capital costs, *Treatment facilities, Industrial water, Operating costs, Maintenance costs, Water pollution control, Federal Water Pollution Control Act, Iron, Steel.
Identifiers: *Iron and steel industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution control technology.

Pollution abatement technologies and their costs are examined for the iron and steel industry (SIC 3312, 3315, 3316 and 3317). Several levels of abatement are reviewed, including those promulgated or proposed by the U.S. Environmental Protection Agency under the Federal Water Pollution Control Act of 1972 (PL 92-500). Total estimated costs (in 1973 dollars) to achieve the 1977 BPT abatement level (best practicable control technology currently available) are $2.2 billion capital and $180 million/yr O and M. Incremental added costs (also in 1973 dollars) to achieve the 1983 abatement level (best available technology economically achievable) are $700 million capital and $40 million/yr O and M. Also developed are residuals generated, and energy other than non-financial resource requirements. Over 400 facilities are identified under this industrial category. (NCWQ)
W76-10558

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, CONTROL OF WATER POLLUTION FROM SELECTED NONPOINT SOURCES.
Mid West Research Inst., Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-248 806, $10.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/22, November 1975. 321 p, 5 fig, 12 tab. WQ5AC088.

Descriptors: Pollution abatement, Waste water treatment, *Farm wastes, Water pollution sources, Construction costs, Costs, *Sediment control, *Sediment yield, Soil conservation, Estimated costs, *Soil erosion, Federal Water Pollution Control Act, Residual soils, Runoff, Water pollution control.
Identifiers: *Nonpoint water pollution sources, Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

Pollution control technologies, their effectiveness and costs are examined for non-irrigated cropland, construction and silviculture. (1) Implementing selected soil conservation practices for 15 million acres deemed in need of treatment would cost an estimated $2 billion, annualized at $500 million or $3.10 per acre and would reduce sediment yield from 1,800 million to 922 million tons per year. (2) Annual cost of sediment control for construction is estimated at $1.44 billion, reducing sediment yield from 198 to 140 million tons. (3) Control measures, efficiencies and costs of sediment control for silviculture are more difficult to generalize. Where applicable, chopping can reduce sediment yield substantially. (NCWQ)
W76-10567

WATER POLLUTION CONTROL ACT OF 1972, MUNICIPAL OPTIONS.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-10568

WATER POLLUTION CONTROL ACT OF 1972, SOCIAL IMPACTS, EIGHT CASE STUDIES.
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-10569

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 1).
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W76-10570

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 2),
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W76-10571

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME I),
Little (Arthur D.), Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10572

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME II),
Little (Arthur D.), Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10573

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT, VOLUME I,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10574

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT VOLUME II,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10575

WATER QUALITY ANALYSIS, IOWA-CEDAR RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W76-10576

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, CONNECTICUT RIVER.
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 5G.
W76-10577

WATER QUALITY ANALYSIS, SANTEE RIVER BASIN,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.
W76-10578

WATER QUALITY ANALYSIS, COLUMBIA RIVER.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W76-10579

WATER QUALITY AND ECONOMIC CRITERIA FOR RURAL WASTEWATER AND WATER SUPPLY SYSTEMS,
Duke Univ., Durham, N. C. School of Forestry.
R. Rajagopal, R. L. Patterson, R. P. Canale, and J. M. Armstrong.
Journal Water Pollution Control Federation, Vol. 47, No. 7, p. 1834-1847, 1975. 5 fig., 4 tab., 17 ref. NOAA SG 04-3-158-23.

Descriptors: *Rural areas, *Water supply, *Sewerage, *Water distribution(Applied), *Groundwater, Urbanization, *Michigan, Equations, Septic tanks, Water wells, Costs, Economic efficiency, Water pollution, Waste water treatment, Waste water disposal.
Identifiers: Traverse City(Mich).

An analytical method is described to evaluate wastewater disposal and water supply alternatives on the basis of both economic and groundwater quality criteria for rural areas in transition of urbanization surrounding Grand Traverse Bay, Michigan. The assessment is based on the current state of groundwater quality, statistical correlations of water quality as related to land use, soil, well, and water table characteristics, population growth and distribution, cost analysis of alternative supply and disposal systems, and then synthesized in an interactive computer system. Residential density, cherry orchards acreage, and well and soil characteristics exhibited a statistical relationship with the groundwater concentration of nitrate-nitrogen. The prediction accuracy of the nonlinear statistical models for the three land uses decreased with the increase in orchards near the sample locations. The results indicate that for a set of existing groundwater flow and soil conditions, an optimal community size may be defined to meet water quality criteria at specific acquifer depths. The cost equations indicate that the construction of community wastewater disposal and water supply systems for rural areas in the 1000 to 5000 population ranges is uneconomical. But because of concentrated development in certain locations, some communities might seek uneconomic solutions to their sewerage and water supply problems because of water quality and public health criteria. (Auen-Wisconsin)
W76-10583

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE ANIMAL FEED, BREAKFAST CEREAL, AND WHEAT STARCH SEGMENTS OF THE GRAIN MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10594

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE, FRICTION MATERIALS AND SEALING DEVICES SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10595

OXIDATION OF AMMONIA IN WATER BY FERRATES (VI) AND (IV),
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
K. Svanks.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 631, $5.00 in paper copy, $3.00 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 444, June 1976. 71 p, 18 fig, 9 tab, 26 ref. OWRT A-031-OHIO (1).

Descriptors: *Ammonia, *Oxidation, Sewage, Effluents, *Nitrogen, Nitrates, Nitrites, Phosphates, Chemical oxygen demand, *Waste water treatment, Iron, Sewage treatment, Reactions.
Identifiers: *Potassium ferrate(VI), *Ferrates(VI), Ferrates(IV).

The objective of the exploratory study was to determine the feasibility of application of ferrates (VI) to oxidation of ammonia to elemental nitrogen in pure water solutions and sewage treatment plant secondary effluent. Two competing reactions, the oxidation of ammonia and the decomposition of potassium ferrate (VI) proceed simultaneously. The net oxidation rate of ammonia, and the fraction of ammonia oxidized, depends on the relative rates of these two reactions. Generally, at pH values in the neutral and into alkaline region the reaction products are elemental nitrogen, nitrate, and nitrite, but with increasing pH the amount of nitrate and nitrite decreases. Depending on the imposed conditions, 30 to 80 percent of the oxidized ammonia was oxidized to elemental nitrogen. pH is the main factor affecting the stability of ferrate (VI) in water, and consequently also affects the extent of ammonia oxidation. A maximum of the fraction of ammonia oxidized was observed at pH 10.5 up to 11 and 15 percent was oxidized at mole ratios of ferrate (VI) to ammonia of 1:1 and 2:1 respectively and at ammonia concentrations of 15 ppm. In a sewage treatment plant secondary effluent, up to 25 percent of the ammonia was oxidized to elemental nitrogen by a two step procedure. A 30 percent C.O.D. reduction and 27 percent phosphate removal was also achieved.
W76-10611

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT: PARAMETER IDENTIFICATION,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-10613

FEASIBILITY STUDY OF A NUCLEAR POWER-SEWAGE TREATMENT SYSTEM FOR THE CONSERVATION AND RECLAMATION OF WATER RESOURCES,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
R. Fazzolare.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 630, $3.50 in paper copy, $3.00 in microfiche. Completion Report, (1976). 8 p, 1 fig, 1 tab, 3 ref. OWRT A-028-ARIZ(4). 14-31-0001-3503.

Descriptors: Water conservation, *Waste water treatment, *Sewage treatment, Reclaimed water, Activated carbon, Nuclear powerplants, Feasibility studies, *Water reuse, *Recycling, *Heated water, Heat treatment, Domestic wastes.
Identifiers: *Heated sewage.

Seventy percent of the energy produced in a nuclear power reactor is rejected to the environment as low quality heat. One possible use of this heat source is for domestic wastewater treatment. This study examined a ferric-chloride, powdered activated carbon and an aluminum sulfate, powdered activated carbon physical-chemical system in a one-step process as a function of temperature (20 - 80C). COD, suspended solids, turbidity and phosphorus removals were used to monitor performance. Significant improvement in pollutant removals was obtained at higher temperatures with the optimum results occurring between 50 and 60C. Since urban wastewater flow and electric power usage are population-dependent and the system optimum treatment temperature coincides with waste heat characteristics, a combined power plant-wastewater system would generate recyclable water.
W76-10614

DISPOSAL LAGOON.
Soil Conservation Service, Honolulu, Hawaii.
Engineering Standard, Miscellaneous Publication, Cooperative Extension Service, University of Hawaii, Volume 113, p 7-11, January, 1974.

Descriptors: *Design criteria, *Lagoons, *Waste disposal, *Hawaii, Aerobic conditions, Anaerobic conditions, Operation and maintenance, Biological treatment, *Waste treatment, Farm wastes, Effluents, *Water quality standards.
Identifiers: Effluent disposal.

A disposal lagoon is defined as an impoundment made by constructing an excavated pit, dam, embankment, dike, levee or combination of these for biological treatment of animal waste. This publication establishes, as an engineering standard for Hawaii, the minimum acceptable quality for design, construction, and maintenance of disposal lagoons located to serve predominantly rural or agricultural areas. (Merryman-East Central)
W76-10618

WATER TRANSPORT ACROSS CATION-EXCHANGE MEMBRANE. I. EXPERIMENTAL TECHNIQUE. INFLUENCE OF THE CONCENTRATION AND TEMPERATURE ON THE WATER TRANSPORT NUMBER.
Rouen Univ. (France). Lab. of Macromolecular Chemistry.
For primary bibliographic entry see Field 3A.
W76-10620

LIBRARY OF THE UNIVERSITY OF

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTEWATER TREATMENT IN CHLORINE CAUSTIC PRODUCTION,
Houston Univ., Tex.
F. D. Singleton, Jr., J. A. Galloway, and R. G. Thompson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-242 159, $5.00 in paper copy, $3.00 in microfiche. Report NSF-RA-E-74-048, 1975. 87 p, 20 fig, 17 tab, 20 ref, 2 append.

Descriptors: *Waste water treatment, *Model studies, *Water utilization, *Industrial production, Chemical industry, Costs, Industrial water, Standards, Effluents, Water quality standards, Industrial wastes.
Identifiers: Chlorine caustic, Effluent standards.

A linear economic model of a representative chlorine-caustic plant was developed and used for evaluating the economic effects of increasingly restrictive waste water effluent standards and higher costs of water withdrawals on production costs, effluent taxes, water use, and solid waste discharges in chlorine-caustic production. Both mercury cell and diaphragm cell production methods were studied at the design stage. The model included production processes, energy system processes, water use and waste water treatment processes, and disposal processes for solid wastes and brine. The least-cost combination of processes was determined for each specification of waste water effluent standards and water withdrawal costs. Each combination of processes gives the quantity of each input purchased, the quantity of each pollutant discharged, and the cost of producing the required amount of chlorine caustic. Incremental cost estimates were made for increasingly restrictive waste water effluent standards for each pollutant. The marginal values implied by each combination were used to develop demand schedules for both the disposal and withdrawal uses of water. Zero discharges of total solids increased production costs 5.6% in diaphragm cell plants and 12.1% in mercury cell plants. Only diaphragm cells can accomplish zero discharge of mercury. (Snyder-FIRL)
W76-10621

AEROSOL PRODUCTION FROM LAND APPLICATION OF WASTEWATER BY AGRICULTURAL IRRIGATION EQUIPMENT,
Brookhaven National Lab., Upton, N. Y.
G. S. Raunor, and J. V. Hayes.
Available from the National Technical Information Service, Springfield, Va 22161, as BNL-19847, $3.50 in paper copy, $3.00 in microfiche. Report BNL 19847, (1975), 2 p. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, *Aerosols, *Application methods, Land use, Irrigation, Drops(Fluids), Spraying, Sprinkler irrigation.
Identifiers: Land application.

Dye particles resulting from evaporated spray droplets were sampled to study aerosol production from sprays of four agricultural nozzle systems. This investigation was part of a larger study evaluating upland recharge of waste water as an alternative to conventional sewage treatment and as a means to return water to underground aquifefrs after removal of nutrients by growing vegetation. Only a small percentage of the dye-containing water was aerosolized, but 10 to the 10th power or more particles were produced per min from single nozzles. Most droplets were smaller than 100 micron. The number of aerosol particles produced is related to wind speed and the length of time the liquid stream is exposed to the wind. Fewer aerosols are produced at low wind Speeds from low spraying nozzles, but concentrations may be higher because dilution by the airflow is less. Emitting fixed amounts of liquid may result in production of fewer aerosols at greater flow rates due to shorter operating time and shorter exposure to the wind. (Snyder-FIRL)
W76-10625

ADVANCES IN INTERFACIAL PHENOMENA OF PARTICULATE/SOLUTION/GAS SYSTEMS; APPLICATIONS TO FLOTATION RESEARCH,
American Inst. of Chemical Engineers, N.Y.
P. Somasundaran, and R. B. Grieves.
AIChE Symposium Series, Vol. 71, No. 150, 1975, 191 p.

Descriptors: *Interfaces, *Flotation, *Waste treatment, *Surfactants, *Adsorption, Chemical properties, Physical properties, Chemical reactions, Suspended solids, Metals, Ions, Sulfites, Desalination, Sulfides.

Advances in the area of interfacial phenomena of particulate/solution/gas systems are reviewed along with their application to flotation research. Topics covered include: basic principles of interfaces and solution phenomena; the role of metal ion hydrolysis and the roles of double layers and ion exchange properties of oxide and silicate mineral flotation systems; the application of flotation processes to the removal of precipitated metal ions from aqueous solution, calcium sulfite from scrubber liquor, surfactant additives and suspended solids from desalination solutions, and submicron particulates via high expansion foams; solid/solution/gas properties such as contact angle; solid/solution properties such as adsorption and electrokinetics; and solution/gas properties such as surface tension. The above properties are in most cases correlated with the flotation characteristics of minerals. The flotation chemistry of sulfide mineral systems is also discussed. (See W76-10628 thru W76-10636) (Kreager-FIRL)
W76-10627

INTERFACIAL CHEMISTRY OF PARTICULATE FLOTATION,
Henry Krumb School of Mines, New York.
For primary bibliographic entry see Field 5B.
W76-10628

ELECTROCHEMICAL PROPERTIES OF THE OXIDE-SOLUTION INTERFACE IN RELATION TO FLOTATION,
Department of Energy, Mines and Resources, Ottawa (Ontario). Mineral Sciences Div.
For primary bibliographic entry see Field 5B.
W76-10629

ION AND PRECIPITATE FLOTATION OF METAL IONS FROM SOLUTION,
Pennsylvania State Univ., University Park. Mineral Processing Section.
J. W. Perez, and F. F. Aplan.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 34-39, 1975. 3 fig, 3 tab, 25 ref.

Descriptors: *Water purification, *Flotation, *Copper, *Iron, *Ions, Efficiencies, Precipitation intensity, Surfactants, Chemical reactions, Evaluation, Performance, Sulfides, Metals.
Identifiers: Hydroxides, Precipitate flotation, Ion flotation.

The processes of ion and precipitate flotation were studied in connection with the removal of copper and iron ions from aqueous solutions. Precipitate flotation proved superior to ion flotation with respect to the amount of surfactant used. Roughly one mole of collector was required for every mole of metal ion removed during ion flotation, whereas only about 1/100 mole of surfactant was required for the removal of a mole of metal ion during precipitate flotation. Metal ion precipitation as sulfides showed the following advantages over precipitation as hydroxides: increased selectivity between species, reduced froth volumes, and the introduction of a broad variety of additional surfactants, especially sulfhydryl compounds which can be used as the collector. A mechanical laboratory flotation cell gave precipitate recoveries similar to those achieved with a foam column; the mechanical cell was also simpler to operate and showed greater potential for the control of foaming and thus froth volume. Breakup of precipitated aggregates was negligible with copper sulfide precipitates and modest for hydroxide precipitates. (See also W76-10627) (Kreager-FIRL)
W76-10630

PRECIPITATE FLOTATION OF CALCIUM SULFITE FROM DILUTE AQUEOUS SOLUTION WITH AN ANIONIC SURFACTANT,
Kentucky Univ., Lexington. Dept. of Chemical Engineering.
R. B. Grieves, D. Bhattacharyya, and W. T. Strange.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 40-45, 1975. 4 fig, 1 tab, 21 ref.

Descriptors: *Flotation, *Waste water treatment, *Industrial wastes, *Surfactants, *Sulfite liquors, Separation, Efficiencies, Feasibility studies, Performance, Evaluation, Chemical reactions, Treatment, Anions, Aqueous solutions.
Identifiers: *Precipitate flotation, Calcium sulfite.

Studies were conducted to assess the feasibility of using precipitate flotation for the treatment of waste streams from wet limestone scrubbing processes used to remove sulfur dioxide from power plant stack gases. The precipitation of calcium sulfite from dilute aqueous solutions (0.0025-0.0105 Molar) at a pH of 8.6 in the presence of calcium sulfate, followed by flotation with the strongly acidic and anionic surfactant sodium dodecylbenzenesulfonate at a feed to sulfite ratio of 0.011 mole/mole resulted in 85% removal of the total sulfite. An increase in the feed calcium to sulfite ratio from 1.0 to 2.0 did not affect the flotation as long as sufficient surfactant was present but did substantially improve the removal of total sulfite due to enhanced precipitation. (See also W76-10627) (Kreager-FIRL)
W76-10631

DETERMINATION OF SURFACE EQUILIBRIA AND MASS TRANSFER RATES IN A CONCURRENT FLOW BUBBLE COLUMN,
California Univ., Berkeley. Dept. of Chemical Engineering; and California Univ., Berkeley. Sea Water Conversion Lab.
E. Valdes-Krieg, C. J. King, and H. H. Sephton.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 46-51, 1975. 4 fig, 21 ref.

Descriptors: *Foam fractionation, *Waste water treatment, *Adsorption, *Surfactants, *Metals, *Solid wastes, Separation techniques, Flow, Equilibrium, Brines, Ions, Treatment, Equipment, Evaluation.
Identifiers: Bubble fractionation.

A technique for the measurement of surface equilibria in a concurrent-flow, gas-liquid bubble column was developed as part of a more extensive program dealing with the removal of surfactants, metal ions, and particulate matter from aqueous systems by combined foam and bubble fractionation. Test solutions consisted of either de-ionized water or model solutions simulating three-fold concentrated seawater brine. The concurrent flow method allowed for the determination of surface equilibria under both foaming and nonfoaming conditions. Mass transfer coefficients computed from concurrent flow experiments indicate that care must be exercised in the design of devices for adsorption equilibrium measurements to ensure enough bubble contact time with the liquid for equilibration to occur. The mass transfer rates ob-

served in the present experiment indicated that a satisfactory approach to equilibrium was obtained for a column of 174 cm in height. (See also W76-10627) (Kreager-FIRL)
W76-10632

BEHAVIOR OF HYDROGEN AND HYDROXYL IONS AT THE OXIDE-WATER INTERFACE,
Kyoto Univ., (Japan). Dept. of Mineral Science and Technology.
For primary bibliographic entry see Field 5B.
W76-10633

CHARACTERIZATION OF ADSORBED COBALT AT THE OXIDE-WATER INTERFACE,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
P. H. Tewari, and N. S. McIntyre.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 134-137, 1975. 5 fig, 1 tab, 7 ref.

Descriptors: *Adsorption, *Cobalt, *Flotation, *Waste treatment, *Interfaces, *Oxides, Chemical reactions, Metals, Ions, Water pollution control.
Identifiers: Aluminum oxide, Zirconium oxide, Oxide-water interfaces.

The adsorption of cobalt at the oxide-water interface was studied using aluminum oxide and zirconium oxide. The photoelectron line-binding energies for the adsorbed species were compared with those for a number of cobalt oxides and hydroxides to identify the cobalt species adsorbed onto the surface. For cobalt adsorbed from solutions at 30 C, the presence of electronic shake-up associated with the photoelectron lines indicated that the species was paramagnetic and was probably divalent cobalt. Adsorption of divalent cobalt on zirconium oxide and aluminum oxide increased with pH and temperature. Increasing surface coverage by adsorption produced surface precipitation of cobalt hydroxide under conditions that did not cause precipitation in the bulk solution. At higher temperatures the adsorbed cobalt reacted in the substrate to produce compounds like aluminates and spinels. Adsorption of metal ions from aqueous solutions is important to understanding processes involving mineral flotation and water pollution control. (See also W76-10627) (Kreager-FIRL)
W76-10634

CHARACTERIZATION OF SULFIDE MINERAL SURFACES IN FROTH FLOTATION SYSTEMS USING ELECTRON SPECTROSCOPY FOR CHEMICAL ANALYSIS,
Missouri Univ., Rolla. Dept. of Metallurgical and Nuclear Engineering.
R. K. Clifford, K. L. Purdy, and J. D. Miller.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 138-147, 1975. 6 fig, 4 tab, 44 ref.

Descriptors: *Analytical techniques, *Spectroscopy, *Froth flotation, *Waste treatment, *Sulfides, *Adsorption, Measurement, Feasibility studies, Evaluation, Surfaces, Pollutant identification, Chemical analysis.
Identifiers: Electron spectroscopy.

The feasibility of using electron spectroscopy for the characterization of 10 natural sulfide mineral surfaces in froth flotation systems was evaluated. Surface analyses on high quality speciments were made after comminution in air, comminution in a nitrogen atmosphere, adsorption of xanthate collector, and adsorption of dithiophosphate collector. Analyses were also made after modifiers such as disodium chromate, sulfur dioxide, starch, sodium cyanide, and copper sulfate and the collector had been adsorbed onto the surfaces of the sulfide minerals. Electron spectroscopy proved to be useful for following the action of modifiers rather than collectors due to the large amounts of sulfur and background carbon already present on the sulfide surfaces. The technique shows potential for yielding semiquantitative chemical analyses of the oxidation states of many elements on mineral surfaces. Normalization constants for semiquantitative analyses based on relative elemental sensitivity were calculated for each of the ten minerals studied. (See also W76-10627) (Kreager-FIRL)
W76-10635

ADSORPTION MECHANISM OF SULFIDES AT A PLATINUM-SOLUTION INTERFACE,
Karnataka Regional Engineering Coll., Suratkal (India).
K. A. Natarajan, and I. Iwasaki.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 148-156, 1975. 9 fig, 1 tab, 26 ref.

Descriptors: *Electrodes, *Adsorption, *Sulfides, *Hydrogen sulfide, *Interfaces, *Electrochemistry, analytical techniques, Flotation, Waste water treatment, Sewage treatment, Monitoring.

The behavior of platinum electrodes in the presence of hydrogen sulfide and sulfide ions was studied to provide information on the effects of sulfides on electrochemical measurements used for process control in connection with water and sewage treatment systems as well as flotation processes. In acidic solutions, hydrogen sulfide was a severe poisoning agent, with electrode behavior becoming erratic in its presence. In neutral to alkaline solutions, the presence of sulfide ions in low concentrations did not seriously hamper the electrode response. The mechanism of sulfide adsorption at the platinum solution interface is discussed in relation to various types of potential measurements. (See also W76-10627) (Kreager-FIRL)
W76-10636

MONITORING: THE TRIGGER FOR ACTION,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5A.
W76-10640

AN EVALUATION OF AUTOMATIC WASTE-WATER COMPOSITORS,
Environmental Protection Agency, Kansas City, Kans. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W76-10652

MONITORING OF SUBSURFACE WASTE-DISPOSAL OPERATIONS: A GENERALIZED SYSTEMS APPROACH WITH EXAMPLES FROM CANADIAN CASE HISTORIES,
Windsor Univ. (Ontario). Dept. of Geology.
F. Simpson.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-7-1 - 9-7-4. 21 ref.

Descriptors: *Waste disposal, *Waste disposal wells, *Injection wells, *Monitoring, *Systems analysis, Wastewater treatment, Chemical reactions, Reservoirs, Aquifers, Equipment, Observation wells, Well data, *Canada.

A systems approach to subsurface waste disposal and monitoring is presented. A typical subsurface-disposal facility is broken down into the following three subsystems: an actuator (the disposal well) through which materials (fluid wastes) and energy (injection pressures and exothermic heat of chemical reactions) are directed into subsurface reservoirs; an injection-affected subsurface space of the disposal interval in which the growing plume of wastes is accommodated through structural adjustment of the aquifer framework and displacement of formation fluids; and a monitoring device which provides a continuous record of both waste behavior in the subsurface environment and the response of the reservoir strata to injection. Monitoring usually takes the form of one or more of the following: wellhead records of injection and annular fluid pressures; shallow and deep observation wells; and geodetic surveys to detect subsidence or increase in strain rate near fracture zones. The current status of monitoring in Canadian subsurface-disposal operations is reviewed with reference to 74 waste-injection facilities initiated to date. (See also W76-10637) (Kreager-FIRL)
W76-10662

SORPTION CAPABILITIES OF SOILS FOR PHOSPHATE REMOVAL,
Ontario Ministry of the Environment, Toronto. Applied Science Section.
G. D. Zarnett.
January, 1976, 56 p. Publication No. S58, 14 fig, 40 ref.

Descriptors: *Waste water treatment, *Sorption, *Soils, *Phosphates, *Efficiencies, Soil filters, Ion exchange, Adsorption, Nutrient removal, Septic tanks.

The efficiency of a septic tank tile field system depends heavily on the capability of the soil, which acts both as a filter and an ion exchange-adsorption medium, to remove potentially detrimental contaminants. Soil samples were analyzed to determine the amount of phosphorus already present and the amount of phosphorus that would rapidly be taken up by the soil. Phosphorus removal from effluents passing through soil took place by a combination of ion exchange, physical adsorption, and precipitation. Ion removal was related to the clays' structure and mineral content. Clays act by ion exchange and prefer the counter ion of higher valence. Selectivity increases with decreasing hydrated radius. Phosphate isotherms were determined by a 24 hr batch equilibration with a solution of a known phosphorus concentration. The degree of sorption by combined mechanisms was evaluated by an equilibrium-adsorption procedure. The Langmuir Isotherm Equation was used to correlate the equilibrium distribution between the soil and liquid phases. The Langmuir model can be readily extended to multi-species solutions. The rate of phosphorus movement in the soil was estimated using a form of the Langmuir Isotherm Equation, which also applies to the movement of other contaminants in groundwater flow. The life-time of the particular soil-groundwater system was then determined from the groundwater flow rate and the calculated ratio of water to contaminant velocity. (Snyder-FIRL)
W76-10673

DO REGULATED FREIGHT RATES DISCOURAGE RECYCLING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W76-10676

OWRT INTEREST IN NEW TECHNOLOGIES FOR WATER TREATMENT,
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10677

FLUID-MECHANICS ASPECTS IN THE DESIGN OF SEWAGE OUTFALLS INTO THE SEA (STROEMUNGSMECHANISCHE ENTWURFSASPEKTE FUER ABWASSEREINLEITUNGEN INS MEER),
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
For primary bibliographic entry see Field 5E.
W76-10678

A FEASIBILITY STUDY OF THE CONTROL OF POLLUTION FROM INDUSTRIAL WASTE WATERS DISCHARGED INTO THE LAGOON OF VENICE,
Bostock, Hill and Rigby. Birmingham, (England).
R. K. Chalmers, and S. H. Jenkins.
Water Pollution Control, Vol. 75, No. 2, p 176-191, 1976. 4 fig, 7 tab, 5 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Feasibility studies, *Water pollution effects, *Lagoons, Treatment facilities, Sewage treatment, Evaluation, Chemical oxygen demand, Nitrogen, Ammonia, Sewers, Activated sludge, Costs, Effluents.
Identifiers: *Lagoon of Venice(Italy).

The feasibility of controlling industrial waste water discharged into the lagoon of Venice was investigated. Studies of the water quality in the lagoon and different canals throughout Venice revealed average nitrogen (as ammonia) concentrations ranging from 1.07 g/liter at Marittima to 6.49 g/liter at Fusina with corresponding chemical oxygen demand values of 32.71-34.31 mg/liter during the 1969-1970 period. Two technically feasible treatment alternatives were identified. One method involved making maximum use of the public sewer for industries preferring this disposal method and treating the remaining industrial effluent at one or more plants on the industrial site. The other alternative was to make maximum use of the public sewer and sewage treatment capacity, with the remaining portion of the industrial effluent being conveyed through a new and separate sewer to the sewage works for combined treatment with sewage. On the basis of costs for the treatment of similar chemical wastes using activated sludge and sludge incineration, the cost of treating the major part of the industrial effluent (about 75% of the load) on the industrial site appeared to be about the same of slightly greater than that for combined treatment at the sewage works. (Kreager-FIRL)
W76-10679

CITIES NEED SEWERLESS TOILETS,
Institute for Local Self-Reliance, Washington, D.C.
P. M. Nesbitt, and N. N. Seldman.
Building Systems Design, Vol. 73, No. 3, p 11-17, April/May, 1976. 10 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Sewers, Sewage disposal, Costs, Biodegradation, Incineration.
Identifiers: *Sewerless toilets.

Compost toilets may have advantages in urban as well as rural areas. Alternatives to centralized physical-chemical waste water treatment technologies should be considered due to tough water quality standards and increasing costs of labor, energy, and chemicals. Upgrading and expansion of treatment plants are not expected to significantly improve overall river quality, because erosion and runoff problems are being ignored. Expansion and upgrading costs for treatment facilities are high, and operating costs are increasing. As sewage treatment improves, greater quantities of sludge are produced. The size of the waste load should be reduced. Sewer pipe should be repaired so that groundwater does not seep into the system, where it is treated unnecessarily. Sewerless toilets theoretically could eliminate the problems of large, centralized sewerage systems. One of these, the compost toilet degrades the wastes naturally to produce compost. Aerobic tanks are similar to septic tanks, but air is mixed into the tank, making them more reliable in areas where ordinary septic tanks have failed. Incineration toilets, which have been used effectively in remote areas, use large amounts of energy but could still be less expensive than centralized treatment. The closed loop oil-flush toilet is also available, which is flushed with a mineral oil from which the wastes are separated by gravity, so that the oil can be reused. (Snyder-FIRL)
W76-10680

HOW TO USE AND SELECT A SCREW PUMP,
Lakeside Equipment Corp. Bartlett, Ill.
For primary bibliographic entry see Field 8C.
W76-10681

FIBER-GLASS-REINFORCED POLYESTERS AND FURAN RESINS FOR WATER- AND WASTE-TREATMENT SYSTEMS,
Ashland Chemical Co., Columbus, Ohio. Resins and Plastics Div.
For primary bibliographic entry see Field 8G.
W76-10682

COMPARING INFLOW AND INFILTRATION,
Pool (Charles) and Associates, Inc., Ketchikan, Alaska.
J. J. Lutz.
Water and Sewage Works, Vol. 123, No. 5, p 68-69, May, 1976. 4 fig.

Descriptors: *Infiltration, *Inflow, *Sewers, *Hydrograph analysis, Analytical techniques, Hydrographs, Storm runoff, Computer programs, Cost-benefit analysis, Waste water treatment.
Identifiers: Infiltration/inflow.

Both inflow and infiltration into sewer systems vary considerably, and the problem of comparing systems can be avoided by standardizing field measurements to a common denominator to adjust all measured inflow and infiltration inputs to their probable peak values. This approach was used in Ketchikan, Alaska, where brief, intense inflow and infiltration episodes occur. Hydrograph analysis was performed, using a graphical technique similar to that used for stream hydrograph analysis. The first step involves subtracting the sanitary sewage component as determined from a dry weather base flow period. The graphical separation of infiltration is accomplished by estimating 'straight line' patterns on semilogarithmic graph paper as is done in determining stream baseflow levels in hydrology applications. After a number of storms have been analyzed, it is possible to estimate the probable worst infiltration rate and to relate inflow to rainfall. Inflow and infiltration problems are standardized by expressing every individual problem as a percentage of the whole at the time of measurement and multiplying the percentage by anticipated peak inflow or infiltration. If the percentages add up to more than 100%, the hydrograph analysis obviously bears checking. Individual percentages adding up to less than 100% of the total infiltration/inflow problem quantify the magnitude of undiscovered problems. A computer program has been developed to perform the standardization arithmetic once hydrographs have been manually analyzed. There is a degree of judgment involved when splitting the hydrograph into components, and users are cautioned to watch for seasonal variations. These techniques demonstrate that it is possible to adapt cost-effective analysis to the complexities of infiltration/inflow behavior. (Snyder-FIRL)
W76-10683

CLEVELAND MIXES METHODS IN SEWER CONSTRUCTION.
Water and Sewage Works, Vol. 123, No. 5, p 90-91, May, 1976. 2 fig.

Descriptors: *Interceptor sewers, *Tunnels, *Tunneling, *Excavation, *Sewers, *Tunneling machines, Soil types, Diversion structures, Storm water, Clays, Shales.

The Northwest Interceptor Sewer, one of five to be constructed in the Cleveland Regional Sewer District, is currently under construction and will divert stormflow in times of heavy rainfall. A combination of tunneling techniques are being used, because the sewer extends through several miles of mixed soil composition. A 4,200-ft-long open cut is also being used. For one section, an electrically powered machine with a 6 ft long blade cut the blue clay soil; then circular steel ribs were inserted. In areas where earth composition is shale, mining machines are being used. Various means are also being used to support the tunnels. Laser beam guidance systems have been used to keep the tunnel on line and grade. (Snyder-FIRL)
W76-10684

UNDERLAKE SEWER SPURS RESORT DEVELOPMENT,
Burns and McDonnell, Kansas City, Mo.
N. McDonald, and W. Goodnow.
Water and Wastes Engineering, Vol. 13, No. 5, p 70, 72, May, 1976. 1 fig.

Descriptors: *Sewers, *Waste water treatment, *Treatment facilities, *Interceptor sewers, *Sewerage, *Subsurface drainage, Sanitary engineering, Materials, Engineering structures, Conduits, Lakes, Missouri.

An interceptor and waste water treatment plant project for the 25-square-mile Middle Big Creek watershed located south of Lee's Summit, Missouri is described. Sub-aqueous interceptors extend through three lake areas and are designed to provide gravity sewer service to the lakes' frontal development and eliminate the need for expensive lift station and force main systems around lake perimeters. The interceptor construction is designed to provide sewer service to a projected ultimate population of 78,000. The sub-aqueous pipe through the lakes is either ductile iron or prestressed steel-cylinder concrete pipe with supplemental interior coatings for corrosion and erosion protection. The pipeline is buried beneath the lake and pressure tested at heads greater than the lake's flood pool elevations to insure that lake water does not leak into the sewer. A 2 million gallon/day treatment plant is also scheduled for construction and will include a 2000 gallon/minute lift station, two 10-foot-deep aeration basins totaling 13.26 surface acres, a chlorine contact chamber, a standby power generator, and a blower building containing all controls and aeration compressor equipment. The interceptor and treatment plant project is funded by a 75% Environmental Protection Agency grant, 15% state grant, and 10% local share. (Kreager-FIRL)
W76-10685

HYDRAULIC JUMP IN CIRCULAR SEWERS,
Greater Chicago Metropolitan Sanitary District, Ill. Sewer Design Section.
A. S. Paintal.
Water and Sewage Works, p R-216-R-217, April 30, 1976. 4 fig.

Descriptors: *Sewers, *Hydraulic jump, *Graphical methods, *Equations, *Graphical analysis, Fluid mechanics, Hydraulics, Flow, Flow rates, Waste water treatment, Sanitary engineering.

A graphical method for estimating hydraulic jump depths in circular sewers is presented. The method is developed by first writing an equation for applying the momentum principle to a hydraulic jump in a horizontal circular sewer. Equations are then developed which relate the pre-jump and post-jump depths to the flow rate and sewer size. A graphical representation of these equations is then used to estimate pre- or post-jump depth for a given flow depth and flow rate. (Kreager-FIRL)
W76-10686

TOWN MAINTAINS SEWERS DESPITE 'SUGAR SAND',
Bossier City Utilities Dept., La.
J. H. Venable.

Water and Wastes Engineering, Vol. 15, No. 3, p 45, 48, May, 1976.

Descriptors: *Sewers, *Quicksand, *Municipal wastes, *Repairing, *Maintenance, Equipment, Financing, Sanitary engineering, Geology, Polymers, Materials.
Identifiers: Sugar sand, Polyvinyl chloride.

Measures taken by Bossier City, Louisiana to maintain over 100 miles of sewer line which is particularly susceptible to breakage as a result of the fact that the city is located atop a subterranean layer of quicksand-like material called sugar sand are described. The loose consistency of sugar sand causes sewer line shifts, resulting in breakage. The exclusive installation of polyvinyl chloride pipe on both repair and new line construction was initiated to reduce problems associated with susceptibility to shock and soil corrosion. The city handles its own repair jobs internally and owns such equipment as a truck-mounted flexible high-velocity pipe cleaning machine, two trailer-mounted standard city sets, and a sewerodder. Originally, the city planned to amortize the equipment purchases over 10 years but found that much of it has paid for itself in just 2.5 years. Owning the equipment has also resulted in more flexible and efficient handling of sewer line repairs. (Kreager-FIRL)
W76-10687

WATER POLLUTION THROUGH RAIN OVERFLOWS FROM MIXED SEWERS (GEWASSERVERSCHMUTZUNG DURCH REGENUBERLAUFE AUS MISCHKANALISATIONEN),
For primary bibliographic entry see Field 5B.
W76-10688

FIVE PUMPS SALVAGE A QUEBEC SEWER JOB,
For primary bibliographic entry see Field 8C.
W76-10689

SEWERS - RELINING VS REPLACEMENT,
Grand Rapids City Engineer Office, Mich.
For primary bibliographic entry see Field 8G.
W76-10690

MARINE SANITATION DEVICE STANDARD,
Environmental Protection Agency, Washington, D. C.
R. F. Train.
Federal Register, Vol. 40, No. 198, p. 47972-74, October 10, 1975. 3 p.

Descriptors: *Federal Water Pollution Control Act, *Environmental sanitation, *Sewage disposal, Pollution abatement, *Waste water treatment, Federal jurisdiction, State jurisdiction, Water pollution, Treatment facilities, Waste treatment, Freshwater, Legislation, Water law, Standards, Flow characteristics, Waste water(Pollution), Lakes.
Identifiers: *Marine toilets, Administrative regulations, *FWPCA Amendments of 1972.

In October, 1975, the Environmental Protection Agency (EPA) proposed revision of 40 CFR Part 140, the Marine Sanitation Device Standard. This revision provides for a no-discharge standard for vessel sewage wastes in land-locked freshwater lakes, freshwater reservoirs, or other freshwater impoundments, or in rivers not capable of navigation by an interstate vessel on which a marine toilet facility has been installed. In all other navigable waters, U. S. Coast Guard certified flow-through treatment devices may be installed and operated on vessels. This approach is consistent with the EPA's focus on physical characteristics of water bodies. Section 312(f) of the Act provides mechanisms whereby individual states may obtain no-discharge regulations for specified water bodies. Under section 312(f)(3) any water within a state which is not included in the general no-discharge standard may be made no-discharge water by the state upon a showing that adequate pump-out and treatment facilities are reasonably available for all vessels plying such waters. (Reinders-Florida)
W76-10758

SOAP AND DETERGENT MANUFACTURING CATEGORY PRETREATMENT STANDARDS FOR NEW SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10759

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY, PROPOSED PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10760

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10761

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, UREA SUBCATEGORY,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10764

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS FOR NEW SOURCES FOR THE PHOSPHATE SUBCATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10768

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY, ETHYLENE OXIDE, ETHYLENE GLYCOL, METHYL AMINES AND OXO CHEMICALS PROCESSES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10769

WATER PROGRAMS SECONDARY TREATMENT INFORMATION,
Environmental Protection Agency, Washington, D.C.
J. Quarles.
Federal Register, Vol 40, No 159, p 34522-23, August 15, 1975. 2 p.

Descriptors: *Waste water treatment, *Disinfection, *Chlorine, *Pathogenic bacteria, *Water quality standards, Municipal wastes, Coliforms, Domestic wastes, Public health, Bacteria, Sewage bacteria, Water pollution, Regulation, Administrative agencies, *Sewage treatment, Federal government, Inorganic compounds, Industrial wastes, Biological treatment.
Identifiers: *Carcinogens, Administrative regulations, FWPCA Amendments of 1972.

The Environmental Protection Agency (EPA) has proposed that the secondary treatment regulation be amended by deleting the effluent limitations for fecal coliform bacteria. The biological or physical/chemical processes used in secondary waste water treatment processes are not capable of making a significant reduction in pathogenic organisms. This reduction is typically accomplished by a disinfection process using chlorine or its derivatives. Since chlorine may form carcinogenic compounds, the EPA is discouraging uncontrolled or excessive use unless necessary for the protection of public health. Another proposed amendment is intended to clarify the effluent pH limitations. For effluents from physical/biological treatment processes followed by disinfection pH adjustments are not required. (Capehart-Florida)
W76-10770

DOMESTIC WASTEWATER DISINFECTION, SECONDARY TREATMENT,
Environmental Protection Agency, Washington, D.C.
J. Quarles.
Federal Register, Vol 40, No 159, p. 34524, August 15, 1975. 1 p.

Descriptors: *Domestic wastes, *Waste water treatment, *Water quality standards, *Disinfection, *Chlorination, Municipal wastes, Fisheries, Shellfish, Coliforms, Federal Water Pollution Control Act, Chlorine, Irrigation, Public health, Halogenated pesticides, Toxins, Toxicity, Bacteria, Sewage bacteria, Water pollution, Regulation, Administrative agencies, Water quality, Standards, Federal government, Sewage treatment.
Identifiers: *Carcinogens, Administrative regulations.

The Environmental Protection Agency has proposed amendments to the domestic waste water disinfection section of the regulation for secondary treatment by publicly owned treatment works. The amendment deletes the fecal coliform bacteria limitations from the definition of secondary treatment. Chlorine and chlorine-based compounds are widely used for disinfection of waste water. These compounds can form halogenated organic compounds which are potential carcinogens. In addition, chlorine residues can reach a level that is toxic to aquatic life. For these reasons, the benefits of chlorine disinfection should be balanced against the risks involved. Chlorine should be used only when public health hazards exist. The need for disinfection is to be established by water quality standards which shall take into consideration the protection of public water supplies, fisheries and shellfish waters, irrigation and agricultural waters, and waters where human contact is likely. (Capehart-Florida)
W76-10771

INK FORMULATING POINT SOURCE CATEGORY, PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10774

VARIANCES AND TEMPORARY PERMITS FOR OPERATION OF NON-CONFORMING SEWAGE DISPOSAL FACILITIES.
For primary bibliographic entry see Field 6E.
W76-10793

CHARACTERIZATION AND TREATMENT OF BRINE WASTEWATERS FROM THE CUCUMBER PICKLE INDUSTRY,
North Carolina Univ., at Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 3E.
W76-10805

FOAM FORMATION IN PLANTS FOR BIOLOGICAL PURIFICATION OF EFFLUENTS FROM THE MANUFACTURE OF KRAFT PULP (PENOOBRAZUVANETO V STANTSIITE ZA BIOLOGICHNO PRECHISTVANE NAOTPAD' CHITE VODI OT PROIZVODSTVOTO NA SULFATNATSELULOZA),
D. Baicheva, S. Bogoev, and M. Toneva.
Tseluloza i Khartiya, Vol. 6, No. 4, p 29-32, 1975. 1 fig, 4 ref, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Foaming, Wastes, *Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Municipal wastes, Lignins, Fibers(Plant), Stabilty, Biological treatment, Water purification.
Identifiers: Black liquors, Kraft mills, Sulfite pulp mills.

Effluents purified by the activated sludge method at the S. Kiradzhiev pulp and paper mill in Novi Krichim, Bulgaria, consist of wastes from the production of kraft and neutral sulfite pulps and kraft paper. A similar plant at the Razlog mill purifies a mixture of mechanically pretreated effluents from the manufacture of kraft pulp and paper, municipal sewage, and waste waters from the yeast-producing hydrolysis factory. Foaming at the Novi Krichim plant is intermittent, while at the Razlog plant it is a constant phenomenon, which cannot be controlled by the available mechanical means. Analyses were made of the foams at various stages of the purification process. In all samples, lignin and fibers were the main components. The foam samples also contained smaller amounts of activated sludge and substances extractable with ether. The foaming tendency and the foam stability of lignin (from black liquor), ether extractives (from concentrated black liquor), their 1:1 mixture, and of black liquor to which activated sludge and fibers had been added were investigated. The extractives caused the formation of large volumes of foam which is unstable. Lignin forms smaller amounts of foam, but this foam is stable and stabilizes the foam formed by the extractives. Activated sludge reduces the foaming in proportion to its amount, and this explains the lesser foaming in aeration tanks compared to the mixing tank. The action of fibers depends on their dimensions: small fibers stabilize foam, large fibers prevent its formation. The formation of stable foam at the Razlog purification plant is apparently due to the presence of large amounts of fines. (Stapinski-IPC)
W76-10833

REMOVAL OF SURFACE-ACTIVE AND OTHER SUBSTANCES CAUSING THE FORMATION OF STABLE FOAM DURING PURIFICATION OF EFFLUENTS FROM THE MANUFACTURE OF UNBLEACHED KRAFT PULP (OPITI ZA OTSTRANYAVANE NA POV'RKHNOSTNO-AKTIVNITE I DRUGI VESHCHESTVA, OBUSLAVYASHCHI OBRAZUVANETO NA USTOJCHIVA PYANA PRI PRECHISTVANETO NA OTPAD'CHNI VODI OT PROIZVODSTVOTO NA NEIZBELENA SULFATNA TSELULOZA),
D. Baicheva.
Tseluloza i Khartiya, Vol. 6, Noo. 5/6, p 19-24, 1975. 7 fig, 1 ref, 1 tab.

Descriptors: *Pulp wastes, *Lignins, *Flotation, *Waste water treatment, *Surfactants, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Foaming, Coagulation, Color, Water pollution control, Flocculation, Water purification.
Identifiers: Aluminum sulfate, Foam control, Black liquors.

A previous study of foam formation in the biological purification plants of two Bulgarian pulp and paper mills has shown that lignin and small fibers are the main components of the effluents responsible for the formation of stable foam. A detailed description is given of laboratory experiments conducted on samples of effluents from the two mills containing various amounts of lignin, in which lignin and other surface-active agents were removed by pressure flotation with and without the use of coagulants and flocculants. Based on the results obtained, the following process is recommended: flotation under a pressure of 4 atmospheres with the addition of a coagulant (aluminum sulfate) to the flotation column. The amount of coagulant depends on the content of lignin in the effluent, a sufficient amount being 1 g aluminum/3.7-6 g lignin. Compared to other methods of foam control (mechanical, chemical antifoams), the proposed method has the advantage of simultaneously decolorizing the effluent and not introducing any chemicals that would increase water pollution or prevent the recycling of the purified effluent. The treatment should preferably be applied to effluents strongly contaminated with black liquor prior to their pooling with other kraft mill effluents. (Stapinski-IPC)
W76-10834

COAGULATION OF TEXTILE INDUSTRY EFFLUENTS WITH CATIONIC POLYELECTROLYTES (KOAGULACJA SCIEKOW PRZEMYSLU WLOKIENNICZEGO PRZY UZYCIU POLIELEKTROLITOW KATIONOWYCH),
Centralne Laboratorium Dziewiarstwa (Poland).
J. Rouba.
Przeglad Wlokienniczy, Vol. 29, No. 12, p 635-636, December, 1975. 5 ref, 3 tab.

Descriptors: *Textiles, *Waste water treatment, *Coagulation, *Polyelectrolytes, Waste treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Water purification, Dyes, Bleaching wastes, Color, Sediments, Flocculation, Cations.
Identifiers: Sedipur KA, *Cationic polyelectrolytes.

Experimental data are presented on the effectiveness of the cationic polyelectrolyte Sedipur KA (BASF) when used as coagulant for textile industry effluents. The chemical, in the form of a 1% solution, was used for coagulating combined concentrated effluents consisting of spent dyeing, bleaching, and plasticizing baths, and effluents from dyeing with direct and reactive dyes. In the first case, Sedipur KA gave complete decolorization and a good clarification at a dosage of 150 mg/cu dm. The chemical effectively decolorized effluents from direct dye dyeing (over 90%) along with clarification of the effluent. It was ineffective for spent reactive dye baths. The sediments had a tendency to flocculate rather than sediment; they were obtained in amounts considerably smaller than with the use of inorganic coagulants, and could be burned. (Stapinski-IPC)
W76-10836

FULL-SCALE TESTS OF AN INSTALLATION FOR PURIFICATION OF VISCOSE PRODUCTION EFFLUENTS BY ELECTROFLOTATION (PROIZVODSTVENNYE ISPYTANIYA USTANOVKI ELEKTROFLOTATSIONNOI OCHISTKI STOCHNYKH VOD VISKOZNYKH PROIZVODSTV),
Vsesoyuznyi Nauchno-Issledovatel'skii Institut Iskusstvennogo Volokna (All-Union Scientific Research Institute for Man-made Fibers), USSR.
M. A. Kraizman, G. N. Filippov, I. Z. Eifer, I. G. Shimko, and E. A. Shrader.
Khimicheskie Volokna, No. 5, p 37-40, 1975. 2 fig, 6 ref.

Descriptors: *Waste water treatment, Water pollution sources, Water pollution treatment, *Textiles, *Treatment facilities, Sedimentation, Flotation, Zinc, Metals, Electrolytes, Energy, Gases, Generators, Water purification, Wastes, Industrial wastes, Waste treatment, Heavy metals, Electrolysis, *Cellulose.
Identifiers: *Viscose rayon, *Electroflotation, Sodium hydroxide, Regenerated cellulose.

Production tests were completed on an experimental installation for the purification of viscose process effluents by electroflotation. The apparatus consists of a sedimentation tank, two flotation tanks with built-in electrolytic gas generators, an electrolyte circulation system, and a feed source. Determination of the process variables made it possible to remove 96-98% of the zinc from the effluents. Average energy consumption was 0.2-0.4 kw-hr/cu m, while electrolyte consumption (NaOH) was 1.5 g/amp-hr. (Chern-IPC)
W76-10837

STUDIES ON COAGULATION TREATMENT OF SPENT WATER FROM PULPING PROCESS. PART 2. COAGULATION CHARACTERISTICS OF HEMICELLULOSE (IN JAPANESE),
Tokyo University, Japan, Faculty of Agriculture,
M. Jo, G. Meshitsuka, and J. Nakano.
Japan Tappi, Vol. 30, No. 2, p 107-112, February, 1976. 9 fig, 12 ref, 1 tab. (English summary)

Descriptors: *Coagulation, *Carbohydrates, *Sulfite liquors, Lignins, Water pollution sources, Flocculation, Separation techniques, Hydrogen ion concentration, Wastes, Industrial wastes, Adsorption, Pollutants, Chemical precipitation, Pulp wastes, Effluents.
Identifiers: *Hemicellulose, *Aluminum sulfate, Glucomannan, Xylan, Lignosulfonates, Sulfite pulp mills, Polysaccharides.

Because hemicelluloses are major pollutants in sulfite mill effluents, the coagulation of xylan and glucomannan by aluminum sulfate in the presence and absence of lignosulfonate was studied. The coagulation of xylan was less efficient and more pH-dependent than was that of glucomannan. The differences are attributed to glucuronic acid moieties. The presence of lignosufonate promoted hemicellulose coagulation, probably by adsorption of coflocculated lignosulfonate/alum precipitate. (See also W75-07636) (Brown-IPC)
W76-10839

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA. (3). DEGRADATION OF LIGNIN PREPARATION FROM WASTE LIQUOR OF OXYGEN-ALKALI PULPING (IN JAPANESE),
Nagoya University, Japan, Faculty of Agriculture.
H. Kawakami, and T. Kanda.
Japan Tappi, Vol. 30, No. 3, p 165-172, March, 1976. 7 fig, 16 ref, 8 tab. (English summary)

Descriptors: *Lignins, *Pulp wastes, *Microbial degradation, Wastes, Industrial wastes, Water pollution sources, Biodegradation, Pseudomonas, Aerobic bacteria, Amino acids, Nitrogen, Bacteria, Degradation(Decomposition), Pine trees.
Identifiers: Pseudomonas ovalis, Kraft lignin, Beech trees(Fagus), Guanine, Adenine, Chromatography, Vanillin, Syringaldehyde, Oxygen pulping process.

Lignin preparations (OL) isolated from spent oxygen-alkali pulping liquors are appreciably oxidized and have increased hydrophilicity. They were, therefore, more readily decomposed by Pseudomonas ovalis than were kraft lignin and sulfonated lignin. After 30 days incubation, the high molecular-weight fraction of pine and beech OL showed appreciable decomposition. The nitrogen content of residual lignin increased with prolonged incubation. The amino acid composition of the degraded lignin hydrolyzate differed from that of bacterial cells. Apparently about 10-20% of the nitrogen content in the biodegraded OL samples came from bacterial cell protein. However, treatment with Pronase (proteinase) did not significantly affect the samples' nitrogen content. Slight amounts of guanine and adenine (derived from bacterial nucleic acids) were detected by thin-layer chromatography, but no nucleic acids were detectable. Yields of vanillin and syringaldehyde from the biodegraded OL decreased considerably,

indicating a corresponding increase in the amounts of guaiacyl and biphenyl units condensed in the 5-position. The methoxyl and phenolic OH contents decreased with progressive bacterial degradation, whereas p-hydroxphenyl and 4-methoxy-isophthalic acid structures increased, as was observed previously for kraft lignin. The organism thus seemed to demethoxylate OL. (See also W75-11346 and W76-05485) (Brown-IPC)
W76-10840

A CLEAN PIECE OF PAPER,
Beak Consultants Ltd., Vancouver (British Columbia).
J. E. G. Sikes.
Unasylva, Vol. 27, No. 109, p 11-16, 1975. 2 illus, 3 tab.

Descriptors: *Pulp and paper industry, *Air pollution, *Water pollution control, Legislation, Water pollution treatment, Water pollution sources, Industrial wastes, Wastes, Costs, Reviews, Waste water treatment.
Identifiers: Closed systems.

The developments of the past decade in air and water pollution control for pulp and paper mills are surveyed, including legislation, and encouraging trends such as the development in the foreseeable future of closed water systems which will result in virtually no effluent discharge. Typical costs of water pollution control for various types and sizes of mills (bleached and unbleached kraft, newsprint, etc.) are given. (Witt-IPC)
W76-10842

PRODUCTION STUDIES ON THE ELECTROLYTIC METHOD OF RECOVERING ZINC FROM EFFLUENT SEDIMENTS (PROIZVODSTVENNYE ISSLEDOVANIYA ELEKTROLITICHESKOGO SPOSOBA REGENERATSII TSINKA IZ OSADKOV STOCHNYKH VOD),
Ukrainskii Institut Inzhenerov Vodnogo Khozaistva (USSR).
O. P. Sinev, A. I. Matsnev, N. P. Rossinskii, and A. I. Kuznetsov.
Khimicheskie Volokna, No. 5, p 41-43, 1975. 1 fig, 2 ref, 1 tab.

Descriptors: *Waste water treatment, *Zinc, *Electrolysis, Water pollution sources, Water pollution treatment, Leaching, Sedimentation, Flotation, Sediments, Sodium compounds, Wastes, Industrial wastes, Waste treatment, Separation techniques, Metals, Chemical wastes, Sludge treatment, Dewatering, Textiles, Heavy metals, Cellulose.
Identifiers: *Viscose rayon, Electroflotation, Sodium hydroxide, Sodium zincate, Regenerated cellulose.

A diagram is given of an experimental production-scale installation for the recovery of zinc from sediments of viscose process effluents. The apparatus consists of a reactor for leaching the sediment with NaOH solution, a vessel for separating undissolved admixtures from the sodium zincate by sedimentation or electroflotation, electrolysis baths, and a holding tank for spent alkali. The setup makes it possible to recover 75-85% of the zinc in the effluents, compared to 30% by the two-stage soda method. The loss of 15-25% of the zinc and NaOH (300-500 kg/ton of metallic zinc) takes place when the flotation sludge is dumped into a sludge holding tank. This loss can be reduced by dewatering the sludge. (Chern-IPC)
W76-10846

ADAPTATION OF FEED YEAST TO A CELLULOSIC EFFLUENT MEDIUM (IN ARMENIAN WITH RUSSIAN SUMMARY),
L. G. Petrosyan, R. M. Akhinyan, and F. G. Sarukhanyan.
Izvestiya Sel'skokhozyaistvennykh Nauk, Vol. 17, No. 10, p 93-95, 1974. 2 tab.

Descriptors: *Yeasts, *Waste water treatment, *Cellulose, *Water pollution sources, Wastes, Industrial wastes, Filters, Effluents, Hydrolysis, Chemical degradation, Nutrients, Water pollution control, Waste water disposal, Waste treatment, Carbohydrates, Textiles.
Identifiers: *Cellulose acetate, Monosaccharides.

At the Armenian Kirovakan synthetic fiber factory, effluents from the production of cellulose acetate as well as the filters are discharged without treatment. Cellulose constitutes 94% of the effluent material. Following hydrolysis to monosaccharides, the effluents could be used as a nutrient medium for several strains of feed yeast. The yield of the yeast cells was 52.46-96.54%, based on sugars. (Stapinski-IPC)
W76-10847

USE OF ELECTRODIALYSIS IN THE WATER RECYCLING SYSTEM OF VISCOSE PRODUCTION (PRIMENENIE ELEKTRODIALIZA V SISTEME VODOOBOROTA VISKOZNOGO PROIZODSTVA),
Cherkasskii Zavod Khimicheskogo Volokna (USSR).
A. I. Artyukhov, M. A. Kraizman, I. Z. Eifer, I. G. Shimko, and E. F. Yastreb.
Khimicheskie Volokna, No. 6, p 36-39, 1975. 4 fig, 7 ref.

Descriptors: *Waste water treatment, *Water reuse, *Electrodialysis, Wastes, Industrial wastes, Water pollution sources, Demineralization, Water purification, Separation techniques, Waste treatment, Water pollution treatment, Water quality control, Sodium sulfate, Electric power, Pressure, Textiles, Cellulose, Recirculated water, Reclaimed water, *Recycling.
Identifiers: Viscose rayon.

A diagram and description are given of a wash water recycling system at the Cherkassk man-made fiber factory in which demineralization is accomplished by electrodialysis. Power consumption decreased sharply with increasing pressure in the water circuit (0.05 to 0.15 MPa) and decreasing potential (450-350 volts). Optimum degree of demineralization was 0.5 g/liter of sodium sulfate (from 3 g/liter). This required a power consumption of 5 kw-hr/cu m. Output was 50 cu m/day. (Chern-IPC)
W76-10848

ENVIRONMENTAL PROTECTION INSTALLATIONS OF CELLULOSE ATTISHOLZ AG. (UMWELTSCHUTZANLAGEN DER CELLULOSE ATTISHOLZ AG.).
Wochenblatt fuer Papierfabrikation, Vol. 104, No. 5, p 178, 180, March 15, 1976. 1 fig, 1 illus.

Descriptors: *Pulp wastes, *Treatment facilities, *Waste water treatment, Waste treatment, Alcohols, Yeasts, Evaporation, Incineration, Waste disposal, Water purification, Biological treatment, Dewatering, Sludge disposal, Bark, Wood wastes, Europe.
Identifiers: *Cellulose Attisholz AG.(Switzerland).

On November 20, 1975, Cellulose Attisholz AG. in Switzerland hosted a public viewing of their environmental protection installations, notably the fourth stage of a series. In 1914 they established a plant for making alcohol from the effluents, in 1944 a yeast plant, and in 1962 an evaporation and combustion system. The present installation, which is described here, comprises a mechanical-chemical purification stage, a biological treatment stage, and a dewatering and combustion stage for sludge and bark residues. (Ward-IPC)
W76-10849

BIOLOGICAL FILTERS (BIOLOGICHESKIE FIL'TRY),
S. V. Yakovlev, and Yu. V. Voronov.
Stroizdat, Moscow, 1975. 136 p. 55 fig, 48 ref, 37 tab.

Descriptors: *Biological membranes, *Filters, *Waste water treatment, Sewage treatment, Waste treatment, Water purification, Design, Operation and maintenance, Foreign research, Construction, Biological treatment, Membranes, Industrial wastes, Equipment, Treatment facilities, Filtration, *Biological treatment.
Identifiers: Soviet Union(USSR), *Biological filters.

This book deals with the purification of sewage and industrial effluents on biological filters, the types of filters, and their design, theory, and operation. The material is presented in the following four chapters: Soviet and Foreign experience with the use of biological filters (types of filters and their classification, filling materials, immersible filters, high-capacity filters); Biological filters of modern construction; Design of biological filters (including general requirements, calculations, and design of biological purification plants); and Recommendations concerning start-up and operation of biological filters. (Stapinski-IPC)
W76-10850

POLLUTION CONTROL THROUGH UTILIZATION OF SPENT SULFITE LIQUORS FROM THE PULP INDUSTRY AS ORGANIC NITROGEN FERTILIZER (EIN BEITRAG ZUR UMWELTFREUNDLICHEN TECHNIK DURCH VERWERTUNG DER SULFITABLAUGEN DER ZELLSTOFFINDUSTRIE ALS ORGANISCHER STICKSTOFFDUENGER),
W. Flaig, and H. Sochtig.
Netherlands Journal of Agriculture Science, Vol. 22, No. 4, p 255-261, 1974. 2 fig, 14 ref, 1 tab.

Descriptors: *Sulfite liquors, *Pulp wastes, *Fertilizers, Water pollution control, Ammonification, Nitrogen, Water pollution sources, Industrial wastes, Wastes, Lignins, Organic compounds.
Identifiers: Spent pulping liquors.

Organic fertilizer with a nitrogen content of 18-20% can be produced from spent sulfite liquors through oxidative ammonification. The nitrogen occurs in various forms. Pot experiments with N-lignins obtained using different amounts of oxygen during oxidation showed that products obtained at an oxygen consumption of about 13 moles/kg serve best as a source of nitrogen for plants. Substances are contained in the N-lignins which inhibit nitrification. As a result, not only is the content of nitrates in fast-growing plants reduced, but also the deposition of nitrogen in the form of nitrate ions. The physical properties of the fertilizer can play a role in the transfer of nitrogen from N-lignin into the deeper soil layers. (Speckhard-IPC)
W76-10851

TRENDS AND EXPERIENCE IN THE PRIMARY TREATMENT OF PAPERMAKING EFFLUENTS (INDIRIZZI ED ESPERIENZE NEL TRATTAMENTO PRIMARIO DELLE ACQUE DI SCARICO DELLE CARTIERE),
A. Santangelo.
Il Cartaio, No. 1, p 3-8, January/February, 1976. 2 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Sedimentation, Wastes, Industrial wastes, Water pollution treatment, Sewage treatment, Water pollution sources, Waste treatment, Lime, Flocculation, Zeta potential, *Flotation, Water pollution control, Separation techniques, Effluents.
Identifiers: Aluminum sulfate.

This discussion mainly concerns the sedimentation process for treating paper mill effluents, particularly the recommended additions of aluminum sulfate, lime, and flocculating agents for various

classes of effluents, the theory of sedimentation, the role of zeta-potential, and advantages of the sedimentation process. Flotation treatment of effluents is also mentioned. (Speckhard-IPC)
W76-10852

REASONS FOR HAVING THE IVL-INSTITUTE FOR WATER AND AIR POLLUTION CONTROL RESEARCH. (VARFOR ETT IVL-INSTITUT FOR VATTEN- OCH LUFTVARDSFORSKNING.),
For primary bibliographic entry see Field 5G.
W76-10853

SEQUENTIAL TREATMENT OF KRAFT PULP WASHING WASTEWATER BY PILOT PLANT: ACTIVATED SLUDGE TREATMENT, LIME TREATMENT, AND ACTIVATED CARBON ADSORPTION TREATMENT (IN JAPANESE),
Japan Government Industrial Research Inst., Shikoku.
T. Fujii, H. Kabeya, H. Kamishima, T. Kubo, and J. Hosokawa.
Japan Tappi, Vol. 30, No. 2, p 94-106, February 1976. 10 fig, 15 ref, 8 tab. (English summary).

Descriptors: *Pulp wastes, *Activated sludge, *Lime, *Activated carbon, *Waste water treatment, *Pilot plants, Foreign research, Lignins, Color, Chemical oxygen demand, Adsorption, Separation techniques, Tertiary treatment, Recycling, Waste treatment, Wastes, Industrial wastes, Water pollution sources, Industrial water.
Identifiers: Wash water, Kraft mills, *Japan.

High-intensity purification of brown stock wash waters for recirculation purposes was studied for 45 days in a pilot plant, using activated sludge, lime precipitation, and activated carbon techniques in succession. The fixed-bed activated carbon adsorption system comprised 6 columns, each 2 m long and 15 cm in diameter, filled with granular carbon of 8-30 mesh. The effluent was passed through at a flow rate of 60 liters/hr. The untreated wash water contained about 400 ppm COD, 280 ppm lignin, and 2400 Pt units of color. Combined activated sludge and lime treatments removed about 90% COD and color and about 85% lignin. The activated carbon 3rd stage resulted in colorless water of very low COD, suitable for recycling. (Brown-IPC)
W76-10854

FOAM SEPARATION FOR DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
K. S. Ng, J. C. Mueller, and C. C. Walden.
Journal Water Pollution Control Federation, Vol. 48, No. 3, p 458-472, March, 1976. 7 fig, 17 ref, 13 tab.

Descriptors: *Pulp wastes, *Bleaching wastes, *Toxicity, *Foam separation, *Waste water treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Hydrogen ion concentration, Water purification, Water pollution control, Separation techniques, Waste treatment, Water quality control, Bleaching wastes, Suspended solids.
Identifiers: Kraft mills, White water(Paper machines).

Foam separation has been successfully developed on a laboratory and small pilot-plant scale as a novel process to detoxify bleached kraft mill effluents. Factors controlling detoxification efficiency include pH, contact time, gas-liquid interfacial area, initial level of toxicity, and the absence of inhibitive chemicals. Foam separation is effective on whole mill effluent but ineffective on unbleached white water or acid bleach effluent alone because of the poor foaming characteristics. During a reliability test, 83% of the 205 samples from 10 mills were detoxified. A continuous two-stage system detoxified 92% of the samples at pH 8, 1-hr retention time, and a gas:liquid ratio of 9:1. Modifications of the process reduce the foam volume to be removed for complete detoxification to less than 3%. The discharged foam may be effectively combined with the removal of suspended solids. (Witt-IPC)
W76-10855

TOUGH ILLINOIS EFFLUENT STANDARDS ARE MET BY CELOTEX BOXBOARD MILL,
For primary bibliographic entry see Field 5G.
W76-10856

TOWN GIVES PRIMARY AND SECONDARY TREATMENT TO BLANDIN'S EFFLUENT,
Grand Rapids Industrial Waste Plant, Minn.
J. Jetland.
Pulp and Paper, Vol. 50, No. 3, p 132-133, March, 1976. 4 fig.

Descriptors: *Pulp wastes, *Minnesota, *Waste water treatment, *Treatment facilities, *Sewage treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Municipal wastes, Flocculation, Sedimentation, Water purification, Aeration, Lagoons, Sludge, Dewatering, Chlorination, Aerated lagoons.
Identifiers: Eimco clarifiers, Grand Rapids(Minn).

Grand Rapids, Minnesota, maintains and operates an effluent and sewage treatment plant capable of treating 1.5 million gallons/day of domestic wastes and 11 million gallons/day of wastes from Blandin Paper Company. Mill effluent is given primary and secondary treatment in a separate section of the town plant. The primary treatment consists of flocculation in two 50 x 20-ft tanks, 16-ft deep, and sedimentation in two 110-ft-diameter 8-ft deep Eimco clarifiers. Aeration provides agitation in the flocculation tanks. Overflow from the domestic and industrial primary clarifiers is combined and pumped to the secondary plant. Two lagoons receive the primary effluent and return activated sludge. Effluent from the lagoons goes to two Eimco clarifiers. There sludge is settled out for return to the lagoons or return to the primary plant for dewatering. Overflow is pumped to the next lagoons for further aeration. The liquor then flows by gravity to a third set of lagoons for chlorination and final settling. The six treatment basins contain almost 90 million gallons at design high water level. (Sykes-IPC)
W76-10857

SEQUENTIAL CHLORINATION -- IMPACT ON THE ENVIRONMENT,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y.
R. J. Gall, H. D. Partridge, D. J. Jaszka, and G. R. Roseman.
Tappi, Vol. 59, No. 4, p 122-125, April, 1976. 4 fig, 28 ref, 4 tab.

Descriptors: *Water pollution control, *Bleaching wastes, *Pulp and paper industry, *Chlorination, Water pollution sources, Chemical oxygen demand, Chlorides, Color, Costs, Recycling, Sodium chloride, Sodium sulfate, Softwood, Incineration, Organic loading, Effluents.
Identifiers: Kraft mills, Chlorine dioxide, Kraft pulp, White liquor(Kraft-process), Chemical recovery.

Sequential chlorination of softwood kraft pulp reduces the amount of pollutants in the bleach plant effluent. The level of reduction depends on the degree to which chlorine is replaced by chlorine dioxide. Sequential chlorination may be coupled with existing external and internal treatment processes. A new alternative, predicated on sequential chlorination and effluent-recycling semiclosed loop system, is proposed so that the projected Environmental Protection Agency guidelines may be met. A high chlorine dioxide replacement ratio is recommended, followed by an alkaline extraction with caustic or oxidized white liquor. This combination yields a low level of chlorides in the extraction liquor and thus permits its recycling to the recovery system where the major organic pollutant loads are incinerated and caustic is recovered. The low volume of effluent from the sequential stage is treated in a resin-packed column to further reduce its color and COD. A salt separation process is used to control the sodium chloride level in the recovery system and to separate sodium sulfate from the precipitator dust. The process may be implemented in a series of steps to give a programmed reduction of pollutants. These reductions in amount of effluent pollutats are projected to involve equivalent or slightly lower chemical costs than previously used methods. (Sykes-IPC)
W76-10860

ENVIRONMENTAL AND SOCIAL FACTORS (IN THE PAPER INDUSTRY),
Crown Zellerbach Corporation, Camas, Wash.
For primary bibliographic entry see Field 5G.
W76-10861

HOW TO MEET WATER CLEANUP DEADLINES,
Ecodyne Corp., Union, N. J.
R. K. Schmidt.
Environmental Science and Technology, Vol. 10, No. 2, p 140-143, February, 1976. 2 fig, 2 illus.

Descriptors: *Waste water treatment, *Food processing industry, *Pulp and paper industry, Sewage treatment, Tertiary treatment, Equipment, Water pollution treatment, Water pollution control, Waste treatment, Wastes, Water pollution sources, Water purification, Suspended solids, Biological treatment, Lagoons, Biochemical oxygen demand, Filtration, Chemical precipitation, Color, Water quality standards, Regulation, Effluents.
Identifiers: Steel industry.

Primary, secondary, and tertiary waste water treatment processes are discussed briefly with respect to objectives and equipment. In general, progressing from primary to tertiary treatment involves more complex application technology and invariably higher expense. Basic effluent treatment processes used by steel mills, plating mills, food-processing plants, and pulp and paper mills are also discussed. The waste water treatment technology presently in use at most paper mills includes primary clarification for suspended solids removal, followed by biological treatment, which for the most part consists of stabilization lagoons for BOD removal. The 1977 Environmental Protection Agency standards require paper mills to filter the effluent from the ponds to remove trace suspended solids before discharge. A physical/chemical process (chemical addition and precipitation in a clarifier) is being used to remove color from paper mill effluents. Diagrams are included illustrating waste water treatment processes at a steel mill, pulp and paper mill, and food processing plant. (Witt-IPC)
W76-10862

DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
J. C. Mueller, and C. C. Walden.
Journal Water Pollution Control Federation, Vol. 48, No. 3, p 502-510, March, 1976.

Descriptors: *Biological treatment, *Pulp wastes, *Toxicity, *Waste water treatment, Waste treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Aerated lagoons, Activated sludge, Biochemical oxygen demand, Foam fractionation, Mixing, Nutrients, Water purification, Water pollution control.
Identifiers: Kraft mills.

Factors affecting the performance of various conventional and modified biotreatment systems on bleached kraft effluents have been assessed. A conventional 5-day aerated lagoon, a 24-hr extended activated sludge system, and a 6-hr activated sludge system removed 74, 72, and 81% of the 5-day BOD, respectively, while detoxifying effluents only 52, 85, and 68% of the time. Modification to conventional systems involving partial detoxification of effluents by foam fractionation before biotreatment, or improved mixing during biotreatment, enhanced 5-day BOD removal and detoxification success rates to 90% or better. Biological systems effectively and consistently remove 5-day BOD and toxicity from bleached kraft mill effluents when protected against toxicity shocks by surge equalization or prior foam fractionation. Adequate nutrient levels and mixing also are essential to detoxification performance. (Witt-IPC)
W76-10867

PURIFICATION OF LIGNOSULFONATES BY DYNAMIC MEMBRANE ULTRAFILTRATION,
Institute of Paper Chemistry, Appleton, Wis.
J. W. Collins, A. A. Webb, and A. J. Wiley.
Ion Exchange and Membranes, Vol. 2, No. 2, p 91-98, 1975. 9 fig, 13 ref, 7 tab.

Descriptors: *Sulfite liquors, *Lignins, *Reverse osmosis, *Waste water treatment, Membrane processes, Separation techniques, Waste treatment, Wastes, Industrial wastes, Water pollution sources, Temperature, Tertiary treatment, Water quality control, Pulp wastes, Water pollution treatment, Membranes, Water pollution control, Carbon, Operation and maintenance, Filtration.
Identifiers: *Lignosulfonates, Spent pulping liquors, *Ultrafiltration.

The lignosulfonates of calcium-base spent sulfite liquor were concentrated by ultrafiltration through dynamic membranes on sand log module which had been pretreated with spent sulfite liquor and small amounts of powdered carbon. The process, which does not use cellulose acetate or other cast membranes, could be operated at temperatures as high as 90C. Rejection and flux properties were not greatly different from those of a conventional cellulose acetate membrane. (Buchanan-IPC)
W76-10868

UNIQUE PROCESS FOR SULFITE SPENT LIQUOR KEEPS OLDER MILL VIABLE,
J. C. W. Evans.
Pulp and Paper, Vol. 49, No. 10, p 63-65, September, 1975. 1 fig, 6 illus.

Descriptors: *Sulfite liquors, *Pulp wastes, *Waste water treatment, *Incineration, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Evaporation, Oxidation, Sodium sulfate, Hardwood, Waste water disposal, Hardwood, New York.
Identifiers: Marathon Engineering direct evaporator, Goslin-Birmingham evaporator, Broby furnace, Sulfite pulp mills.

Spent liquor from the sodium bisulfite high-yield hardwood pulping operation at Georgia-Pacific Corporation's Lyons Falls, New York, mill is processed in a Marathon Engineering Inc. multiple-effect direct evaporator system. The liquor is thickened from 8% to 18% in a Goslin-Birmingham vacuum evaporator. The 18% liquor is fed into a venturi scrubber where it is contacted by flue gas from the Broby furnace and raised to 60% solids. The thickened liquor is sprayed into the top of the Modified Broby furnace where it is burned. It then falls to a bed at the bottom where combustion is completed under oxidizing conditions. The resulting smelt passes between water-cooled rolls to produce a thin flake which is broken up, stored in a silo, and eventually sold to kraft mills as a replacement for saltcake. (Sykes-IPC)
W76-10871

ELECTROCHEMICAL PRODUCTION OF FREE RADICALS FOR WASTEWATER TREATMENT,
Missouri Univ., Columbia. Dept. of Civil Engineering.
L. Hemphill, and M. Clark.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 794, $4.00 in paper copy, $3.00 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, May 20, 1976. 31 p, 8 fig, 3 tab, 11 ref. OWRT A-082-MO(1), 14-31-0001-4025.

Descriptors: *Electrolysis, *Waste water treatment, *Kinetics, *Oxidation, *Chemical reactions, Gamma radiation, Phenols, Sewage, Chemical oxygen demand, Colorimetry.
Identifiers: *Radiolysis, Plasma radiolysis, Glow discharge electrolysis, *Organic oxidation, Organic carbon, Free radical oxidation.

The purpose was to determine the nature and kinetics of aqueous free radical oxidation reactions produced by glow discharge electrolysis (GDE) and 60 Co gamma irradiation. Results showed that phenolic solutions and domestic wastewater were oxidized by GDE and gamma radiation produced free radicals. Direct comparison of the free radical oxidation produced by GDE and 60 Co gamma irradiation indicated organic oxidation was a first order reaction and GDE was more efficient. Comparison of chemical dosimetry (Fricke) results showed that a laboratory GDE reactor apparatus produced a radiation dose rate equivalent to about one third of the radiation dose rate of a kilocurie 60 Co source. Radiolysis decay of phenol solutions by 60 Co and GDE proceeded at a rate proportional to the chemical dosimeter (Fricke) determined values for each source. Design of GDE reactors and associated equipment is described. Domestic waste water GDE radiolysis is a typical first order reaction.
W76-10876

WATER REUSE, A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 818, $12.00 in paper copy, $3.00 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 76-204, July 1976, 462 p.

Descriptors: *Water reuse, *Bibliographies, *Recycling, Reclaimed water, *Sewage treatment, Water conservation, *Waste water treatment, Water treatment, Industrial wastes.

This report, containing 301 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). Volumes 1 through 4 cover the material announced in SWRA from October 1968 through January 1972 (See W75-06639, W75-06638, W73-11702 and W73-11701). At the time of search for this bibliography, the data base had 95,781 abstracts covering SWRA through April 15, 1976 (Volume 9, Number 8). Author and subject indexes are included.
W76-10878

TOXICITY OF CHLORINATED POWER PLANT CONDENSER COOLING WATERS TO FISH,
Michigan Water Resources Commission, East Lansing; and Michigan Bureau of Water Management, East Lansing.
For primary bibliographic entry see Field 5C.
W76-10896

COMPARATIVE TOXICITY OF SEWAGE-EFFLUENT DISINFECTION TO FRESHWATER AQUATIC LIFE,
Environmental Research Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W76-10898

DESIGN OF ALTERNATING DIFFUSER PIPES,
Skopje Univ. (Yugoslavia).
For primary bibliographic entry see Field 8B.
W76-10952

METAL RECOVERY FROM WASTE TREATMENT SLUDGES,
Dart Environment and Services Co., Los Angeles, Calif. (Assignee).
L. E. Lancy.
U. S. Patent No. 3,953,306, 6 p, 5 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1840, April 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, *Water pollution control, Metals, Sludges, Sludge treatment, Alkalis(Bases), Economic efficiency.
Identifiers: Metal plating industry, *Metal recovery.

This invention pertains to the recovery of metal values from waste streams and in particular to the separate recovery of metals in a useful form. The regulatory requirements to precipitate these metals and remove them from the effluent stream to minimize pollution, create an even greater cost for the operation of these processes because the precipitated metal is in the form of thin slurry sludges and the removal of sludges to the waste disposal area is usually the most expensive part of the waste treatment operation. Additionally, the area in which metal sludges are allowed to be deposited is continually shrinking making a problem of ultimate disposal. This invention is an improved process for preparing highly concentrated salt solutions of metals of high purity from waste metal sludges at superior dissolution rates and is achieved by preparing, concentrating and washing the sludge containing insoluble metal hydroxide under specific conditions to safeguard against the solids being exposed to air or dried out. The wet sludge is then dissoved in a dilute acid. The resultant solution can be used directly e.g. as make up in many electrolytic metal finishing processes to compensate for drag out losses occurred, or as the primary metal source in electrolytic processes employing insoluble anodes. Other specific uses for the process include the preparation of aluminum sulfate coagulants. (Sinha-OEIS)
W76-10960

OXYGEN AERATION SYSTEM FOR CONTAMINATED LIQUIDS,
H. Reimann.
U.S. Patent No. 3,953,326, 6 p, 7 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1846, April 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Water pollution control, Water quality control, Organic wastes, Biochemical oxygen demand, Aeration, Carbon dioxide, Recycling, Activated sludge.

A system is provided for the purification of an organically contaminated liquid, the purifying effect of which is chronologically approximately constant, even in the case of high BOD concentrations of the liquid. The process of this invention provides a simple control of the CO2 concentration in the aeration tank, i.e. that concentration which otherwise prevents a constant rate of purification, by stripping out, by mass transfer with gas, the CO2 obtained in the aeration tank continuously at least from a portion of the matter present or recycle to the aeration tank. This has the result that the pH value of the liquid-sludge mixture in the aeration tank remains constant, and the efficiency of the total oxygen utilization is not adversely affected. Air is preferred for stripping. The stripping

of the liquid can be conducted within or outside of the aeration tank. When stripping within the aeration tank, it is accomplished by producing a liquid current and blowing or stirring the air into this current. At the end of this directed gaseous flow, the gaseous mixture is withdrawn from the aeration tank, while the liquid current, now extensively freed of metabolic products is readmixed to the residual mixture in the aeration tank. When conducting the stripping step outside of the aeration tank, a partial stream of the recycle activated sludge and/or liquid-sludge mixture is withdrawn from the aeration tank, stripped in mass transfer with air in a suitable stripping unit, and after being extensively freed of metabolic products, recycled into the aeration tank. (Sinha - OEIS)
W76-10961

WATER-SOLUBLE CATIONIC POLYMERIC MATERIALS AND THEIR USE,
Betz Labs, Inc., Trevose, Pa. (Assignee).
R. G. Tonkyn, N. Vorchheimer, W. J. Fowler, Jr., and R. A. Heberle.
U. S. Patent No. 3,953,330, 9 p, 8 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1848, April 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Industrial wastes, *Sewage treatment, Water pollution treatment, Water quality control, Water pollution control, Suspended solids, Coagulation, Flocculation, *Polymers, Water reuse, Economics, Cations.

Because of pollutional requirements and requirements for economic processing of aqueous waste streams, it has been necessary to treat both municipal and industrial waters to remove as much of the suspended organic and/or inorganic matter as possible. Similarly, in the ore processing and refining industries, as in some pulp and paper mill systems, it is necessary to remove fines and fibers from the aqueous systems in each to permit water conservation and reuse and/or to insure that the water is acceptable for discharge. Sedimentation, filtration, centrifugation processes, although acceptable in some instances, are generally too slow and costly when substantial volumes of water are to be treated. There has been a consistent increase in the effort to develop and produce materials which will operate to effectively coagulate or flocculate suspended matter more rapidly and at lower dosage rates to thereby provide improved economics. It was discovered that the flocculation and coagulation of suspended matter could be effectively achieved by utilizing a water-soluble cationic polymer obtained by the polymerization of an epithalohydrin with a specific family of alkylene polyamine, the polymerization being carried out under certain conditions and utilizing specific concentrations of the respective ingredients. (Sinha - OEIS)
W76-10964

PURIFICATION OF WASTE WATER CONTAINING ORGANIC AND INORGANIC IMPURITIES,
Ruhrchemie Aktiengesellschaft, Oberhausen (West Germany). (Assignee).
S. Speth, G. Kuppenbender, and W. Jansen.
U. S. Patent No. 3,953,332, 5 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1848-1849, April 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Industrial wastes, *Water pollution treatment, Water pollution control, Water quality control, Separation techniques, Flow separation, Organic wastes, Inorganic compounds, Flocculation, Skimming, Temperature, Equipment.
Identifiers: Gravity separator.

This invention relates to the purification of waste water and the separation of light water insoluble organic liquids and water insoluble solids which flocculate in the presence of such water insoluble liquids. The components are introduced into an introduction zone of the gravity separator. Thereafter they pass into a separation zone where separation of the water from the organic and solid components takes place. By adjusting the temperature of the materials in the introduction zone undesired flocculation in the separation zone can be presented so that there are formed two distinct sludge phases, a sedimented heavy sludge phase which rapidly settles to the bottom of the gravity separator and a lighter, but more distinct swimming sludge phase. This lighter swimming sludge phase is lighter than the water phase and can be removed from the surface of the water in the introduction zone of the separator by a skimming type operation. The water phase can then be removed by passing it over a weir. Thus, with the process of the invention, consecutive flocculation which would result in the formation of solid particles of large surface area having high adsorption capacity for the organic impurities during the contact time, is prevented. (Sinha-OEIS)
W76-10966

ELECTROCHEMICAL CELL FOR DECREASING THE CYANIDE AND HEAVY METAL CONTENT OF AN AQUEOUS SOLUTION,
Rockwell International Corp., El Segundo, Calif. (Assignee).
H. L. Recht.
U. S. Patent No. 3,954,594, 5 p, 1 fig, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 240, May 4, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Heavy metals, Water pollution sources, Water purification, Separation techniques, Electrolysis, Oxidation, Reduction(Chemical), Anodes, Cathodes, Electrochemistry.
Identifiers: *Cyanides, Electrochemical cell.

It has been found that both the cyanide and heavy metal content of a waste water may be concurrently reduced utilizing a certain electrochemical cell. The cell is provided with separate cathode and anode compartments. Each of the compartments contains a bed of electrically conductive particles. The compartments are separated by an electronically nonconductive foraminous member. In accordance with the method, the aqueous solution containing cyanide ion and at least one heavy metal in soluble form is passed sequentially through the beds of electrically conductive particles contained in each of the two compartments of the cell. A direct electric current is passed between the two compartments making one compartment cathodic and the other anodic. The heavy metal is deposited upon the particles in the cathodic compartment and the cyanide is oxidized in the anodic compartment. The wastewater having a substantially reduced cyanide and heavy metal content is then discharged from the electrochemical cell. (Sinha-OEIS)
W76-10972

FILTER APPARATUS,
R. F. Worlidge.
U. S. Patent No. 3,954,613, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 246, May 4, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Water quality control, *Water pollution treatment, *Filtration, *Filters, Separation techniques, Cleaning, Flow control.

In the fields of pollution control, effluent treatment and sewage treatment, the separation of solids from liquids or the concentration of solids into a smaller volume of liquid has presented a problem which has been difficult to solve effectively where the nature of the solids to be removed or concentrated is such that a very thin layer of solids deposited on a filter media seals the passages to such a degree that the media becomes blocked. In this invention a nozzle is arranged adjacent the filter screen. A variable speed drive causes relative movement between the filter screen and the nozzle such that deposited solids are removed from successive portions of the filter screen and a control unit controls the speed of the relative movement in dependence upon the degree of blockage of the filter screen. Throttling the discharge of the filtered liquid causes liquid to flow from the side of the filter screen remote from the nozzle back through the screen into the nozzle which is provided with an inlet having an adjustable cross-sectional area for varying the flow. A cleaning system arranged to direct clean liquid through the filter screen into the nozzle is provided for cleaning the screen should the screen become completely blocked. (Sinha-OEIS)
W76-10975

FILTRATION AND BACKWASHING APPARATUS FOR USE WITH A WATER FILTRATION SYSTEM,
Hydrotechnic Corp., New York. (Assignee).
For primary bibliographic entry see Field 5F.
W76-10977

WATER SUPPLY FOR THE GREATER NEW YORK METROPOLITAN AREA,
Corps of Engineers, New York. Northeastern U.S. Water Supply Study.
For primary bibliographic entry see Field 6B.
W76-10983

THE USE OF FLOWING BIOLOGICAL SYSTEMS IN AQUACULTURE, SEWAGE TREATMENT, POLLUTION ASSAY AND FOODCHAIN STUDIES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10986

REMOVAL OF INORGANIC NITROGEN IN AN INTEGRATED FOOD CHAIN SYSTEM,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10988

RELATIVE GROWTH OF DIFFERENT SPECIES OF MARINE ALGAE IN WASTEWATER-SEAWATER MIXTURES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10989

THE USE OF POWER PLANT WASTE HEAT IN MARINE AQUACULTURE,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
J. E. Huguenin, and J. H. Ryther.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 196-220. 2 fig., 1 tab., 16 ref.

Descriptors: *Feasibility, *Aquiculture, *Cooling water, *Water reuse, Period of growth, Heated water, Commercial fish, Commercial shellfish, Hazards, Pilot plants, Public health, Fish diseases, Animal parasites, Marketing, Political constraints, Regulation, Legal aspects.
Identifiers: Sea food farming, Powerplant fish hatcheries.

The feasibility and inherent drawbacks of using power plant cooling water for marine aquaculture are discussed. The benefits are increased periods of growth, accelerated growth, the ability to control water temperature, especially in areas with great seasonal changes in water temperature, and

raising species outside of their normal range. Several pioneering projects conducted at nuclear and fossil fuel plants in Maine, Florida, New York, California, Connecticut, Texas, Scotland, England, and Japan are described. Disadvantages include dependence on continuing power plant operation and schedules, increased risk of diseases, predators, and parasites, the problems of nitrogen and oxygen supersaturation, unfavorable changes in product quality, and uptake of biological and chemical pollutants deleterious to human health. Other deterrents may be that the elimination of pronounced seasonal water temperature variations may alter the organisms' natural life cycles with unknown long range consequences, as well as the discharge of aquaculture wastes, and the necessity of handling large volumes of water. Large scale thermal aquaculture may be limited more by legal, political, and regulatory factors than by technical considerations. Continued research involving both hardware and procedures is necessary to give assurance of product quality and economic efficiency. (See also W76-10986) (Auen-Wisconsin).
W76-10992

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. I. MONITORING DURING PILOT OPERATION,
Woods Hole Oceanographic Institution, Mass.
W. B. Kerfoot, and S. A. Jacobs.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 224-242. 2 fig., 3 tab., 24 ref. NSF-RANN-32140.

Descriptors: *Heavy metals, *Domestic wastes, *Tertiary treatment, *Sewage effluens, *Aquiculture, *Oysters, Lead, Nickel, Cadmium, Copper, Zinc, Chromium, Sea water, Pilot plants, Dilution, Safety, Marine algae, Design, Absorption.
Identifiers: Sea food farming.

Concentrations of heavy metals (zinc, copper, cadmium, chromium, lead, and nickel) were determined in effluents from the Otis Air Force Base Sewage Treatment Plant, seawater, and oysters grown in a pilot sewage treatment-marine aquaculture system. The effluent metal content was less than that usually found in secondary effluents, except that copper was occassionally above normal. Except for nickel (which was the same as in seawater), metal concentrations were generally 8-150 times the level found in seawater. The metal concentrations in oysters declined from the 45th day of culture; zinc, copper, and lead levels remained essentially constant, while cadmium, chromium, and nickel decreased slightly. Lack of metal accumulation was due to dilution of effluent by seawater, the relatively low metal content of the Otis effluent, and the increased growth of the oysters. The 102-day study showed that oysters can be rown with secondary effluent as a substitute fertilizer without danger of metal contamination. The initial results suggest that inherent elevated metal concentrations in domestic wastewater do not pose a threat to shellfish culture if effluent of a principally domestic source is used. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-10993

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. II. DEVELOPMENT OF GUIDELINES BY METHODS, OF ADDITIONS,
Woods Hole Oceanographic Institution, Mass.
W. B. Kerfoot, and G. A. Redmann.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 243-271. 7 fig., 2 tab., 23 ref.

Descriptors: *Heavy metals, *Sewage effluents, *Standards, *Aquiculture, *Oysters, Marine algae, Lead, Nickel, Cadmium, Copper, Zinc, Chromium, Sea water, Oysters, Toxicity, Domestic wastes, Dilution, Pilot plants, Tertiary treatment, Absorption.
Identifiers: Phaeodactylum tricornutum, Sea food farming.

Guidelines are developed to define suitable sources of effluents for aquaculture. In scale-model treatment-aquaculture systems, effluent metal concentrations had little influence on algal (Phaeodactylum tricornutum) abundance. Permissible levels in effluents of copper, cadmium, nickel, chromium, lead, and zinc which might inhibit algal growth or cause morphological changes were determined. High density cell cultures suppressed toxicity. Toxic levels of metals decreased culture stability and its ability to recover from production slumps. No acute toxicity to oysters was observed. All elements were accumulated by phytoplankton; absorption of lead varied with effluent concentration, but the order of magnitude of metal accumulation was stable for the others (in decreasing order: zinc, copper, cadmium, nickel, chromium). An increase in metal concentration in seawater/effluent media increased the metal concentration in oyster tissues. Chromium, nickel, and cadmium had lower affinities; lead concentration rose abruptly; while cadmium showed detectable accumulation but appeared to saturate at the highest level. The amount of copper, cadmium, nickel, and chromium uptake decreased with increasing concentration. Values are given for each metal concentration permissible in effluents based on algal acute toxicity, shellfish acute toxicity, human acute and chronic toxicities, and pollution alert levels. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-10994

INTEGRATED SYSTEMS OF MOLLUSK CULTURE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10996

VIRUS SURVIVAL PATTERNS IN A TERTIARY SEWAGE TREATMENT-AQUACULTURE MODEL SYSTEM,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
J. M. Vaughn, and J. H. Ruther.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 324-346. 5 fig., 1 tab., 19 ref. NSF RANN GI-32140

Descriptors: *Viability, *Viruses, *Tertiary treatment, *Sewage treatment, *Aquiculture, Laboratory tests, Sewage effluents, Hydrogen ion concentration, Mollusks, Algae, Sea water.

The presence of pathogenic human viruses in sewage effluent could pose a threat to social and legal acceptance of aquaculture system products as viruses could be accumulated by filter-feeding mollusks. Virus survival under simulated conditions of a tertiary sewage treatment aquaculture system was studied. Algae (Skeletonema costatum, Chaetoceros simplex, and Cylindrothecia closterium) and MS-2 phage or poliovirus type II were used. Contact between pure algal cultures and viruses produced no significant removal of virus from water by non-specific adsorption. The survival time was found to be longer in a pure culture of growing algae (C. closterium) despite environmental conditions which are usually believed to be antiviral in nature, such as sea water, high pH, etc. Virus survival was further enhanced with increasing concentrations of sewage effluent in sewage-seawater mixtures. Viral progress through aquaculture systems was not impeded in the algal ponds; thus mollusks would be exposed, perhaps contaminating the entire system. The best and perhaps the only solution to the potential virus problem may be the effective removal or deactivation of the virus prior to using the effluent. A variety of in-line virus removal processes are being studied. (See also W76-10986) (Buchanan-Davidson--Wisconsin)
W76-10999

ANIMAL WASTE MANAGEMENT CONFERENCE.
Iowa State Univ., Ames.
Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 101 p.

Descriptors: *Farm wastes, *Management, *Livestock, *Confinement pens, *Waste treatment, *Waste storage, *Waste disposal, *Feed lots, Economics, Legal aspects, Lagoons, Runoff.

This conference was held in order to give an overview of animal waste management alternatives as they are practiced nationally, regionally, and by state. Animal waste characteristics, waste treatment facilities, waste disposal methods, and open lots vs housed confinement come under close scrutiny. Legal and regulatory aspects of confinement are discussed. Activities of the Environmental Protection Agency, Soil Conservation Service, Agricultural Stabilization and Conservation Service, and Iowa Water Pollution Control Commission are discussed as well. (See W76-11033 thru W76-11046) (Merryman-East Central)
W76-11032

ANIMAL WASTE MANAGEMENT--COMMENTS ON THE NATIONAL SITUATION,
Agricultural Research Service, Peoria, Ill. Agricultural and Natural Resources Div.
K. R. Majors.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971. 7 p, 2 tab.

Descriptors: *Farm wastes, *Management, *Livestock, Feed lots, Confinement pens, Economics, Legal aspects, Technology, Waste treatment.

The character and magnitude of the problem of animal waste management, the impact of waste management and requirements of pollution control now mandatory for livestock producers, and the waste-management phase of livestock production are discussed. Agriculture ranks high as a generator of wastes--from both animal and crop production--but agriculture is unique in that it makes use of biological procedures almost entirely. The total animal waste figure is around two billion tons per year, or 55 million tons per day. Confinement housing systems for all animal production, with quite different waste management systems than those for feedlots, must handle the same amount of waste per animal. Waste management and pollution control have become a concern in the livestock marketing system as well. Discussed briefly are various basic aspects of waste management including: technological requirements; regulatory requirements; economic factors; and social, political, legal, and related factors. Additional funds, expansion of activities, shifts in program emphasis, legislation for waste control, and cost sharing and broadening of provisions for financial assistance for feedlot operators are the key items desired by governmental agencies in order to make their programs more effective. (See also W76-11032) (Cartmell-East Central)
W76-11033

LIBRARY U. OF I. URBANA-CHAMP.

THE STATE AND REGIONAL SITUATION,
Iowa Agricultural and Home Economics Experiment Station, Ames.
S. W. Melvin.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 9 p. 6 tab.

Descriptors: *Feed lots, *Confinement pens, *Farm wastes, *Livestock, *Management, Water pollution, Odor, Fishkill, Runoff, *Central U.S., Waste treatment.

The Midwest is now and will continue to be a great livestock-producing area. Waste management problems have resulted from increased densities of animals in confinement. The water pollution hazard of many animal production units has been recognized. Regulations for control of this problem presently exist in most of the midwestern states. Odor is still a problem to many producers. The technology of animal waste management must develop rapidly to solve many of the producers' problems. (See also W76-11032) (Cartmell-East Central)
W76-11034

AEROBIC WASTE TREATMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
D. L. Day.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971. 14 p. 3 fig, 6 tab, 4 ref.

Descriptors: *Aerobic treatment, *Farm wastes, *Waste treatment, Aerobic conditions, *Oxidation lagoons, *Aerated lagoons, Municipal wastes, Design, Odor, Costs, Livestock, Aerobic bacteria.

Several forms of aerobic treatment relative to use in municipal waste treatment plants and adaptations for treatment of livestock metabolic wastes are discussed. Aerobic lagoons may be divided into two classifications, dependent upon the method of aeration: oxidation ponds (naturally aerated lagoons) and aerated lagoons (mechanically aerated lagoons). An oxidation pond is usually a shallow basin 3 to 5 feet deep for the purpose of treating sewage under climatic conditions (warmth, light, and wind) that promote the introduction of atmospheric oxygen and that favor the growth of algae to produce oxygen. An aerated lagoon is one that has a device that beats or blows air into the water with a portion of the oxygen being dissolved. The oxidation ditch is a modified form of the activated-sludge process. Aerobic bacteria use the organic matter in the waste as food for their metabolic processes, thus reducing the biologically degradable organics to stable material, with carbon dioxide and water as the major by-products. Design recommendations for in-the-building oxidation ditches are given. Some form of aerobic treatment is likely to be used in livestock waste management schemes because of the low level of odors associated with this method of treatment. (See also W76-11032) (Cartmell-East Central)
W76-11035

SYSTEM COMPONENTS TO SEPARATE SOLIDS AND LIQUIDS,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
G. L. Pratt.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 7 p. 3 fig.

Descriptors: *Solid wastes, *Liquid wastes, *Separation techniques, *Waste treatment, Feed lots, Livestock, Settling, Filtration, Centrifugation, Slurries, *Farm wastes.
Identifiers: Gravity flow.

The separation of solids from the liquid component of livestock manure adapts to many waste treatment and handling systems. Separation of these components is being introduced into systems where the material is separated prior to treatment as well as after the combined materials have undergone a treatment process. Two general methods are being used to accomplish the separation of manure components. These are settling and mechanical separation. In all devices that are used to settle solid materials from the liquid component of livestock waste, the velocity of flow of the liquid solid slurry is retarded to the point where sedimentation can occur. Concrete tanks and earth dugouts are being used for settling containers for the manure slurries. For runoff from feedlots, segregating the solid material from the liquids may be accomplished by settling channels. Mechanical separation includes filtration and centrifugation. Filtration of the combination solid liquid waste from livestock systems can often be designed to provide satisfactory installations. Advantages of the centrifuge are given. Gravity flow of liquids away from the solid manure is being investigated. Equipment improvements must be perfected before the system can be recommended. (See also W76-11032) (Cartmell-East Central)
W76-11036

SWINE MANURE COLLECTION AND REMOVAL SYSTEMS,
Iowa Agricultural and Home Economics Experiment Station, Ames.
L. D. Van Fossen.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 6 p.

Descriptors: *Hogs, *Farm wastes, Confinement pens, Labor, Hydraulic transportation, Lagoons, Cleaning, *Waste treatment, Cleaning.
Identifiers: Stockpiling, Slotted pits, Flushing tanks.

Collection and removal systems for swine manure are described. Topics considered are: (1) hand cleaning, (2) mechanical cleaning, (3) pumps and stockpiling, (4) moving manure with a hydraulic head, (5) manure storage in the building, and (6) hydraulically handling manure. (See also W76-11032) (Cartmell-East Central)
W76-11037

NATURE AND BEHAVIOR OF MANURE,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-11038

DESIGN CONSIDERATIONS IN FEEDLOT RUNOFF CONTROL,
Iowa Agricultural and Home Economics Experiment Station, Ames.
S. W. Melvin.
In: Animal Waste Management Conference, Iowa State University, October 13-15, 1971, 5 p.

Descriptors: *Feed lots, *Runoff, *Control, *Design, *Farm wastes, Chemical characteristics, Waste disposal, Waste treatment, Iowa.

This outline of feedlot runoff pollution and control defines the following: (1) feedlot runoff, (2) problems caused by feedlot runoff, (3) factors affecting feedlot runoff quality, and (4) component design of runoff control facilities. Suggestions for minimizing feedlot complaints are listed. (See also W76-11032) (Cartmell-East Central)
W76-11039

WASTE MANAGEMENT SYSTEMS FOR ROOFED BEEF CONFINEMENT FACILITIES,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
J. A. Moore.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971. 6 p. 1 fig, 1 tab.

Descriptors: *Farm wastes, *Management, *Cattle, *Confinement pens, Performance, Oxidation lagoons, Liquid wastes, Pollution abatement, Waste treatment.
Identifiers: *Roofed beef confinement, *Waste management systems.

The major objectives considered when discussing a waste management system are pollution control, saving of labor, and an increase in animal productivity. The system may be divided into four components: collection, storage, treatment, utilization and/or disposal. In the discussion of roofed beef confinement, the facilities are divided into three categories: (1) environmental conditions (cold and warm units), (2) floor type (solid or slatted), and (3) moisture content of the waste (less than 1% to over 50% total solids). The right types of confinement facilities discussed are dry solid cold, dry solid warm, dry slatted cold, dry slatted warm, liquid solid cold, liquid slatted cold, liquid solid warm, and liquid slatted warm. Climate has a direct relationship upon the selection of these systems. By listing objectives, properties of waste material, and the design of the system, an optimum design can be obtained. (See also W76-11032) (Cameron-East Central)
W76-11040

SWINE SYSTEMS FOR IOWA AND NORTH CENTRAL STATES,
Iowa Agricultural and Home Economics Experiment Station, Ames.
L. D. Van Fossen.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 3 p.

Descriptors: *Hogs, *Farm wastes, *Management, *Iowa, *Environmental control, Confinement pens, Waste storage, Waste disposal, *Central U. S., Waste treatment.

Before building a swine facility, the producer must compare the features of the alternate systems in order to select the ones most appropriate for his needs. The goal to develop successful swine facilities is to minimize extreme and uncomfortable environmental stress conditions that adversely affect pig performance, utilize natural pig habits to properly select the building features and operate the facility, and provide convenience for the swine producer. Items to be considered are: (1) level of environmental control, (2) environmental modifying systems, (3) manure collection and removal systems, (4) manure disposal systems, (5) feeding systems, (6) pen size, (7) animal and man access, (8) arrangement, (9) pen partitions, (10) building location, and (11) operating the system. (See also W76-11032) (Cartmell-East Central)
W76-11041

WASTE APPLICATION TO SOILS,
Iowa State Univ., Ames.
J. K. Koelliker.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 8 p.

Descriptors: *Farm wastes, *Application methods, *Soils, Fertilizers, Economics, Waste disposal, Water pollution, Nutrients, Bacteria, Odor, Soil contamination, Groundwater, Denitrification, Application rates.
Identifiers: Land spreading, Surface water pollution.

Manure disposal can cause air, water, or soil pollution. Air pollution may be caused by odors emitted during spreading or from manure left uncovered following spreading. Air pollution during spreading can be avoided by spreading only when meteorological conditions are favorable for good air mixing and when the wind will dissipate odors

into an unpopulated area. Direct injection of liquid manure can eliminate nearly all odor during spreading. Surface water pollution is caused by inadequate incorporation of manure into the soil surface. Consequently, runoff from this soil may result in excessive organic load, excessive nutrients, and possible bacterial contamination of streams and lakes. Spreading on steep slopes, frozen or snowcovered ground, or flood plains should be avoided unless incorporation can be done immediately. Groundwater pollution may result from excess nitrogen and from bacterial contamination from farm wastes. Soil contamination may also result from manure disposal. Heavy manure applications can result in anaerobic conditions caused by rapid decomposition and excess soil water. Design criteria and recommendations are given for combatting these pollution problems. (See also W76-11032) (Cartmell-East Central)
W76-11042

ECONOMIC CONSIDERATIONS INVOLVED IN SELECTING TYPES OF CONFINEMENT AND WASTE DISPOSAL SYSTEMS FOR SWINE AND BEEF,
Iowa State Univ., Ames.
E. G. Stoneberg.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 5 p.

Descriptors: *Economics, Confinement pens, *Waste disposal, *Hogs, *Cattle, Costs, *Farm wastes, Water quality standards, Waste treatment.
Identifiers: *Beef, Environmental standards.

Some of the critical factors which influence the selection of types of confinement and waste systems are presented. The use of confinement systems in beef or swine production substantially increases the capital investment within the enterprise. Because of the high capital requirements of confinement systems, consideration must be given to the potential advantages and disadvantages of this investment and to some of the characteristics of the investment. Although there are wide variations in the investment per animal unit capacity in confinement systems, the average investment per head of annual capacity in a cattle confinement system is normally in the range of $75 to $150. This does not normally include feed storage or processing facilities and may not include feed distribution equipment. The annual ownership costs of a confinement facility will probably fall in the range of 13 to 20 percent of the original cost. Any type of confinement system for pork or beef production requires some provision for animal waste disposal. Environmental standards for disposal of animal wastes may change the structure of the swine and beef industries if these standards are very severe. (See also W76-11032) (Cartmell-East Central)
W76-11043

LEGAL ASPECTS OF LIVESTOCK PRODUCTION AND WASTE MANAGEMENT,
Iowa State Univ., Ames.
N. E. Harl.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 11 p.

Descriptors: *Legal aspects, *Livestock, *Farm wastes, *Management, Economics, Costs, Ethics, Negligence, Trespass, Waste treatment.
Identifiers: Nuisance laws, Registration.

Pollution is an economic problem. Three basic approaches are possible to shift the external costs back onto the pollutor. Develop an ethic of environmental preservation; create appropriate economic incentives or disincentives to achieve a desired behavior pattern; or impose legal regulations or legal sanctions to circumscribe undesirable behavior patterns. The idea of an environmental ethic is unlikely to be sufficiently effective to improve environmental quality at an acceptable pace. Most ethical standards relied upon by society have come to be backed by the force of law. The concept of taxes or charges on those polluting to (1) encourage substitute production methods that are less harmful to the environment, (2) increase the cost to consumers of products having an adverse effect upon the environment with the result that consumers tend to consume more of the less harmful products, and (3) generate revenues to fund public efforts to improve environmental quality holds considerable economic appeal, although relatively little use has been made of this approach in the past. It has become clear that the rights inherent in land ownership do not sanction or protect activities contributing to environmental pollution. Livestock producers must recognize that fact or face serious legal difficulty either through private litigation, public response to violation of environmental quality standards, or both. (See also W76-11032) (Cartmell-East Central)
W76-11044

EPA'S ROLE IN THE ANIMAL WASTE PROBLEM: PANEL DISCUSSION,
Agricultural Stabilization and Conservation Service, Des Moines, Iowa.
For primary bibliographic entry see Field 5G.
W76-11045

SOIL CONSERVATION SERVICE PROGRAM IN ANIMAL WASTE MANAGEMENT,
Soil Conservation Service, Des Moines, Iowa.
For primary bibliographic entry see Field 5G.
W76-11046

LARGE COMMERCIAL FEEDLOTS - HOW WASTES ARE HANDLED IN THE WEST,
Agricultural Research Service, Lincoln, Neb.
C. B. Gilbertson.
In: Proceedings of Conferences on Farm Animal Wastes, Nitrates and Phosphates in Rural Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, Feb. 1-5, 1971, p. 270-279. 2 fig.

Descriptors: *Feed lots, *Nebraska, *Design, Performance, Runoff, *Farm wastes, Waste treatment, Waste disposal.
Identifiers: *Waste handling, *Runoff control.

Research is underway for determining design factors for construction, installation and management of runoff control facilities on outdoor feedlots. There are three requirements for a functional runoff control facility: (1) a debris basin, (2) a holding pond, and (3) disposal area. Two separate management designs are available for installation. They are the 'batch' system and the 'continuous flow' system. Both systems must be designed for removal of settleable solids from the runoff. Many factors must be blended in the design of a feasible feedlot operation which will yield good animal performance and, at the same time, control all wastes, including surface runoff, groundwater contamination and nuisances such as odors, dust, and flies. Several steps are listed for designing and constructing a runoff control facility for a beef feedlot. Assistance for design, layout and construction may be obtained from local health authorities, Soil Conservation Service, Extension Agricultural Engineers, and practicing consulting engineers. (Cameron-East Central)
W76-11048

CONTROLLING BARNYARD RUNOFF,
Soil Conservation Service, Madison, Wis.
J. Densmore.
In: Proceedings of Conferences on Farm Animal Wastes, Nitrates and Phosphates in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, Feb. 1-5, 1971, p. 211-214.

Descriptors: *Waste disposal, Wisconsin, Feed lots, Farm wastes, Runoff, Waste treatment, Water pollution control.
Identifiers: *Runoff control, Barnyards.

A concerted effort has been made by the Soil Conservation Service, at the request of farmers, to provide technical assistance in planning and implementing needed measures to control feedlot and barnyard runoff. In providing a barnyard runoff control system, attention should be given to three basic steps: (1) making use of structures and practices that will intercept and divert all surface runoff not originating on the yard, (2) reshaping the lot to provide good surface drainage, and (3) collecting, conveying, storing and finally safely disposing of runoff from the livestock yard itself. To meet the problem in any feedlot or barnyard, one or perhaps all three of these steps may be needed. Temporary storage of barnyard runoff can be provided in a settling pond or basin and in a retention pond. Not only are good planning and construction essential for the success of farm animal waste disposal systems, but increasing attention will have to be given to maintenance and management. (Cameron-East Central)
W76-11049

FARM ANIMAL WASTE MANAGEMENT: WHAT OUR MILK MARKET REQUIRES,
Wisconsin State Dept. of Agriculture, Madison. Food and Standards Div.
N. E. Kirschbaum.
In: Proceedings of Conferences on Farm Animal Wastes, Nitrates and Phosphates in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, Feb. 1-5, 1971, p. 208-210.

Descriptors: *Milk, *Waste disposal, *Dairy industry, *Management, Wisconsin, *Farm wastes, Waste treatment, Regulation.
Identifiers: Waste management.

A rough estimate of the manure produced daily by dairy herds in Wisconsin is 200,000 tons. In the past, major efforts have been made to encourage daily removal and field spreading of animal wastes or manure. In General Order No. 124, certain provisions for the handling of dairy farm animal waste and human waste, as they would affect the production of milk, were established. Specific requirements found in the statutes are set forth. These provisions are concerned primarily with the cleanliness of the cows, the breeding of flies, and the pollution of water used for drinking or for cleaning equipment. The daily removal and spreading of manure, which was previously recommended, is now being discouraged. Dairy farmers are now confronted with questions of lagoons, liquid manure handling operations, stacking of manure, and similar issues. All of these methods are unique and present problems with handling, odors, fly control, and possible water pollution. More research is needed to make certain that practical solutions are found for problems accompanying methods of animal waste storage and disposal. (Cameron-East Central)
W76-11050

SEEPAGE LOSS FROM HOLDING PONDS,
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5B.
W76-11051

HOW TO PLAN AND MANAGE A LAGOON,
B. Eftink.
Successful Farming, Vol. 71, No. 8, p. H4, June-July, 1973. 1 fig.

Descriptors: *Lagoons, *Planning, *Management, *Waste disposal, *Farm wastes, Hogs, Sludge, Aerated lagoons, Anaerobic conditions, Livestock, Waste treatment.

A lagoon must be built downwind from houses, away from water wells, yet close to the animals. The lagoon should also be large enough to contain the sludge from the animals. Once the lagoon starts working, it's better to make frequent, small loadings instead of uneven, large loadings which

cause bacteria fluctuations and poor decomposition. (BallardoEast Central)
W76-11052

BIODEGRADING POULTRY EXCRETA WITH HOUSE FLY LARVAE: THE CONCEPT AND EQUIPMENT,
Agricultural Research Service, Washington, D. C. Entomology Research Div.
N. O. Morgan, C. C. Calvert, and R. D. Martin.
ARS 33-136, United States Department of Agriculture, Agricultural Research Service, February, 1970, 3 p. 1 fig, 2 ref.

Descriptors: Poultry, *Farm wastes, *Biodegradation, Fertilizers, Organic wastes, *Waste treatment, Waste disposal, Recycling, Equipment.
Identifiers: *House fly larvae, White leghorns, *Poultry excreta.

The excretion of one White Leghorn laying hen amounts to 0.25-0.40 pound per day. In biodegradation experiments in Beltsville, Maryland, larvae of the house fly are being used to process the raw excreta of hens to produce a fertilizer or soil conditioner and a feed supplement. These experiments involve allowing the fly eggs to hatch on the poultry feces and the larvae develop. The larvae then aerate the medium by their tunneling which produces a fertilizer or soil conditioner and a feed supplement. (Ballard-East Central)
W76-11053

LYSIMETER STUDIES WITH LONG TERM APPLICATION OF SWINE LAGOON EFFLUENT,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-11055

POLLUTION ABATEMENT SYSTEMS FOR FARM ANIMAL WASTES IN SOUTHEAST MICHIGAN,
Soil Conservation Service, Ann Arbor, Mich.
B. E. Boesch, and D. F. Kesselring.
Presented at the 1973 Annual Meeting, American Society of Agricultural Engineers, University of Kentucky, Lexington, June 17-20, 1973, Paper No. 73-414, 13 p, 2 ref.

Descriptors: *Farm wastes, *Michigan, *Pollution abatement, *Waste treatment, *Waste disposal, *Waste storage, *Design, Equipment, Costs, Livestock, Feed lots, Lagoons, Irrigation, Construction costs.

Seventy-nine pollution abatement systems for farm wastes were installed in southeast Michigan during 1970 to 1972. The systems varied greatly in size, but they can be categorized into farm functions: diversion, collection, storage, and disposal. The systems used to perform these functions are discussed. Included in the discussion are: liquid manure tanks, holding ponds, semiliquid manure storage units, solid storage units, earthen holding pits, conventional manure-handling equipment, tanker wagons, and spray distribution systems. Actual design, construction, costs, and guidelines for these waste management systems are given. (Frantz-East Central)
W76-11057

PERFORMANCE OF FEEDLOT RUNOFF CONTROL FACILITIES IN KANSAS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
J. K. Koelliker, H. L. Manges, and R. I. Lipper.
Presented at 1974 Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, Paper No. 74-4012, 17 p, 2 fig, 3 tab, 9 ref.

Descriptors: *Feed lots, *Runoff, *Control, *Kansas, *Model studies, Performance, Design, Disposal, Irrigation, Waste treatment, Watershed management, *Farm wastes, Waste disposal.

A continuous watershed model utilizing daily inputs has been developed to evaluate expected performance for feedlot runoff control facilities for Kansas conditions. In Kansas, runoff control structures sized to contain the entire volume of the 10-year and 25-year 24-hour precipitation from the feedlot and dispose of 10 percent of the design volume per disposal day would control from 91.3 to 99.4 and 93.0 to 100.0 percent, respectively, of all runoff from an unsurfaced feedlot from east to west across the state. About one-third of the average precipitation in Kansas is expected to run off an unsurfaced feedlot while about forty-four percent is expected to run off a surface lot. Based upon results of this watershed model, evaporation pond sizes to provide as good or better control for Kansas than land disposal systems would be 6 feet deep for a surface area 120 percent of the minimum surface area and 4 feet deep for a surface area 150 percent of the minimum surface area. Use of this watershed model allows prior evaluation of various alternative systems for both the level of pollution control expected as well as management feasibility. (Cartmell-East Central)
W76-11058

A SUMMARY OF STATE REGULATIONS PERTAINING TO ANIMAL WASTE MANAGEMENT IN THE NORTH CENTRAL REGION OF THE UNITED STATES,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-11060

THE IMPACT ON DAIRY FARM ORGANIZATION OF ALTERNATIVE MANURE DISPOSAL SYSTEMS. A METHOD OF ASSESSING THE COST OF ENVIRONMENTAL REGULATION,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
M. Ashraf, R. L. Christensen, and G. E. Frick.
Research Bulletin Number 608, University of Massachusetts Agricultural Experiment Station, Amherst, Massachusetts, May 1974. 40 p, 24 tab, 17 ref.

Descriptors: *Dairy industry, *Costs, *Waste disposal, *Regulation, Water pollution, Nutrients, Fertilizers, Farm wastes, Waste treatment, Economic impact, Estimated costs, Alternative planning.
Identifiers: *Linear models, Land disposal, Stacking systems.

The economic impact is given for controlled use of commercial fertilizers and of alternative waste disposal systems on 25 dairy farms with small, medium, and large herd sizes from the 3 geographical dairy regions of Massachusetts. Also evaluated are alternative manure disposal systems and farm resource adjustments minimizing the cost of meeting manure disposal constraints on individual dairies. Stacking and liquid pollution control systems required additional capital expenditure of 2 to 3 times and 3 to 5 times respectively, when compared to daily spreading systems. The liquid systems caused greater reductions in farm income compared to stacking systems, with the opportunity cost larger on free stall dairies than on stanchion dairies. Manure disposal may be improved by avoiding confinement systems and by acquiring additional acreage for forage production. The inclusion of plowing operations with the stacking and liquid systems yielded about twice and one-third greater cost opportunity than systems not requiring immediate plowing. On small farms, disposal in conjunction with plowing would be preferred because the added value of nutrients exceeded the combined marginal cost of labor and plowing. Results indicated a trade-off relationship between dairy farm income and enhancement of water quality. Income levels of the dairy operations could be restored to previous levels by acquiring about 50 acres of cropland and seasonal labor of 15 hours per week on 100 cow and 50 cow farms and 40 hours per week on 212 cow farms. (Battles-East Central)
W76-11061

RECYCLING GROUND WATER IN WAUSHARA COUNTY, WISCONSIN: RESOURCE MANAGEMENT FOR COLD-WATER FISH HATCHERIES,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 4B.
W76-11082

5E. Ultimate Disposal Of Wastes

RECYCLING OF LIQUID DIGESTED SEWAGE SLUDGE ON DREDGED RIVER SAND,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W76-10501

EPA'S NEW FEEDLOT DISPOSAL PLAN,
For primary bibliographic entry see Field 5D.
W76-10532

DISPOSAL OF CATTLE FEEDLOT WASTE IN AN ANAEROBIC LAGOON ON THE ORGANIC SOILS OF SOUTH FLORIDA--PRELIMINARY RESULTS,
Agricultural Research and Education Center Belle Glade, Fla.
F. M. Pate, B. G. Volk, T. W. Casselman, and J. R. Crockett.
Proceedings, Soil and Crop Science Society of Florida, Vol. 33, p. 224-227, 1974. 4 fig, 2 tab, 15 ref.

Descriptors: *Feed lots, *Florida, Lagoons, *Waste disposal, Chemical properties, Groundwater, Water pollution, Farm wastes, Anaerobic conditions, Soils, Organic soils, Waste treatment.
Identifiers: *Anaerobic lagoons.

A study was conducted to determine the effectiveness of an anaerobic lagoon for holding beef feedlot wastes on the organic soils of south Florida. A series of test wells were drilled 7.6, 30.5, and 61.0 m from the lagoon to monitor changes in groundwater quality. Initial lagoon and groundwater levels of NH3-N, NO3-N, dissolved PO4-P, chemical oxygen demand, and K were 2.0, 0.02, 0.04, 225, and 15 mg/liter, respectively. The highest levels of NH3-N, NO3-N, dissolved PO4-P, chemical oxygen demand and K observed in lagoon water were 125, 0.7, 36, 4000, and 280 mg/liter, respectively. These levels occurred when manure disposal was stopped, 5 months after disposal began. The chemicals monitored rapidly diminished after manure disposal into the lagoon stopped. The only observed increase in groundwater levels of these chemicals was in one of 6 wells 7.6 m from the lagoon. From these results, it was deducted that a moderate sized waste disposal lagoon on the organic soil region of south Florida will not immediately contaminate the surrounding groundwater, even though there was active water movement to and from the lagoon. (Merryman-East Central)
W76-10540

AN ECONOMIC APPRAISAL OF ALTERNATIVE DAIRY WASTE MANAGEMENT SYSTEMS DESIGNED FOR POLLUTION CONTROL,
Economic Research Service, East Lansing, Mich. Farm Production Economics Div.
For primary bibliographic entry see Field 5D.
W76-10547

QUALITY VARIATION OF FEEDLOT RUNOFF IN STORAGE,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5B.
W76-10549

WATER QUALITY AND ECONOMIC CRITERIA FOR RURAL WASTEWATER AND WATER SUPPLY SYSTEMS,
Duke Univ., Durham, N. C. School of Forestry.
For primary bibliographic entry see Field 5D.
W76-10583

CHEMICAL AND MICROBIOLOGICAL CHANGES IN POULTRY LITTER APPLIED TO SOIL AS INFLUENCED BY THE TIME AND METHOD OF APPLICATION,
Georgia Univ., Athens. Dept. of Agronomy.
A. M. Rao.
PhD Dissertation, 1973, 90 p. 22 fig, 12 tab, 75 ref.

Descriptors: *Poultry, *Litter, *Chemical properties, *Microorganisms, *Waste disposal, *Application rates, Soils, Ammonia, Coliforms, Farm wastes, Degradation(Decomposition).
Identifiers: *Land application, *Application method.

An investigation was conducted to determine the number and types of microorganisms during decomposition of poultry litter in soil and the effect of interval and method of poultry litter application on some soil properties with particular emphasis on possible contribution to surface and underground water pollution. The persistence and effect of ammonia concentration on coliform bacteria were also studied. These experiments were conducted both in the laboratory and in the field over a two-year-period. Laboratory studies were conducted mainly to obtain initial information for the field experiment. Separate experiments were conducted to determine (a) the effect of drying on N loss in fresh droppings, (b) the effect of rate, method and time of application of litter on nitrification, and (c) the changes in the microbial ecology of decomposing poultry droppings and litter upon incubation with and without soil. The field experiment was initiated to determine the effect of method and time of application of poultry manure on (a) soil NO3-N and other nutrients vertical distribution in the soil profile, and (b) the number and relative abundance of major groups of soil microflora including coliform bacteria. Results are given for both laboratory and field studies. It was felt that the combination of an N responding crop with litter application might provide a safer and more efficient disposal method than trying to reduce nitrates by frequent applications. The abundance and movement of soil microflora were increased by litter application, but coliforms were not greatly increased. Pollution by pathogens from poultry manure would more likely occur in surface runoff than in groundwater. (Cameron-East Central)
W76-10615

MANURE AND THE NITRATE PROBLEM,
Delaware Univ., Newark.
W. C. Liebhardt.
In: Lime and Fertilizer Conference, Delaware-Maryland Plant Food Association Proceedings, 1972, 2 p. 2 tab.

Descriptors: *Recycling, *Crop response, *Poultry, *Nitrates, Groundwater, Water pollution, Farm wastes, Waste disposal, Delaware, Solid wastes, Soils.
Identifiers: *Land disposal, *Application rates.

In Delaware approximately 140 million chickens are grown each year. The amount of waste these chickens produce is greater than the amount of solid waste produced by New York City. The waste is being recycled back to the soil at so great a rate that it is reducing the crop yield. Another problem is that with the sandy soil and high water table, nitrates may leach into the ground water supply. Public health standards set the limit for NO3-N at 10 ppm. In soil samples taken at a depth of 4 ft, the level found in the ground water usually exceeded this amount. Poultry manure is being added to the soil at rates of 10 to 100 tons per acre. Ten tons of manure contains approximately 254 pounds of N, 108 pounds of P2O5, and 185 pounds of K2O, plus secondary and micronutrients. The corn yield at this rate is about 55.6 bushels per acre. At 100 tons of manure per acre, the yield was about 14 bushels per acre, a substantial reduction. (Cannon-East Central)
W76-10616

DISPOSAL LAGOON.
Soil Conservation Service, Honolulu, Hawaii.
For primary bibliographic entry see Field 5D.
W76-10618

FEASIBILITY OF USING SEWAGE SLUDGE IN HIGHWAY EMBANKMENT CONSTRUCTION,
Gillette Co. Research Inst., Rockville, Md.
A. Kawam, L. M. Smith, J. Ross, H. G. Larew, and L. Rude.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-242 260, $4.50 in paper copy, $3.00 in microfiche. Federal Highway Administration, Report No. FHWA-RD-75-38, February, 1975, 44 p. 11 fig, 23 tab.

Descriptors: *Sewage sludge, *Lime, *Fly ash, *Calcium sulfate, *Sludge disposal, Soils, Construction materials, *Embankments, Highways, *Feasibility.
Identifiers: Sulfate waste, Waste utilization.

The possible use of sewage sludge combined with other by-products and wastes in constructing a highway embankment was investigated in the laboratory. The mixtures evaluated contained lime, fly ash, waste calcium sulfate, and up to 17% sewage sludge. The effect of fly ash source, lime type, and relative proportions of fly ash, lime, and waste calcium sulfate on the compressive strength of compacted speciments was measured. For over 75% of the formulations, the 28-day compressive strength was 50 psi greater than that of uncured speciments. In selected formulations, 30, 50, and 70% of the fly ash was replaced with two soils, one sandy and the other clayey. For all samples with the soil replacement, the 28-day compressive strength was at least 50 psi greater than that of uncured specimens. Volume change, durability, permeability, and leachability tests were performed on selected formulations. The mixes broke up considerably in the freeze-thaw and wet-dry tests. The permeability was of the order of 0.000006 cm/sec. The heavy metals in the sewage sludge, cadmium, chromium, mercury, and zinc, were retained in the mixture rather than entering the leachate in the permeability tests. The pH and calcium and sulfate ion concentrations in the leachate were increased by lime and gypsum. Small quantities of sewage sludge can be mixed with soil, lime, fly ash, and waste sulfate to produce a material suitable for use in highway embankments. The embankments should be so zoned during construction that the sewage sludge treated materials are at least 3 ft below any exposed surfaces, to prevent freeze-thaw or wet-dry breakup of the material. (Snyder-FIRL)
W76-10624

AEROSOL PRODUCTION FROM LAND APPLICATION OF WASTEWATER BY AGRICULTURAL IRRIGATION EQUIPMENT,
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 5D.
W76-10625

MONITORING OF SUBSURFACE WASTE-DISPOSAL OPERATIONS: A GENERALIZED SYSTEMS APPROACH WITH EXAMPLES FROM CANADIAN CASE HISTORIES,
Windsor Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 5D.
W76-10662

LAND DISPOSAL OF WASTES: POTENTIAL FOR GROUNDWATER POLLUTION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
R. A. Carnes, D. R. Brunner, R. E. Landreth, and M. H. Roulier.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 15-2-1 - 15-2-3. 12 ref.

Descriptors: *Landfills, *Waste disposal, *Groundwater, *Water quality, *Monitoring, Industrial wastes, Municipal wastes, Sanitary engineering, Subsurface waters, Water pollution, Flow.

The potential for groundwater contamination as a result of land disposal of municipal and industrial wastes is discussed. Studies have identified certain geographic regions which are more susceptible than others to groundwater contamination, and case histories of pollutants migrating into surface or groundwater are established. The placement of landfill activities over or near groundwater tables generally poses a definite threat to the water quality of the latter. A shortage of well-documented cases of water pollution resulting from poor land disposal practices appears to be primarily due to a lack of adequate surface and groundwater monitoring. Observation well monitoring systems do not appear to be the most effective means of tracing chemical pollutant flow paths or for determining groundwater chemical concentrations at any time or depth; rather, chemical analysis of core samples from the underlying earth material profile seems to be preferred since it permits a positive definition of any chemical constituent within the profile at any given location. (See also W76-10637) (Kreager-FIRL)
W76-10667

DUMPING SEWAGE SLUDGE IN THE OCEAN.
Environmental Science and Technology, Vol. 10, No. 6, p 530-531, June, 1976. 2 fig.

Descriptors: *Pollutant identification, *Sludge disposal, *Sewage sludge, *Atlantic Ocean, Organic matter, Decomposing organic matter, Water pollution sources, Water pollution effects, Waste dumps, Mixing.
Identifiers: *New York Bight, *Sewage sludge dumping.

Shortly after sewage sludge is dumped at the designated New York Bight site, there is very little evidence that the sludge had been dumped. Organic material-rich muds are detected, but they may be composed partly of dredged material (DM), or even material of natural origin, as well as sewage sludge. Most of this material is found in a topographic depression north and west of the sewage sludge dump site, at the head of the Hudson Shelf Valley. By December 1973, sewage sludge dumping (SSD) had become a very controversial issue, the response to which led to greater emphasis on SSD by the New York Bight Project (NYBP) of the Marine EcoSystems Analysis (MESA) Program. The study uses a ship to obtain data on salinity, temperature, turbidity, depth, dissolved oxygen (DO), and pH. Instruments on buoys also provide data on salinity, depth, temperature, and current velocity. The sewage sludge at the New York Bight Apex site consists of about 5% solids and 95% water. It is less dense than water and fractionates and is eddied about rather than sinking as a unit. Nevertheless, adverse effects include fin rot on some fish, exoskeleton erosion and gill clogging on crabs and lobsters, high coli counts, absence of adult surf clams near some dumping sites, decreased DO, high total organic

arbon(TOC) and heavy metals concentrations, nd evidence of pathogens. The dumping area also eceives contaminants from the Hudson River, air ollution fallout, and other waste disposal activi- ies. Since there is no proof satisfactory to public ealth authorities of a hazard to human health, the National Oceanic and Atmospheric Administra- ion (NOAA) suggests using the existing dump ites until ocean dumping be phased out in 1981. Snyder-FIRL)
W76-10674

PESTICIDE INCINERATION,
Municipal Environmental Research Lab., Cincin- nati, Ohio.
R. A. Carnes, and D. A. Oberacker.
News of Environmental Research in Cincinnati, April 15, 1976. 4 p, 3 fig, 11 ref.

Descriptors: *Pollutant identification, *Treatment facilities, *Organic pesticides, *Incineration, *Ultimate disposal, Smoke, Chlorinated hydrocar- bon pesticides, Pilot plants, Efficiencies, Odor, Air pollution.

An experimental pilot-scale incineration system was designed and constructed to evaluate the ef- fect of operating variables on the efficiency of pesticide destruction. Fifteen commercial formu- lations of nine pesticides representing the major classes of organic pesticides were individually tested. Stack gases from the incineration tests were analyzed for sulfur dioxide, oxides of nitrogen, carbon monoxide, carbon dioxide, methane, total hydrocarbons, and particulates. When organonitrogen and organophosphate pesti- cides were tested, analyses for cyanide and total pyrophosphates, pesticides can be destroyed. For each pesticide, a range of temperature retention times exists at which more than the necessary 99.99% is destroyed. Temperature and retention time in the combustion chamber were the two most important operating variables. Certain con- ventional solid, liquid, or sludge waste incinera- tors, with adequate retention time and operating temperature, could be used for pesticide incinera- tion with an appropriate injection method. Emis- sions requiring control include particulates from solid formulations, phosphorus pentoxide from phosphorus-based pesticides, hydrogen chloride from chlorinated hydrocarbons, cyanide from nitrogen-containing organics, and sulfur dioxide. (Snyder-FIRL)
W76-10675

FLUID-MECHANICS ASPECTS IN THE DESIGN OF SEWAGE OUTFALLS INTO THE SEA (STROEMUNGSMECHANISCHE ENT- WURFSASPEKTE FUER ABWASSEREIN- LEITUNGEN INS MEER),
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
H. Kobus.
Wasserwirtschaft, Vol. 66, No. 5, p 148-155, 1976. 11 fig, 12 ref.

Descriptors: *Sewerage, *Outfall sewers, *Waste disposal, *Waste dilution, *Oceans, *Fluid mechanics, Mixing, Outlets.

Pollutants whose decay times are several days long can be disposed of with carefully designed ocean outfalls. The fluid mechanics of mixing and transport of the discharged wastes must be known to assess the effects in terms of water pollution. The outfall diffuser geometry and position can strongly influence the dilution process. Proper out- let structure design, therefore, allows the initial dilution to be optimized and, when density statifi- cation occurs, allows the sewage field to be sub- merged below the surface. (Snyder-FIRL)
W76-10678

A FEASIBILITY STUDY OF THE CONTROL OF POLLUTION FROM INDUSTRIAL WASTE WATERS DISCHARGED INTO THE LAGOON OF VENICE,
Bostock, Hill and Rigby. Birmingham, (England).
For primary bibliographic entry see Field 5D.
W76-10679

CITIES NEED SEWERLESS TOILETS,
Institute for Local Self-Reliance, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10680

DREDGED MATERIAL DISPOSAL--EFFECTS AND ALTERNATIVES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
D. P. Booth, and R. T. Saucier.
Water Spectrum, Vol. 6, No. 3, p. 26-33, 1974. 8 p, 10 photo, 1 tab.

Descriptors: *Dredging, *Navigable waters, *Channels, Water quality, Environmental effects, Disposal, Navigation, Channeling, Channel im- provement, Sediment control, Sediments, Sedi- mentation, Rivers and Harbors Act, Habitats.

Dredging to create and maintain navigable chan- nels requires the removal of large quantities of sediment, which must be disposed of economically but with the least possible adverse environmental impact. The Rivers and Harbors Act of 1970 authorized research into the effects of such prac- tices and consideration of possible alternatives. The Army Corps of Engineers Waterways Experi- ment Station (WES) has broken down its research into four general areas: aquatic disposal; produc- tive uses; habitat development; and disposal operations. The purpose of the aquatic disposal research program is to determine under what con- ditions the magnitude of environmental impact of open water disposal will be sufficiently adverse to warrant expenditure of larger amounts of money for alternative disposal methods. The productive uses research program has assigned itself the task of inventorying and defining the geographical ex- tent of potential disposal areas in relation to the lo- cation where dredged material will normally be generated. The habitat development research pro- ject explores the environmental impacts of land disposal. The disposal operations research pro- gram's most important objective is to operate con- fined land disposal sites and produce immediate results for the Corps. (Gagliardi-Florida)
W76-10724

HERE COME DE SLUDGE,
For primary bibliographic entry see Field 6E.
W76-10746

MARINE SANITATION DEVICE STANDARD,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-10758

LONG-TERM STABILITY OF WASTE LIGNINS IN AQUATIC SYSTEMS. PART 2. STABILITY IN SALINE WATER,
Swedish Water and Air Pollution Research Laboratory, Stockholm, Sweden.
For primary bibliographic entry see Field 5B.
W76-10838

LAND APPLICATION OF SEWAGE SLUDGE, III. NITRATE ACCUMULATION AND WHEAT GROWTH RESULTING FROM ADDITION OF SEWAGE SLUDGE AND WOOD WASTES TO SOILS,
Colorado State Univ., Fort Collins.
B. R. Sabey, N. N. Agbim, and D. C. Markstrom.
Journal of Environmental Quality, Vol. 4, No. 3, p 388-393, 1975. 5 fig, 19 ref, 5 tab.

Descriptors: *Sewage sludge, *Wood wastes, *Bark, *Soil amendments, Wheat, Growth rates, Nitrates, Sludge disposal, Waste disposal, Leaching, Groundwater, Municipal wastes, Wastes, Water pollution sources, Soils, Soil treat- ment, Anaerobic digestion, Sludge treatment, Clay loam, Softwood.
Identifiers: Engelmann spruce(Picea engelmanni), *Spruce trees.

Mixtures of anaerobically digested municipal sewage sludge and Engelmann spruce wood and bark wastes were added to a Nunn clay loam to determine the effect on wheat growth in the green- house and on nitrate accumulation in the soil. When the mixtures contained more than 50% wood-bark, the nitrate content of the soil was ex- tremely low, and wheat yields were low. Near maximum wheat growth resulted from several ap- plications of mixtures consisting of 50% or less wood-bark residues. The results suggest that addi- tion of up to 50% wood residues to sewage sludge may be useful for immobilizing part of the nitrates and preventing excessive leaching of nitrates into ground waters. (Buchanan-IPC)
W76-10841

POLLUTION CONTROL THROUGH UTILIZA- TION OF SPENT SULFITE LIQUORS FROM THE PULP INDUSTRY AS ORGANIC NITROGEN FERTILIZER (EIN BEITRAG ZUR UMWELTFREUNDLICHEN TECHNIK DURCH VERWERTUNG DER SULFITABLAUGEN DER ZELLSTOFFINDUSTRIE ALS ORGANISCHER STICKSTOFFDUENGER),
For primary bibliographic entry see Field 5D.
W76-10851

THE USE OF WASTE FIBERS AS ABSORPTION MATERIAL IN GRASS SILAGE,
Finnish Pulp and Paper Research Inst. Helsinki.
L. Soderhjelm, and M. Lampila.
Paperi ja Puu, Vol. 58, No. 2, p 41-46, February, 1976. 1 fig, 6 ref, 10 tab.

Descriptors: *Silage, *Pulp wastes, *Sludge, Water pollution sources, Wastes, Industrial wastes, Foreign research, Feeds, Absorption, Grasses, Sheep, Waste disposal, Landfills, Fuels, Digestion, Soil amendments, Fibers(Plant), Ef- fluents.
Identifiers: Kraft mills, *Finland, Fiber recovery.

The Finnish pulp and paper industry annually generates about 180,000 tons of fibrous sludge of which only 60,000 tons are reused in paper or board production while 151,000 tons serve as land- fill, 25,000 tons are incinerated as fuel, and 7,000 tons are sold and/or used for soil amendment. A study at the Finnish Pulp and Paper Research In- stitute (Helsinki) aimed at examining how these waste fibers absorb liquid in silos and at establish- ing their fodder value for domestic animals. Dried waste fiber from the effluent clarifier of a kraft pulp mill was mixed with grass (13% solids con- tent) in proportions of 0, 10, 30, or 50% (based on dry weight) in connection with silage preparation. The amount of dry matter ensiled varied from 160 to 200 kg for each silo, and the feed mass was com- pressed under a pressure of about 1700 kg/sq m in each tower. Effluent was drained from the silos at fixed intervals, weighed, and analyzed. Under the experimental conditions used, the amounts of ef- fluent were diminished by 4.58, 2.83, and 1.97 kg/kg of dry-solids fiber in silages containing 10, 30, or 50% of waste fiber, respectively, and the corresponding final dry matter contents of the silages were 18.2, 23.1, and 27.1%. The apparent organic matter digestibilities by sheep were 74.2, 76.1, and 77.6, and 79.7% for silages containing 0, 10, 30, or 50% fiber; the organic matter digestibili- ty of the fiber, calculated as a difference from the 50% mixture, amounted to 83.5%. These results in- dicate that the waste fibers tested effectively reduce the loss of silo effluent and possess high feed value. (Brown-IPC)
W76-10863

ANIMAL WASTE MANAGEMENT CONFERENCE.
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11032

DESIGN CONSIDERATIONS IN FEEDLOT RUNOFF CONTROL,
Iowa Agricultural and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5D.
W76-11039

SWINE SYSTEMS FOR IOWA AND NORTH CENTRAL STATES,
Iowa Agricultural and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5D.
W76-11041

ECONOMIC CONSIDERATIONS INVOLVED IN SELECTING TYPES OF CONFINEMENT AND WASTE DISPOSAL SYSTEMS FOR SWINE AND BEEF,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11043

LARGE COMMERCIAL FEEDLOTS - HOW WASTES ARE HANDLED IN THE WEST,
Agricultural Research Service, Lincoln, Neb.
For primary bibliographic entry see Field 5D.
W76-11048

CONTROLLING BARNYARD RUNOFF,
Soil Conservation Service, Madison, Wis.
For primary bibliographic entry see Field 5D.
W76-11049

POLLUTION ABATEMENT SYSTEMS FOR FARM ANIMAL WASTES IN SOUTHEAST MICHIGAN,
Soil Conservation Service, Ann Arbor, Mich.
For primary bibliographic entry see Field 5D.
W76-11057

THE IMPACT ON DAIRY FARM ORGANIZATION OF ALTERNATIVE MANURE DISPOSAL SYSTEMS. A METHOD OF ASSESSING THE COST OF ENVIRONMENTAL REGULATION,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 5D.
W76-11061

DECISION MAPPING - TOOL FOR UNDERGROUND WASTE MANAGEMENT,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W76-11063

CONSTRUCTION AND TESTING OF TWO WASTE-INJECTION MONITOR WELLS IN NORTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-11070

DISPERSION OF DYED SEA-WATER DISCHARGED FROM MOVING VESSELS IN COASTAL WATERS,
Dobrocky Seatech Ltd., Victoria (British Columbia).
For primary bibliographic entry see Field 5B.
W76-11086

5F. Water Treatment and Quality Alteration

ADVANCES IN INTERFACIAL PHENOMENA OF PARTICULATE/SOLUTION/GAS SYSTEMS; APPLICATIONS TO FLOTATION RESEARCH,
American Inst. of Chemical Engineers, N.Y.
For primary bibliographic entry see Field 5D.
W76-10627

ION AND PRECIPITATE FLOTATION OF METAL IONS FROM SOLUTION,
Pennsylvania State Univ., University Park. Mineral Processing Section.
For primary bibliographic entry see Field 5D.
W76-10630

WATER PROGRAMS SECONDARY TREATMENT INFORMATION,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10770

DOMESTIC WASTEWATER DISINFECTION, SECONDARY TREATMENT,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10771

WATER REUSE, A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-10878

PROCESS OF WATER TREATMENT,
Water Technology Service, Inc., Cleveland, Ohio. (Assignee).
H. S. Aber, D. D. Riggs, and J. Lamantia.
U. S. Patent No. 3,954,589, 4 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 238, May 4, 1976.

Descriptors: *Patents, *Water treatment, *Water softening, *Hardness(Water), *Scaling, Water purification, Demineralization, Electric fields, Equipment.

The object of the invention is to provide an apparatus for treating liquid to eliminate hardness effects, to prevent scale and mineral formation in liquid streams and to provide an efficient long lasting excitation power source. The apparatus has an enlarged fitting adapted for coupling in a flow line. An insulated screen is supported in the fitting with an electric potential applied between the screen and the fitting. A cleaning device having sharp edges is positioned in the fitting to clean mineral and other deposits from the screen. (Sinha-OEIS)
W76-10971

FILTRATION AND BACKWASHING APPARATUS FOR USE WITH A WATER FILTRATION SYSTEM,
Hydrotechnic Corp., New York. (Assignee).
R. Nebolsine.
U. S. Patent No. 3,954,620, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 248, May 4, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality, *Filtration, Separation techniques, Filters, Equipment, Cleaning, *Waste water treatment.
Identifiers: *Backwashing apparatus.

A filtration and backwashing apparatus, for use with a water filtration system of the type having a filter bed, passes fluids through the entire cross-sectional area of a filter media bed at an even and uniform rate. The apparatus includes two plenum chambers, one being formed between a slotted plate supporting the filter media and the top of the structural deck. The second or lower chamber is formed below the structural fluid-tight deck. Nozzles connect the two plenum chambers and fluid is introduced and passed into either the upper or lower plenum chamber. For backwashing purposes fluid flow pipes with discharge orifices uniformly spaced under the structural deck introduce fluid into the lower plenum chamber and subsequently through the nozzles into the upper plenum chamber. (Sinha-OEIS)
W76-10977

SAFE DRINKING WATER ACT - IMPLICATIONS FOR GROUND WATER QUALITY PROTECTION,
California State Water Resources Control Board, Sacramento.
A. L. Franks.
In: Proceedings, Tenth Biennial Conference on Ground Water, September 11-12, 1975. Ventura, California, p 171-174.

Descriptors: *Legislation, Water treatment, Surface waters, Groundwater, Wells, Potable water, Water supply, Legal aspects, Water quality control, Regulation, Injection wells.
Identifiers: *Safe Drinking Water Act, *Drinking water legislation, Public water supplies, Underground water sources, Underground injection systems, Enforcement of regulations, Secondary drinking water regulation.

The Safe Drinking Water Act provides a national primary drinking water regulation to protect health to the extent feasible using technology, treatment techniques and other means generally available on the date of enactment (December 17, 1974). Part A defines terms. Part B indicates congressional intent to provide for proper treatment of public water supplies. Part C provides for protection of underground sources of drinking water from underground injection systems. Section 1422 delegates primary enforcement responsibility to the state. The Environmental Protection Agency can enforce compliance under Section 1423 if the state fails to do so. The remainder of the Act deals with interim regulations for underground injection, emergency powers, availability of supply, water treatment chemicals, research, technical assistance, training, grants for state programs, special studies, demonstration grants, guaranteed loans, establishment of a national drinking water advisory council and judicial review. Secondary drinking water regulations are to be published 270 days after enactment with regulations being promulgated 90 days thereafter. These interim regulations are to take effect in December, 1976. (Heiss-NWWA)
W76-11064

5G. Water Quality Control

DIRECTORY OF DISASTER-RELATED TECHNOLOGY,
Federal Disaster Assistance Administration, Washington, D. C.
For primary bibliographic entry see Field 10C.
W76-10502

ENVIRONMENTAL CONTROL IN ANIMAL SHELTERS USING POWER PLANT THERMAL EFFLUENTS,
Oak Ridge National Lab., Tenn.
E. Hirst.
J Environ Qual. 2(2), p 166-171, 1973.

Descriptors: Effluent, Waste water disposal, Heat exchange, Heat transfer, Heating, *Electric powerplant, *Environmental control, *Poultry, *Hogs, *Thermal pollution, *Farm wastes.
Identifiers: *Animal shelters, *Waste heat, *Pad and fan systems.

Waste heat could be used by farmers to provide environmental control for broilers and swine. The amount of waste heat which could be so used is about 1-2% of the total available from electric power plants. A proposed system for using waste heat involves conventional pad and fan systems with finned-tube coils mounted downstream of the pads. The potential savings to farmers in fuel and feed costs are significant. However, major problems exist which must be investigated to determine whether incentives exist to develop and implement such systems. The problems include economics, management, marketing, disposal of animal wastes, dispersion of farming units, size of agricultural operation, climate, and seasonality of waste heat demands.--Copyright 1973, Biological Abstracts, Inc.
W76-10507

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE - 1970 (1974 SUPPLEMENT),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley Pa.
J. E. Fritz.
August 1974. 53 p, 6 plates, 7 tab, append.

Descriptors: *Sewerage, *Water supply, *Treatment facilities, *Pollution control, Region, Water storage, Water consumption, Effluent, *Costs, *Pennsylvania, Watershed management, Feasibility studies, Waste water treatment.
Identifiers: *Lehigh Valley(Pa), Package treatment plant.

This report is necessary because of rapid development of the Lehigh Valley and because of Department of Housing and Urban Development requirements. Data are presented for: sanitary sewage facilities usage, including information on design capacities of facilities, municipalities and population served, flow in mgd, and proposed population service and flow; water supply sources, capacity (storage and daily use), areas served, number of connections where possible, and average daily consumption. Industrial, domestic usage is distinguished when possible; priority of projects in most municipalities in previous or future years and their current status is indicated. Part of its regional sewer and water plan the Joint Planning Commission must constantly re-evaluate in light of new plans by municipal areas so that plan revisions may be made. Tabulations list modifications which have been made to the 1970 plan. Major amendments are shown on maps. To update the plan it was necessary to give priority ratings to proposed projects. Five basic areas of concern were given point values: Guiding Orderly Growth and Development, 35 points; Financial Considerations, 20 points; Housing Considerations, 10 points; Health Considerations, 25 points; and Local Initiative, 10 points. These were further broken down into many small categories, each with specific number of points. For each of the approximately 100 proposed projects a point count is determined and thus the priority rankings for the whole group of projects are found. (Smith-North Carolina)
W76-10508

ENVIRONMENTAL INVESTIGATION OF EDEN ISLES,
Burk and Associates, Inc. (New Orleans).
Report prepared for State of Louisiana, Baton Rouge, August, 1975. 74 p, 20 fig, 2 tab, 50 ref, append.

Descriptors: Water quality, *Canal construction, *Canals, Water pollution, *Water quality standards, Environment, Sampling, Estuaries, Ecology, Planning, *Louisiana.
Identifiers: *Eden Isles(LA), *Lake Pontchartrain(LA), Lake Maurepas-Pontchartrain-Catherine-Borgne(MPCB) estuarine system, *Ecological impact, *Environmental impact.

Eden Isles, 5300 acres on the shores of Lake Pontchartrain near Slidell (LA), is planned as a high density development for 20,000 people inhabiting about 4,200 homesites situated along a system of dredged canals. The western section of 2,300 acre is presently being developed. For this study of the Eden Isles canal system the following were measured at 5 stations: water temperature, pH, dissolved oxygen, salinity, suspended solids, turbidity, biochemical oxygen demand, chemical oxygen demand, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, total nitrogen, total phosphates, chlorides, sulfates, and total and fecal coliform count. Data indicate bacterial problems at the channel entrance near homes in the development, and there is an excessive accumulation of nutrients and organics in the canals due to limited flushing and excessive depths. Comparison with similar Florida developments indicates that water quality will probably deteriorate in the canal system, though the timing will depend on rate of urban deveLopment rapidity of nutrient and organic buildup, and degree of implementation of recommended changes. With no changes noxious odors, fish kills and possible health problems are predicted. Water quality will be worse in warm summer months. In Lake Pontchartrain there will be reduced biological activity, physiochemical changes in the water quality of the immediate area. Seven recommendations are given concerning canal design, landscape modification, sewage treatment plant capacity, monitoring of water quality, enforcement of state standards, and state land purchases. (Smith-North Carolina)
W76-10510

MUNICIPAL WASTEWATER TREATMENT WORKS, MODEL FACILITY PLAN FOR A SMALL, RURAL COMMUNITY.
Environmental Protection Agency, Washington, D. C. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W76-10511

CONTROL OF POLLUTION FROM ANIMAL FEEDLOTS,
Hearings before a Subcommittee of the Committee on Government Operations, House of Representatives, Ninety-third Congress, First Session, November 29 and 30, 1973. Washington, D. C., 2157 p.

Descriptors: *Feed lots, *Water pollution control, *Regulation, Farm wastes, *Pollution abatement, Water quality standards.

The Subcommittee on Conservation and Natural Resources held hearings on November 29 and 30, 1973 for the inauguration of an in depth study of manure. Attempts were made in these hearings to ascertain whether Federal pollution control laws are administered efficiently, economically, and so implemented as to control pollution from point sources such as animal feedlots. Testimonies were given from representatives of EPA and other Federal agencies and interested parties to determine the agencies' role in controlling pollution from animal feedlots. (Cameron-East Central)
W76-10533

AN ANALYSIS OF DAIRY WASTE MANAGEMENT ALTERNATIVES FOR SOUTHERN CALIFORNIA DAIRYMEN,
California Univ., Riverside. Agricultural Extension Service.
F. F. Smith, S. E. Bishop, W. W. Wood, Jr., J. C. Oliver, and W. C. Fairbank.
Agricultural Extension Service Publication, November, 1973, 14 p. 5 fig, 2 tab.

Descriptors: *Dairy industry, Costs, Water pollution, Density, Farm wastes, California, Water quality standards, Regulation, *Alternative costs, Alternative planning.
Identifiers: *Waste management, Southern California, *Porter-Cologne Water Quality Act(Calif).

The impact of the Porter-Cologne Water Quality Act is analyzed, and suggestions are made regarding the conditions under which the Southern California dairy industry can remain and be competitive with other dairy regions capable of supplying the market. Regulations designed to prevent pollution of surface and underground waters will require new management decisions for most Southern California dairymen. The requirements of compliance are: (1) contain and dispose of all polluted water on land owned or controlled by dairyman, and (2) limit the application of dairy wastes to each acre of cropland to that produced by 1.5 to 5 cows. Alternatives to each of these requirements are also listed. Eight factors which bear on the selection of these alternatives are (1) land values, (2) taxes on land, (3) cow density (or manure application) limitations imposed by water quality control agencies, (4) cow density limitations imposed by local governmental planning authorities, (5) production responses attributable to geographical region, (6) production responses attributable to the side effects of waste management facilities (heat, cold, mud, rain, injury, insects, disease), (7) operating costs attributable to various waste management systems, (8) net revenue realized from cropland used for waste disposal. A method of assessing the effects of these many variables is presented. (Cameron-East Central)
W76-10534

PREVENTING WATER POLLUTION FROM TURKEY OPERATIONS,
California Univ., Parlier.
J. P. Schroeder.
Poultry Digest, Vol. 34, No. 400, p. 240-241, June, 1975. 3 fig.

Descriptors: Water pollution, *Poultry, Design criteria, Construction, *California, *Regulation, *Farm wastes, Water quality standards, Waste treatment.
Identifiers: *Turkeys.

The California Regional Water Quality Control Board has prepared a survey of the turkey industry in the state to determine its status in relation to state and federal water quality regulations. Questionnaires are going to the turkey growing firms, the contractors, and they are responsible for getting the forms filled out for each of their growers. Sample questions are cited. The California regulations require turkey growers and poultry men to keep water runoff or excess water from their turkey and poultry operations on their farms or to dispose of it in such a manner as not to contaminate the subsurface water or the surface water of their neighbors and create a hazard to public health. For a number of years, turkey growers in central California have been building new facilities or remodeling old ones to conform to the requirements to prevent pollution of public waters. Growers have replaced older narrow shelters of the shed roof type with gabled-roof buildings, which have more height and width. Most of the construction has steel framing. (Cameron-East Central)
W76-10535

EPA PROPOSES NEW FEEDLOT REGULATIONS.
Wallaces Farmer, Vol. 100, No. 23, p. 9, December, 1975.

Descriptors: *Regulation, *Legal aspects, *Feed lots, Water pollution, Farm wastes, Water quality standards.

EPA proposals for new regulations for feedlot permits are advanced for scrutiny. Under the proposals, a feedlot operator will need a waste water discharge permit if: (1) Measurable wastes are discharged directly into any navigable waters that cross the feedlot. (2) Measurable wastes are discharged into navigable waters through a man-made drainage structure. (3) Operation includes more than: 1000 slaughter and feeder cattle, 700 mature dairy cattle, milking or dry, 4500 slaughter hogs, 35,000 feeder pigs, 12,000 sheep or lambs, 55,000 turkeys, 180,000 laying hens, 290,000 broiler chickens. (4) The operation is designated as a significant pollution source by EPA or state water pollution control agencies. If a feeding operation includes a waste control system that keeps wastes from discharging into navigable waters, such as a pit or lagoon, a permit probably won't be needed. (Merryman-East Central)
W76-10536

WATERWAY CLEANS FEEDLOT RUNOFF,
For primary bibliographic entry see Field 5D.
W76-10537

ANNUAL CYCLE OF SPORTFISHING ACTIVITY AT A WARMWATER DISCHARGE INTO GALVESTON BAY, TEXAS,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
A. M. Landry, Jr., and K. Strawn.
Trans Am Fish Soc. 102(3), p 573-577, 1973.

Descriptors: *Texas, *Sport fishing, *Thermal pollution, Bays, Heated water, Surveys, Water temperature, Flow rates.
Identifiers: Arius-felis, Cynoscion-arenarius, Leiostomus-xanthurus, Micropogon-undulatus, Pogonias-cromis, Sciaenops-ocellata, *Galveston Bay(Tex).

A survey of sportfishing activity at the P. H. Robinson Generating Station discharge into Galveston Bay, Texas was taken from 21 Oct. 1968 through 8 Nov. 1969. During 108 daily checks, 1063 fishermen were interviewed and 2635 fish counted. Fishing activity was related to season and temperature of the heated effluent. Maximum fishing pressure and largest catches occurred during the period Dec. 1968 through April 1969 and Nov. 1969 when discharge water temperatures and flow rates were minimum. Lowest angling activity and catch rates were recorded from June through Sept. 1969 when water temperatures approached 40 degrees C in the upper part of the fishing area. Atlantic croaker, Micropogon undulatus; sea catfish (hardhead), Arius felis; sand seatrout, Cynoscion arenarius; black drum, Pogonias cromis; red drum, Sciaenops ocellata; and spot, Leiostomus exanthurus, in order of decreasing abundance, accounted for 96.7% of the fish counted during the study. Seine, trawl, and trammel net data taken from the outfall area indicated that creel survey data of fishing pressure and angling success were valid indicators of fish concentration.--Copyright 1974, Biological Abstracts, Inc.
W76-10541

INTACT MANURE PACKS HALT SEEPAGE.
Hoards Dairyman, Vol. 120, No. 18, p 1087, September 25, 1975.

Descriptors: *Feed lots, *Odor, *Cattle, *Seepage control, Rainfall, Water pollution control, Water pollution sources, Farm wastes.
Identifiers: *Soil pollution, *Manure packs.

A four-year research project has shown that cattle feedlots do not pollute soil and groundwater if they have an intact manure pack and about one animal per 200 square feet. Scientists of USDA's Agricultural Research Service have found that an intact manure pack eliminates water infiltration and movement of contaminants through the soil to the groundwater. Fred A. Norstadt and Harold R. Duke conducted a study utilizing commercial and experimental feedlots without concrete floors. To gather data on water content and chemical movement, the researchers installed three cased dry wells in one of the feedlots and a similar well in a nearby alfalfa field. Nitrate nitrogen concentration was highest near the manure-soil interface. This nitrogen concentration decreased markedly with depth. Nitrate nitrogen content in the water table under each well fell into the same range as had been determined in 1912 before feeding operations were established. In relation to odor, Norstadt theorizes that odors produced by feedlots can be reduced and partially controlled by such improved management practices as using sawdust and wood chips for bedding and stirring the manure pack. A special feedlot was built to test what effect such practices would have on water, salt and nitrogen movement beneath a feedlot. One year of testing has shown that proper management results in no pollution hazard to soil or water beneath the feedlot. (Cameron-East Central)
W76-10544

WATER QUALITY IN A RECIRCULATING RACEWAY SYSTEM FOR FISH CULTURE,
Coastal Plain Experiment Station, Tifton, Ga. Dept. of Entomology and Fisheries.
T. K. Hill, and J. L. Chesness.
Presented at 1973 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 11-14, 1973, Paper No. 73-5508, 14 p. 2 fig, 5 tab, 4 ref.

Descriptors: *Fish farming, *Water quality, *Recirculated water, Rainbow trout, *Channel catfish, Water pollution effects, Animal parasites, Fish diseases, Fish reproduction.

Four seasons of fish production in an 8-segment recirculating earthen raceway system at the Coastal Plain Experiment Station, Tifton, Georgia, are discussed. Rainbow trout were raised during the winter and Channel Catfish were raised during the summer. Purina Trout Chow was fed twice daily to trout at rates of 2-2 1/2 percent body weight and once daily to Channel Catfish at rates of 1-3 percent body weight. Catfish were parasitically infested by Cleidodiscus, Scyphidia, and Trichodina during the studies. Trout were infested by Gyrodactylas and Trichodina. All conditions were effectively treated with 30 ppm of formalin. Raceway water was periodically sampled and dissolved oxygen, total hardness, pH, CO2, ammonia, turbidity, and visibility were measured. The fish were harvested at the end of each season. Experimental results indicate that recirculating raceways provide an easily manageable (treatment, feeding, and harvesting) production system for fish culture. Year-round fish production in a temperate climate can be accomplished by alternately growing Rainbow Trout and Channel Catfish as described. Eight inch long fingerlings should be stocked so that marketable size fish can be attained in the double-crop system. Maximum fish production capacity was not reached during the two-year study. Water quality was still good by the end of the study. It was felt that natural restorative capacity of the system combined with man-made systems (physical, chemical, biological) should provide water quality suitable for significantly increasing fish production. (Merryman-East Central)
W76-10546

FARM ANIMAL MANURES: AN OVERVIEW OF THEIR ROLE IN THE AGRICULTURAL ENVIRONMENT,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
J. Azevedo, and P. R. Stout.
California Agricultural Experiment Station Extension Service Manual 44, University of California, Berkeley, August, 1974, 109 p. 27 fig, 29 tab, 401 ref.

Descriptors: *Farm wastes, Agriculture, *California, Chemical properties, Physical properties, Decomposition, Environmental effects, Fertilizers, Fuels, Waste disposal.

An overview is presented of the status of livestock manures, their interrelationship with society as well as agriculturists, the problems they create, and the possibilities they offer as sources of energy and of soil enrichment. Specific topics discussed are: (1) animal manures in California, (2) quantity of manure produced by domestic animals, (3) chemical and physical characteristics of manures, (4) decomposition of manures, (5) nuisance factors of manures, (6) effects of manure on water quality and water-body ecology, (7) animal manures as factors in disease transmission, (8) prejudices regarding use of animal manures, (9) fertilization with manures, (10) manure as a soil amendment, and (11) alternative uses of manures. (Cannon-East Central)
W76-10548

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, METAL FINISHING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
J. R. Ginn, A. Hill, and E. V. Blanchard, Jr.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-248 803, $6.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/19, June 1975, 152 p. WQ4AC013.

Descriptors: *Pollution abatement, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Economic justification, Engineering costs, Industrial wastes, Estimated costs, Forecasting, Metals, Water pollution.
Identifiers: *Metal finishing industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

The cost of metal finishing in the United States is expected to double in the coming years as a result of the requirements set by the Federal Water Pollution Control Act Amendments of 1972. This will result in a price increase of from three to five percent of finished goods utilizing metal finishing. A period of turmoil may be expected in the industry during the transitional period. Most effected will be small independent job shops, many of which can be expected to go out of business, and small captive shops. Large shops of all kind can generally be expected to survive, mainly because of economies of scale in waste treatment methods. (NCWQ)
W76-10556

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRON AND STEEL INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
A.-L. Lin, R. A. Leone, and J. R. Glenn.
National Commission on Water Quality, Washington, D.C. Report NCWQ 75/18, November 1975, 112 p. WQ4AC013.

Descriptors: *Pollution abatement, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Industrial wastes, Engineering costs, Estimates, Forecasting, Iron, Steel, Water pollution control.
Identifiers: *Iron and steel industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

An analysis is presented of the costs and economic impacts of the Federal Water Pollution Control Act of 1972 on the iron and steel industry (SIC 311). Price rises are foreseen as a result of increased capital and operation and maintenance

equirements, rising gradually from about 0.8 percent in 1977 to 1.5 percent in 1983. Such increases n the domestic steel price will tend to stimulate mports and discourage exports, contributing to a eduction in domestic shipments of 0.2 percent in 977, 0.6 percent in 1983 and 0.9 percent in 1990. Pollution control will require capital to finance ollution abatement facilities which could impede nvestment in steelmaking facilities and initiate urther repercussions within the industry. As the teel industry is very much affected by general usiness conditions, the law's major impact on the ndustry may be its macro impact on the general economy. (NCWQ)
W76-10557

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PULP AND PAPER INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
R. A. Leone, R. Startz, and M. Farber.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-248 801, $10.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/17, June 1975, 317 p. WQ4AC013.

Descriptors: *Pollution abatement, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Economic justification, Engineering costs, *Pulp and paper industry, *Estimated costs, Industrial wastes, Forecasting, Cost-benefit analysis, Water pollution.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

Estimates are presented of costs and their impacts necessary to meet 1977 and 1983 requirements of the Federal Water Pollution Control Act in the pulp and paper industry (SIC 2611, 2621, 2631, 2661). Highest costs will be experienced (among sub-categories of the industry) among groundwood, paperboard from wastewater, non-integrated tissue and non-integrated coarse mills. Among regions, New England, New York, the Middle Atlantic States and the North Central U.S. will be most affected. Approximately 80 mills representing 4.5 percent of total industrial capacity are considered endangered. Cost benefit analyses of technologies show manufacturers can effect cost reductions through altering product or process mix, reducing strength of cardboard cartons, and reducing weight, strength and thickness of paper. Early introduction of process changes to meet projected 1983 requirements is found economically justified. (NCWQ)
W76-10559

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PETROLEUM REFINING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
J. L. Smith, and R. A. Leone.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-248 800, $9.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/16, June 1975, 232 p. WQ4AC013.

Descriptors: *Pollution abatement, *Oil industry, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Economic justification, Engineering costs, Industrial wastes, *Economic impact, *Estimated costs, Forecasting, Water pollution.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Petroleum refining industry, Water pollution abatement technology.

Two hundred and fifty refineries were operating in the U.S. and Puerto Rico as of January 1, 1974; the existence of at most 12, representing less than one percent of the domestic refinery capacity, is likely to be endangered by the effluent limitations promulgated by the U.S. Environmental Protection Agency under the Federal Water Pollution Control Act of 1972. Variations in the complexity of the refining products were found to significantly affect the estimated levels of water pollution abatement as between one refinery and another. Consumer demand for petroleum products clearly appears strong enough to absorb the abatement cost increase for the remaining 99 percent. (NCWQ)
W76-10560

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, LEATHER TANNING INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 019, $6.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/42, November 1975, 113 p. WQ5AC011.

Descriptors: *Pollution abatement, *Tannery wastes, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Costs, Economics, Evaluation, Industrial wastes, Engineering costs, Capital costs, Operating costs, Maintenance costs, Forecasting, Industrial plants, Water pollution control.
Identifiers: *Leather tanning industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

The economic impacts on the leather tanning industry of achieving the 1977 (BPT) and 1983 (BAT) limitation requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) were assessed. The capital requirements for the industry total over $58 million with annual O and M costs of almost $15 million for plants requiring pretreatment and BPT. The additional amounts needed for BAT controls are $35 million capital and over $6 million O and M. Resulting price increases will be an estimated 1.6 percent over baseline in 1977 and 2.2 percent over baseline in 1983. Production lost from plant closures as a result of the Act is estimated at less than 10 percent of industry volume. As a result of plant closures, industry employment will be 950 less than baseline in 1977 and 925 less than baseline in 1983.(NCWQ)
W76-10561

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, FERTILIZER INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 017, $6.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/39, November 1975, 163 p. WQ5AC011.

Descriptors: *Pollution abatement, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Industrial wastes, Forecasting, Industrial plants, Engineering costs, *Fertilizers, Water pollution.
Identifiers: *Fertilizer industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

An examination is made of the economic impacts of the Federal Water Pollution Control Act Amendments of 1972 on the fertilizer industry (SIC 2873, 2874). Price increases of 1.5% or less can be expected as a result of BPT (best practicable treatment technology) pollution controls, while negligible increases in all but amonium nitrate should result from BAT (best available technology) controls. Profits will be reduced for all plants installing pollution controls, but no plant will become unprofitable solely as a result of pollution controls. Small, older plants may close as a result of pollution controls, but will be replaced by larger, more modern plants. Employment, community and international trade impacts are expected to be relatively insignificant. (NCWQ)
W76-10562

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PLANT CLOSURES.
National Bureau of Economic Research, Inc., New Haven, Conn.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 015, $4.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/38, June 1975, 61 p. WQ4AC013.

Descriptors: *Pollution abatement, Federal Water Pollution Control Act, Economics, Evaluation, *Regional analysis, Estimated costs, *Economic impact, Forecasting, Industrial wastes, Economic justification, Water pollution, *Industrial plants, *Industries.
Identifiers: *Industrial plant closures, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

The kinds of plants most likely to close as a result of the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) are discussed. A regional vulnerability analysis was used, which examined past trends in plants and regional growth. Six industires -- textiles, pulp and paper, petroleum refining, iron and steel, non-ferrous metals and electroplating -- are examined. Most highly impacted industries will be the small plants, with fewer than 100 employees, and single branch plants. (NCWQ)
W76-10563

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRRIGATED AND NON-IRRIGATED AGRICULTURE.
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-248 807, $6.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/23, July 1975, 150 p. WQ5AC091.

Descriptors: Erosion, Federal Water Pollution Control Act, *Economic impact, *Farm wastes, *Return flow, Prices, Soil conservation, Water pollution sources, Irrigation, *Agricultural runoff, Evaluation, Runoff, *Erosion control, Economics, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Commodity prices, Water pollution abatement technology.

Economic impacts are considered arising from control of irrigated return flows and pollutant runoff. It is found that return flow controls of any level can be imposed with little impact in terms of commodity prices. Overall impact in the agricultural sector is also minor. Certain control strategies, however, can have a more measurable impact in selected regions. The overall impact of erosion control will be to increase commodity prices and provide a direct impact on the consumer. (NCWQ)
W76-10564

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, NON-FERROUS METALS INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.

L. Wu. Lee, R. A. Leone, and C. Smith.
Available from the National Technical Information Service Springfield, Va. 22161, as PB-248 804, $7.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/20, June 1975, 200 p. WQ4AC013.

Descriptors: *Pollution abatement, Cost analysis, Evaluation, Economics, Engineering, Federal Water Pollution Control Act, Estimated costs, Economic justification, Forecasting, Metals, Copper, Zinc, Lead, Aluminum, Industrial wastes, *Economic impact.
Identifiers: *Non-ferrous metals industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

The requirements of the Federal Water Pollution Control Act Amendments of 1972 will alter the cost structure of non-ferrous smelters and refineries (primarily aluminum, copper, lead and zinc). In the short run, impacted plants may not feel immediate effects but in the long run, plants whose revenues fail to recover total costs of production and water pollution abatement will close. Abatement requirements will affect the availability of capital for new capacity expansion. These cost changes may affect the domestic industry's position in foreign competition. (NCWQ)
W76-10565

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, TEXTILE INDUSTRY.
National Bureau of Economic Research, Inc., New Haven, Conn.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-249 948, $7.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/31, June 1975, 163 p. WQ4AC013.

Descriptors: *Pollution abatement, *Textiles, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Industrial wastes, Economic justification, *Estimated costs, Forecasting, Water pollution.
Identifiers: *Textile industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

This study is an analysis of the economic impacts of the 1972 Federal Water Pollution Control Amendments (PL 92-500) on the industry. An introductory discussion of the economic, technological, and institutional environment within which the textile industry operates is followed by a discussion of water pollution abatement costs and their impact on the industry. The analysis suggests that approximately 5% of the capacity in the industry will be endangered by the requirements of the law. The most severely impacted subcategories of the industry will be woven and knit fabric finishing and wool dyeing. New England and the Mid-Atlantic will be the hardest hit regions. (NCWQ)
W76-10566

WATER POLLUTION CONTROL ACT OF 1972, MUNICIPAL OPTIONS.
Meta Systems, Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-249 947, $13.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/36, December 1975. 528 p, 8 fig, 67 tab. WQ5AC017.

Descriptors: Water pollution, *Cities, *Decision making, *Pollution abatement, *Alternative costs, Costs, Waste water treatment, *Treatment facilities, Water quality, Municipal wastes, Municipal water, Local governments, Federal Water Pollution Control Act.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Those decisions and their associated costs made by communities to meet the requirements of the Federal Water Pollution Control Act of 1972 are examined and compared to alternative decision costs (i.e. least cost decisions). Decisions on secondary treatment works were found to largely depend on the consultant and his interaction with state and Federal authorities and were not sensitive to cost or municipal classification. Different federal incentive programs will not change the range and relative mix of technologies. The federal program could motivate more water pollution control if institutional mechanisms were organized more vigorously to enforce the least cost criterion. More careful attention to alternatives in preliminary studies is suggested, including demographic and industrial projections and per capita water usage. (NCWQ)
W76-10568

WATER POLLUTION CONTROL ACT OF 1972, SOCIAL IMPACTS, EIGHT CASE STUDIES.
Abt Associates, Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-250 106, $13.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/35. June 1975, 554 p. WQ5AC014.

Descriptors: Pollution abatement, Federal Water Pollution Control Act, Water pollution, *Social impact, Evaluation, Economics, Waste water treatment, Treatment facilities, Forecasting, Social change.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Water cleanup in eight geographically dispersed U. S. communities was found to at first curtail and then encourage development, improve water quality, intensify land use and waste water management planning and promote citizen participation. These case studies do not necessary make up a representative sample of eight communities. Social impacts of the Federal Water Pollution Control Act of 1972 will most often be felt through people's occupations. Construction appears to be the sector of local economies and occupational groups that is most sensitive to the benefits and costs associated with the Act. Demographic groups that will be most affected by the Act are (1) males, (2) people aged 31 to 60, and (3) moderate income people. The law is seen by localities to be significantly improving professional quality and comprehensiveness of wastewater management planning. (NCWQ)
W76-10569

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 1).
Utah Water Research Lab., Logan.
National Commission on Water Quality, Washington, D. C. Report NCWQ 75/33-Pt 2, October 1975. 649 p, 65 fig, 55 tab. WQ5AC054.

Descriptors: *Salinity, *Colorado River Basin, *Regional analysis, River basins, *Capital costs, Water pollution, *Pollution abatement, Waste water treatment, Public law, Federal Water Pollution Control Act, Water law, Economic analysis, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Environmental, economic, social and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the Colorado River Basin are reviewed. Salinity, the most critical water quality problem in the basin, will be only slightly reduced by the NPDES permit program set up by the Act. A basin-wide program of irrigation efficiency will reduce the 9.0 million tons of salt carried by the river annually by 2.2 million tons. Total capital costs (in 1973 dollars) will be $160 million to achieve the Act's 1977 requirement of best practicable treatment technology, with an additional $35 million to achieve best available technology by 1983. Part 1 is primarily concerned with basin profiles and detailed analyses. (See also W76-10571) (NCWQ)
W76-10570

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 2),
Utah Water Research Lab., Logan.
National Commission on Water Quality, Washington, D. C. Report NCWQ 75/33-Pt 1, October 1975. 763 p, 18 fig, 51 tab. WQ5AC054

Descriptors: *Salinity, *Colorado River Basin, *Regional analysis, River basins, *Capital costs, Water pollution, Waste water treatment, Pollution abatement, Public law, Federal Water Pollution Control Act, Water law, Economic analysis, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Environmental, economic social and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the Colorado River Basin are reviewed. Salinity, the most critical water quality problem in the basin, will be only slightly reduced by the NPDES permit program set up by the Act. A basin-wide program of irrigation efficiency will reduce the 9.0 million tons of salt carried by the river annually 2.2 million tons. Total capital costs (in 1973 dollars) will be $160 million to achieve the Act's 1977 requirement of best practicable treatment technology, with an additional $35 million to achieve best available technology by 1983. Part 2 is primarily concerned with environmental site studies. (See also W76-10570) (NCWQ)
W76-10571

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME I),
Little (Arthur D.), Inc., San Francisco, Calif.
Available from the National Technical Information Service, SpringfielD Va., 22161, as PB-249 730, $21.25 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington D. C. Report NCWQ 75/27-Vol 1, Nov. 1975. 294 p, 31 fig, 75 tab. WQ5AC053.

Descriptors: *Pollution abatement, California, *Regional analysis, River basins, Bays, Waste water treatment, Water pollution sources, Water resources, Federal Water Pollution Control Act, Water supply, Public law, Water law, Economic analysis, Forecasting.
Identifiers: *Central Valley(Calif), *Federal Water Pollution Control Act Amendments of 1972, *San Francisco Bay(Calif).

The environmental, social, economic and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the San Francisco Bay/Central Valley are reviewed. Point source programs will result in a high level of effluent discharge with minimal adverse environmental and economic impacts, and positive benefits in improved fishery and water recreation uses, and conservation of water supplies. The water pollution control effort in the study areas directly related to water quantity. Among the problems remaining are control of agricultural wastewater and urban runoff. Estimated capital costs (in 1973 dollars) of industrial waste treatment to achieve the 1977 requirement of best practicable treatment technology and the 1983 goal of best available technology will be $41.1 million and $91.8 million respectively O and M will be $5.2 million for 1977 and $14.6 million for 1983. Volume I is primarily concerned with background information and pollution source by subareas. (See also W76-10573) (NCWQ).
W76-10572

VATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME II),
Little (Arthur D.), Inc., San Francisco, Calif.
Available from the National Technical Information Service Springfield, Va., 22161, as PB-249 330, $21.25 in paper copy $3.00 in microfiche. National Commission on Water Quality, Washington D.C. Report NCWQ 75/27 - Vol. 2, November 1975 523 p. WQ5AC053

Descriptors: *Pollution abatement, California, Regional analysis, River basins, Bays, Waste water treatment, Water pollution sources, Water resources, Water supply, Federal Water Pollution Control Act, Public law, Water law, Economic analysis, Forecasting.
Identifiers: *Central Valley(Calif), *Federal Water Pollution Control Act Amendments of 1972, *San Francisco Bay(Calif).

The environmental, social, economic and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500) on the San Francisco Bay/Central Valley are reviewed. Point source programs will result in a high level of effluent discharge with minimal adverse environmental and economic impacts, positive benefits in improved fishery and water recreation uses, and conservation of water supplies. The water pollution control effort in the study area is directly related to water quantity. Among the problems remaining are control of agricultural wastewater and urban runoff. Estimated capital costs (in 1973 dollars) of industrial waste treatment to achieve the 1977 requirement of best practicable treatment technology the 1983 goal of best available technology will be $41.1 million and $91.8 million respectively. O and M will be $5.2 million for 1977 and $14.6 million for 1983. Volume II is primarily concerned with pollution loadings and discharge, costs of abatement, and agricultural, urban storm-water runoff. (See also W76-10572) (NCWQ)
W76-10573

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT, VOLUME I,
Environmental Law Inst., Washington, D. C.
W. A. Irwin, E. I. Selig, K. Hall, R. A. Liroff, and A. S. Miller.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-246 321, $12.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/12-1 October 1975, 479 p. WQ5AC043.

Descriptors: *Law enforcement, Federal Water Pollution Control Act, *Institutions, Evaluation, Social participation, Regulation, Water law, Water pollution, Waste water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Public participation.

The Federal Water Pollution Control Act Amendment of 1972 set up a national permit system to control the discharge of pollutants and provides a balance of Federal and state regulatory powers for enforcement of these permits. A criterion for effectiveness in enforcement is whether water pollution officials are acting decisively with respect to violations that involve matters of fault. While it is too early to judge the effectiveness of enforcement, several patterns were found: both federal and state agency prefer bargaining and administrative approaches to obtain compliance; compliance by federal facility and municipalities is tardy; the enforcement authority granted EPA has provided valuable federal reinforcement for state enforcement efforts; citizen suits have principally been directed at EPA implementation of FWPCA rather than discharger non-compliance with its requirements. Authors suggest alternative strategy for enforcement such as authorization for administrative assessment of civil penalties and ammendments, section 309 of the Act. (See also W76-10575) (NCWQ)
W76-10574

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT VOLUME II,
Environmental Law Inst., Washington, D. C.
W. A. Irwin, E. I. Selig, K. Hall, R. A. Liroff, and A. S. Miller.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-246 322, $18.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington D. C. Report NCWQ 75/12-2, October 1975. 1,132 p. WQ5AC043.

Descriptors: *Law enforcement, Federal Water Pollution Control Act, Administration, *Institutions, Evaluation, Social participation, California, Texas, Water law, Georgia, Ohio, Maine, Maryland, Iowa, Water pollution, Waste water treatment.
Identifiers: *Public administration, *Federal Water Pollution Control Act Amendments of 1972.

Volume II contains case studies describing enforcement activities under the Federal Water Pollution Control Act Amendments and state laws as they are being carried on in eight states-- California, Georgia, Iowa, Maine, Maryland, Ohio, Texas and Utah by both state and federal agencies. Relationships are described as they exist between state agencies, the regional offices of the Environmental Protection Agency and local industries, and municipalities. While it is too early to judge the effectiveness of enforcement, authors found several patterns: both federal and state agencies prefer bargaining and administrative approaches to obtain compliance; compliance by federal facilities and municipalities is tardy; the enforcement authority granted EPA has provided valuable federal reinforcement for state enforcement efforts; citizen suits have principally been directed at EPA implementation of the FWPCA rather than discharger non-compliance with its requirements. (See also W76-10574) (NCWQ)
W76-10575

WATER QUALITY ANALYSIS, IOWA-CEDAR RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 931, $6.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/62, July 1975. 165 p, 5 fig, 10 tab, 5 ref. WQ5AC029.

Descriptors: Sites, *Environmental effects, Evaluation, *Iowa, Rivers, Federal Water Pollution Control Act, River basins, Ecology, Environment, Water pollution effects, Pollution abatement, Water quality, Forecasting, Waste water treatment.
Identifiers: *Iowa-Cedar River Basin, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

A comprehensive water quality analysis at the Iowa-Cedar River Basin was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). The study (1) characterized historical and existing water quality conditions and (2) projected resulting water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W76-10576

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, CONNECTICUT RIVER.
Center for the Environment and Man, Inc., Hartford, Conn.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 924, $9.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/51, April 1975. 255 p, 51 ref. WQ5AC035.

Descriptors: Rivers, *Connecticut River, *Environmental effects, Ecology, Evaluation, River basins, *Massachusetts, Environment, Federal Water Pollution Control Act, Limnology, Water pollution effects, Forecasting, Water quality, Waste water treatment, Sites.
Identifiers: *Environmental impact assessment, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

A comprehensive water quality analysis and environmental impact assessment at the Connecticut River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). The study (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the Commission. (NCWQ)
W76-10577

WATER QUALITY ANALYSIS, SANTEE RIVER BASIN,
Water Resources Engineers, Inc., Springfield, Va.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 928, $6.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/54, April 1975. 137 p, 85 fig, 13 tab, 7 ref. WQ5AC029.

Descriptors: Sites, *Environmental effects, Evaluation, Rivers, Federal Water Pollution Control Act, River basins, *North Carolina, *South Carolina, Ecology, Environment, Water pollution effects, Pollution abatement, Water quality, Forecasting, Waste water treatment
Identifiers: *Santee River Basin, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

A comprehensive water quality analysis at the Santee River Basin was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). The study (1) characterized historical and existing water quality conditions and (2) projected resultant water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the Commission. (NCWQ)
W76-10578

WATER QUALITY ANALYSIS, COLUMBIA RIVER.
Tetra Tech, Inc., Pasadena, Calif.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 927, $5.50 in paper copy $3.00 in microfiche. National Commission on Water Quality, Washington, D. C.

Report NCWQ 75/59, February 1976. 115 p, 41 ref. WQ5AC027.

Descriptors: Sites, *Columbia River, *Environmental effects, Rivers, Evaluation, *Washington, *Oregon, River basins, Ecology, Federal Water Pollution Control Act, Environment, Water pollution effects, Pollution abatement, Water quality, Forecasting, Waste water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

A comprehensive water quality analysis at the Columbia River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). The study (1) characterized historical and existing water quality conditions and (2) projected resultant water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sector of the Commission. (NCWQ)
W76-10579

BENEFITS FROM WATER POLLUTION ABATEMENT, PROPERTY VALUES,
Dornbusch (David M.) and Co., Inc., San Francisco, Calif.
D. M. Dornbusch, C. O. Falcke, P. M. Gelb, and L. W. Kozimor.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 805, $9.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/21, December 1975. 326 p, 32 fig, 27 tab, 43 ref. WQ5AC006.

Descriptors: *Pollution abatement, *Benefits, *Property values, Economics, Evaluation, Social change, Attitudes, Forecasting, Aesthetics, Wildlife, Recreation, Lakes, Rivers, Real property, Value, Water pollution.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

Increases in property values resulting from water pollution abatement programs depend on how changes are perceived, the type and size of the water body, and visual and physical access to the water body. Lay persons relate to quality of water in terms of its (1) wildlife support capacity, (2) recreational opportunities and (3) aesthetic aspects. Residents near large lakes with good or unlimited public access receive the largest benefits, while those living by small rivers with limited public access derive smaller benefits. Magnitude of benefits is also influenced by the type of community, especially its traditional relation to water. Seventeen site descriptions are presented: Lake Washington (2 sites); Green Lake, Wisc; Marion Millpond, Wisc; Mystic River, Conn.; Willamette, Ore.; Kanawha, W. Va.; Rockaway, N. J.; Navesink and Shrewsbury, N. J.; Lake Charles, La.; St. John's, Fla.; Kalamazoo, Mich.; Brown's Lake, Wisc.; Hart, Mich.; Minetonka, Minn.; Big Sioux, S. D.; and San Diego Bay, Calif. (NCWQ)
W76-10580

A MULTI-OBJECTIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT USING GOAL PROGRAMMING,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 6A.
W76-10582

RATIONALE FOR A WATER POLLUTION CODE (PART II): SOCIAL ASSESSMENT,
Caldwell Connell Engineers, Melbourne (Australia).
I. G. Wallis.
International Journal of Environmental Studies, Vol. 8, No. 2, p. 113-120, 1975. 19 ref.

Descriptors: *Water quality control, *Social values, *Welfare(Economics), *Water quality standards, *Value engineering, Australia, Decision making, Attitudes, Environmental sanitation, Economic efficiency, Estimating, Analytical techniques.
Identifiers: Water Pollution Code.

Waste control management decision making based on the objectives of (1) continued health and survival of man and other components of the biosphere; (2) equal distribution of social welfare; and (3) short term maximization of social welfare for the people involved in a specific region, utilizing social assessment by cost-benefit analysis and the preference analysis techniques are discussed. The social welfare function gives a quantitative description of community satisfaction enabling a waste management authority to make quantitative decisions on the basis of the objectives. The methodology of the cost-benefit and preference analyses are described and the application of preference analyses will lead to refinements, increased accuracy and greater confidence in its use. However, in view of the assumptions and inaccuracies involved in developing a social welfare function, it is advisable to use both the cost-benefit and the relative preferences approaches to quantifying satisfaction. A social welfare function reduces the highly complex processes of human perception, habit, and satisfaction to a relatively simple form, which can only approximate the true situation but it may be possible to represent the preferences, and the level of satisfaction of a community, to within an order of magnitude, thus generating results for a compromise water quality standard. (Auen-Wisconsin)
W76-10592

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE ANIMAL FEED, BREAKFAST CEREAL, AND WHEAT STARCH SEGMENTS OF THE GRAIN MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
R. V. Watkins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 861, $5.50 in paper copy, $3.00 in microfiche. Report No. EPA 440/1-74-039-a, December 1974. 124 p. 17 fig., 24 tab., 20 ref.

Descriptors: *Effluents, Standards, *Waste water treatment, *Grains(Crops), *Industries, Cereal crops, Wheat, Feeds, Technology, Water utilization, Pollutants, Electric power costs, Estimated costs, *Water quality standards, Water pollution control.
Identifiers: *Grain milling industry, Breakfast cereal manufacturing, Animal feed manufacturing, Wheat starch/gluten manufacturing.

Effluent limitations guidelines are proposed for the animal feed, hot cereal, ready-to-eat cereal, and wheat starch/gluten manufacturers that can be attained through the application of the Best Practicable Control Technology Currently Available, the Best Available Technology Economically Achievable by July 1, 1977 and July 1, 1983, respectively; and performance standards for the degree of effluent reduction that is achievable through the application of the best available demonstrated control technology, processes, operating methods, or other alternatives. Treatment technologies are recommended for the two subcategories with allowable discharges--ready-to-eat cereal and wheat starch/gluten manufacturing; the technologies are generally similar and may include equalization and biological treatment followed by secondary clarification. Additional solids removal techniques will be required for higher solids removal to meet the 1983 limitations. The estimated investment cost for an entire treatment system for a medium-sized ready-to-eat cereal plant with production of 226,800 kg/day is $812,000. An additional $64,000 will be required to meet the 1983 standards. Investment costs for a typical wheat starch plant with a capacity of 45,400 kg/day are $964,000 for 1977 and $966,000 for 1983. Supportive data and rationale for development of the proposed effluent limitations guidelines and performance standards are presented. (Auen-Wisconsin)
W76-10594

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE, FRICTION MATERIALS AND SEALING DEVICES SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
R. T. Gregg.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 860 $5.00 in paper copy, $3.00 in microfiche. Report No. EPA 440/1-74-035-a, December 1974. 99 p. 5 fig., 12 tab., 35 ref.

Descriptors: *Effluents, Standards, *Waste water treatment, Industries, *Asbestos, Technology, Pollution abatement, Dusts, Sealants, Linings, Insulation, *Water quality standards, Water pollution control.
Identifiers: Asbestos textiles manufacture, Asbestos gaskets manufacture, Asbestos packing manufacture, Friction materials manufacture.

The degree of effluent reduction attainable by the application of the Best Practicable Control Technology Currently Available and by the Best Available Technology Economically Achievable, effective July 1, 1977 and July 1, 1983, respectively, are delineated for these segments of the industry. Performance standards for new sources of waste waters are also prescribed. Water is not used in most plants during the manufacture of asbestos textiles, friction materials, and asbestos gaskets, packing and sealing devices and waste water is not generated. However, process-related waste waters are generated by manufacturing operations or by air pollution equipment in a few plants. The industry is subcategorized by raw waste loads, volumes and rates of waste water discharges, and differences in applicable in-plant control measures and end-of-pipe treatment technologies in the coating, or finishing, of asbestos textiles, solvent recovery, vapor absorption, and wet dust collection operations. The estimated investment cost of achieving the 1977 limitations and standards by all plants in the industry is approximately $200,000 (in 1971 dollars), excluding additional land acquisition costs. The cost of achieving the 1983 level is estimated to be less than $800,000. The investment and annual costs associated with the alternative control technologies for the four subcategories, as well as the effluent quality associated with each alternative, are summarized. (Auen--Wisconsin)
W76-10595

OCEAN BOUNDARIES AND PETROLEUM RESOURCES,
Princeton Univ., N.J. Dept. of Geology.
For primary bibliographic entry see Field 6E.
W76-10596

LITERATURE REVIEW: MOVEMENT OF SPILLED OIL AT SEA,
Mathematica, Inc. Philadelphia, Pa. Regional and Environmental Studies,

or primary bibliographic entry see Field 5B.
/76-10599

IARINE TECHNOLOGY SOCIETY EIGHTH NNUAL CONFERENCE PREPRINTS,
Iarine Technology Society, Washington, D.C.
Iarine Technology Society Eighth Annual Conerence, held in Washington, D.C., September 11-3, 1972. Preprints, 1972. 782 pages.

escriptors: *Continental Shelf, *Environmental ffects, Water resources, *Resources Develop-ent, *Water quality control, Coasts, Estuaries, isheries, Sediments, Buoys, Data processing, ining, Instrumentation.
dentifiers: *Outer Continental Shelf, *Offshore chnology, Energy sources.

his is a collection of preprints of papers to be resented at the 8th annual conference. The apers are arranged according to the following ubject groupings: Buoy Technology, Cables, oastal Zone Management, Education, Sedi-ents, Fisheries, Data and Information Systems, cean Mining and Environmental Considerations, uclear Sources, Power Systems, Social Values - cean Resources Development, Search and alvage, Instrumentation, Ships, Undersea Ships, nderwater Photography, and Water Quality. Per-nent papers are separately abstracted. (See W76-0601 thru W76-10603) (Sinha-OEIS)
/76-10600

N ENVIRONMENTAL ANALYSIS OF A SIMU-ATED SEA-FLOOR MINING OPERATION,
Iarine Minerals Technology Center, Tiburon, alif.
. N. Roby.
n: Marine Technology Society Eighth Annual onference, held in Washington DC, September 1-13, 1972. Preprints, 1972. p 375-380, 9 ref.

escriptors: *Resources development, Water esources, *Mining, *Environmental effects, Water quality control, Metals, Minerals, Con-nental shelf, Regulation.
dentifiers: *Outer Continental Shelf, Mineral eposits, Baseline studies.

he increase in demand for minerals in recent ears suggests that mining activity will increase on he continental shelf. Personnel at the Marine Iinerals Technology Center, National Oceanic nd Atmospheric Administration, are attempting o define the environmental problems that will esult from recovering minerals from the sea floor. Vhat are the problems or fears of problems that ould result from offshore mining. These fears robably can be grouped into three categories: (1) he disturbance of fisheries ecology and habitats;) coastal erosion and degradation of recreational eaches, and (3) hazards to navigation, submarine ables, and pipelines. A simulated mine model has een designed for study. It is obvious that person-el of a mining company must obtain much infor-ation about an offshore mine site before the perations could start. During sea-floor deposit valuation, much environmental data should be etermined during the drilling. Finally, before any ining activity starts, clearance would be required om various agencies. If the operation were ithin the 3-mile limit, permits would be required om: U. S. Army Corps of Engineers, U. S. Coast uard, and California State Lands Division (or a milar agency of other states). If the operation ere beyond the 3-mile limit, permits would be quired from: U. S. Geological Survey and the U. Bureau of Land Management. (See also W76-0600) (Sinha-OEIS)
/76-10601

HE ENVIRONMENTAL IMPACT OF DEEP-EA MINING,
amont-Doherty Geological Observatory, alisades, N. Y.
O. A. Roels, A. F. Amos, C. Garside, and T. C. Malone.
In: Marine Technology Society Eighth Annual Conference, held in Washington DC, September 11-13, 1972. Preprints, 1972. p 369-373, 1 ref.

Descriptors: *Mining, *Environmental effects, *Resources development, Water resources, *Water quality control, Continental Shelf, Biota, Benthos, Sediments, Dredging, Baseline studies, Ecosystems, Monitoring, Manganese, Metals.
Identifiers: *Outer Continental Shelf, *Environmental impact, *Ferromanganese deposits, Pelagic biota, Bottom water.

The proposed mining of ferromanganese deposits from the deep sea will have a measurable effect on benthic and pelagic environments within the mining area. As now envisioned, deep-sea mining operations will result in the removal and redistribution of sediments and benthic organisms and, where suction dredging is employed, in the discharge of nutrient-rich, sediment-laden bottom water into the surface layer. Our approach to the problem of the environmental impact of deep-sea mining is based on (1) the establishment of physical, chemical and biological baseline environmental conditions in potential mining areas; (2) documentation of changes induced in benthic and pelagic ecosystems by deep-sea mining; (3) elucidation of their underlying mechanisms and implications in relation to current and potential marine resource; (4) formulation of guidelines for future mining operations which will minimize harmful environmental effects while enhancing the development of potentially beneficial by-products; and (5) determination of the properties which should be monitored during deep-sea mining to provide the information necessary to continuously evaluate the environmental impact of specific mining operations. (See also W76-10600) (Sinha-OEIS)
W76-10602

SAFETY AND POLLUTION CONTROL - OFFSHORE PETROLEUM PRODUCING FACILITIES,
Humble Oil and Refining Co., Houston, Tex.
D. G. Warner.
In: Marine Technology Society Eighth Annual Conference, held in Washington DC, September 11-13, 1972. Preprints, 1972. p 741-752, 9 fig, 8 ref.

Descriptors: *Offshore platforms, *Oil industry, *Oil pollution, Water resources, *Resources development, *Environmental effects, Water quality control, *Pollution abatement, Continental Shelf, Blowouts, Safety, Drilling.
Identifiers: *Outer Continental Shelf, *Offshore technology.

Blowout prevention and pollution control in offshore petroleum operations are of prime concern to industry, regulatory agencies, and the public. This paper reviews safety and antipollution equipment and procedures used in offshore oil production and discusses Humble and Industry programs to achieve maximum protection. Several safety and pollution-control systems are utilized. Surface safety valves and subsurface safety valves in each well provide shut-in if an abnormal condition develops. Oil leaks are retained in sumps. Fire-fighting equipment is installed on each platform to rapidly extinguish small fires before they can spread. The paper concludes that various industry and regulatory programs are providing the safety and pollution control that is needed. Technological developments and reliability improvements are continuing. Ongoing work emphasizes development of subsurface safety valve concepts applicable to all wells, better manufacturing quality control and standards, and further reductions of human errors through training and safety programs. (See also W76-10600) (Sinha-OEIS)
W76-10603

QUALITY OF WATER CONSIDERATIONS IN ARID AREA WATER MANAGEMENT,
Nevada Univ., Reno. Desert Research Inst.; and Nevada Univ., Las Vegas. Center for Water Resources Research.
For primary bibliographic entry see Field 5B.
W76-10608

AGRICULTURAL SEDIMENT CONTROL FOR WATER QUALITY PROTECTION,
Environmental Protection Agency Washington, D. C. Office of Air and Water Programs.
W. C. Shilling.
In: Agriculture and Clean Water--Proceedings of a Conference to Explore Control Strategy for Agricultural Nonpoint Source Water Pollution, Kansas City, Missouri, April 3, 1975, p 19-26.

Descriptors: *Sediments, Agriculture, *Water quality, *Soil conservation, Farm wastes, *Sediment control.
Identifiers: Public Law 92-500.

Briefly discussed are three major areas of agricultural sediment control. They are the (1) impact of agricultural sediments on water quality and the control of these sediments, (2) nonpoint control features of Public Law 92-500, and (3) state and local control programs. The impact of agricultural sediments on water quality generally falls into three categories. First, there are the direct effects of the sediments. These sediments settle to the bottom of some body of water and smother some of the bottom organisms. They reduce penetration of light, thus affecting the photosynthesis processes. They also have an aesthetic effect. Second, the sediments act as carriers of potentially pollutional materials. Third, they place varying oxygen demands on the water body. Animal waste and crop residue that form a part of the sediments in a total sense are organic materials and will utilize oxygen in their decomposition. Different sections of Public Law 92-500 are given in relation to the control of nonpoint sources or agricultural sediments. Local expertise must be involved from the beginning in the planning, development, and implementation of the management programs. Four items deemed important are: (1) if a control program for agricultural sediments is to be effective, it must be tailored to local conditions, (2) priorities must be determined and an effective control program, developed and implemented, (3) a distinction must be made between soil conservation and water quality protection, and (4) 208 planning and 305 (b) state reports preparation are either on-going or being initiated, and those with specific knowledge in the control of agricultural sediments should make their expertise available for these efforts. (Cameron-East Central)
W76-10617

DIRECTORY OF EPA, STATE AND LOCAL ENVIRONMENTAL QUALITY MONITORING AND ASSESSMENT ACTIVITIES.
Smithsonian Institution, Cambridge, Mass. Center for Short-Lived Phenomena.
J. W. Scotton, K. T. Mullen, J. Whitman, and R. Citron.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 757, $10.75 in paper copy, $3.00 in microfiche. Report EPA-600/4-75-001, December 1974, 384 p. 139 tab.

Descriptors: *Pollutant identification, *Programs, *Monitoring, *Assessments, *Administrative agencies, *Governmental interrelations, Local governments, State governments, Federal government, Air pollution, Water pollution.
Identifiers: Directories.

Federal environmental quality monitoring and assessment programs within the Environmental Protection Agency are described, juxtaposed with corresponding, although not necessarily administratively related, national, state, and local moni-

toring activities. Seven areas are discussed: air, water quality, interstate water carrier supplies, pesticides, radiation, noise, and solid waste. The administration and purpose of the EPA office monitoring each are described. The data in the directly was obtained from EPA. Detailed descriptions of individual monitoring activities were clarified by state and local agencies. This account is not exhaustive, but it provides a first approximation of the types and distribution of monitoring activities. (Snyder-FIRL)
W76-10623

REPORT ON POLLUTION OF INTERSTATE WATERS OF THE CONNECTICUT RIVER.
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W76-10626

INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SENSING AND ASSESSMENT, VOLUMES 1 AND 2.
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.
W76-10637

A PRELIMINARY DESIGN FOR A NATIONAL ENVIRONMENTAL CENSUS,
Energy Resources Co., Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-10642

LEGAL REQUIREMENTS FOR MONITORING GROUNDWATER QUALITY,
Banks (Harvey O.), Inc., Belmont, Calif.
H. O. Banks, and L. G. McMillion.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-1-1 - 9-1-4.

Descriptors: *Legal aspects, *Legislation, *Jurisdiction, *Groundwater, *Monitoring, Federal Water Pollution Control Act, Regulation, Water quality, Water pollution.
Identifiers: Safe Drinking Water Act, Federal-interstate compacts.

Legal mandates and requirements pertaining to groundwater quality monitoring are reviewed. The Federal Water Pollution Control Act, as amended by Public Law 92-500, and the Safe Drinking Water Act are pieces of federal legislation which dictate needs for groundwater monitoring. A few interstate compacts, such as the federal-interstate compacts for the Delaware River Basin and the Susquehanna River Basin, provide authority for compact commissions to monitor groundwater quality. State laws and regulations for groundwater monitoring show wide variation, and there are generally several state agencies which have statutorily defined authorities and responsibilities with respect to groundwater. At the regional and local levels of government, counties, municipalities and special political jurisdictions such as water supply, sanitary, flood control, and water conservation districts have interests in groundwater quality and often conduct extensive monitoring programs. (See also W76-10637) (Kreager-FIRL)
W76-10656

ECONOMIC FRAMEWORK FOR GROUNDWATER QUALITY MONITORING,
California Univ., Santa Barbara. Dept. of Economics.
R. L. Crouch, R. D. Eckert, and D. D. Rugg.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-2-1 - 9-2-4. 10 fig, 3 ref.

Descriptors: *Monitoring, *Groundwater, *Cost-benefit analysis, *Optimum development plans, Economics, Evaluation, Costs, Water quality, Water pollution.

Economic considerations associated with selecting an optimal groundwater quality compliance monitoring strategy are discussed. Marginal benefits and marginal damage functions are used to analyze a hypothetical situation involving the contamination of a farmer's irrigation well with chlorides from an oil company's unlined brine disposal pit. The marginal cost curve for compliance monitoring will change as technological innovations in the monitoring industry occur and as the relative prices of various alternative monitoring techniques change. Similarly, the marginal benefit curve will change as the marginal social gain from monitoring changes, and this will change as the polluter's marginal benefits function from emitting pollutants and the pollutee's marginal damage function from the impact of pollutants change. (See also W76-10637) (Kreager-FIRL)
W76-10657

DO REGULATED FREIGHT RATES DISCOURAGE RECYCLING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
O. W. Albrecht.
News of Environmental Research in Cincinnati, November 14, 1975, 4 p, 1 fig, 2 tab, 9 ref.

Descriptors: *Regulation, *Rates, *Recycling, *Transportation, *Discriminatory pricing, Railroads, Chemicals, Iron, Rubber.
Identifiers: Secondary materials.

Two Environmental Protection Agency (EPA) studies did not prove conclusively discrimination by Interstate Commerce Commission (ICC)-regulated rates against secondary materials. A study by the Research Planning Institute (RPI) implied that discrimination, in the ICC sense, might exist for rates for motor carriers weighted by amounts of necessary chemical constituents for paperboard manufacture. The study did not document, however, that the rate differences actually affected long-run decisions involving plant locations and raw material substitutions. The Moshman Associates study compared percentage contributions to variable cost of different rates per ton-mile. To the extent that the costs were representative, the study implied that economic discrimination existed for ferrous scrap because the applicable rates did vary from incremental costs on long hauls compared to iron ore rates. Discrimination was also suggested for cullet and reclaimed rubber because their contribution percentages were higher than those for their new counterparts. Questions have been raised as to whether ICC costing procedures are appropriate. The basic issue of rate discrimination is related to national goals for regulation of common carriers. There are, at present, no clear criteria for freight rates. It is generally inappropriate to determine discrimination on the basis of incremental cost pricing due to the nature of costs prevailing for railroads. New decision rules are needed if regulation of freight rates is to encourage a social goal, such as recycling. Since the EPA analyses, several general rate increases have occurred, and the ICC ordered holddowns for some of these on certain recyclable commodities. (Snyder-FIRL)
W76-10676

OWRT INTEREST IN NEW TECHNOLOGIES FOR WATER TREATMENT,
Office of Water Research and Technology, Washington, D.C.
W. S. Butcher.
Presented at 80th Annual Meeting of the American Institute of Chemical Engineers, September 7-10, 1975, Boston, Massachusetts, 12 p.

Descriptors: *Water treatment, *Water conservation, *Water purification, *Water resources, *Technology, *Research and development, Federal government, Desalination, Impaired water quality, Saline water, Water sources, Water supply.

The Office of Water Resources Research and the Office of Saline Water Conversion were combined in July 1974 to form the Office of Water Research and Technology (OWRT). New functions were added to the old functions incorporated in the new office. The new office's objectives are to develop new knowledge needed to mitigate or solve important water resource problems and to help disseminate research results. The programs to achieve these objectives include research, development, scientific information dissemination, and technology transfer. Problems studied include the hydrologic cycle, water supply and demand, conservation, and methods of increasing water supplies. Research is performed by contractors. Three major areas of research are surface and groundwater treatment technologies; technologies making impaired water usable; and saline water conversion technologies for municipal, agricultural, and industrial uses. A Water Resources Scientific Information Center is included in OWRT. The technology transfer program is still in a formative stage. The OWRT was established to provide a more responsive system relating water research and results to actual problems. (Snyder-FIRL)
W76-10677

ASSESSMENT OF POLYVINYL CHLORIDE AS A PACKAGING MATERIAL FOR DISTILLED SPIRITS, (ENIVRONMENTAL IMPACT ASSESSMENT),
Bureau of Alcohol, Tobacco and Firearms, Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-10722

AN INTEGRATED INTERNATIONAL AND DOMESTIC APPROACH TO CIVIL LIABILITY FOR VESSEL-SOURCE OIL POLLUTION,
L. D. Wood.
Journal of Maritime Law and Commerce, Vol 7, No 1, p 1-68 (1975). 68 p, 2 fig.

Descriptors: *Oil spills, *Oil pollution, *International law, *Treaties, *Federal Water Pollution Control Act, Pollutants, Water pollution sources, Water pollution effects, Oil industry, Oil, International waters, Navigable waters, United States, Transportation, Ships, Federal jurisdiction, State jurisdiction.
Identifiers: Maritime law, Territorial waters, *Liability, Oil tankers, Vessel-source pollution, Torts.

Presently there are no adequate private law remedies for vessel-source oil pollution damage, either in the United States or abroad. Any potential recovery usually depends on the establishment of a cause of action such as private nuisance or negligence. Even if the plaintiff is able to sustain the difficult burden of proof in such actions, however, recovery may be defeated by a number of common law defenses. To provide an adequate remedy for oil pollution damages, a comprehensive modern plan for dealing with theproblem of liability for vessel-source pollution is set forth in two treaties drafted by the Inter-Governmental Marine Consultative Organization. These treaties would establish a scope of liability and an international compensation fund, supported by a levy on oil transported by sea. The author compares these treaties with existing legal mechanisms, examines various facets of oil pollution damage, and discusses jurisdictional matters relating to both existing and proposed systems, domestic and international. It is urged that Congress ratify the treaties and at the same time enact a program to incorporate their provisions into a comprehensive

LIBRARY U. OF A. ENVIRONMENTAL CENTER

domestic program which would create a uniform body of law for oil pollution liability among the states and within the Federal Government. (Sloan-Florida)
W76-10730

THE ROLE OF THE COASTAL ZONE MANAGEMENT ACT OF 1972 IN THE DEVELOPMENT OF OIL AND GAS FROM THE OUTER CONTINENTAL SHELF,
Morgan, Lewis and Bockius, Washington, D. C.
K. A. Rubin.
Natural Resources Lawyer, Vol. 8, No. 3, p. 399-436 (1975). 38 p.

Descriptors: *State jurisdiction, *Federal-state water rights conflicts, *Continental shelf, *Environmental effects, *Oil reservoirs, Oil, Attitudes, Cocial impact, Atlantic Ocean, Oil fields, Fuels, Oil industry, Oceans, Gases, Atlantic coastal plain, Social aspects, Legal aspects, United States, Jurisdiction, Water rights, Legislation, Federal government, Drilling, Federal jurisdiction.
Identifiers: *Coastal Zone Management Act, *Offshore oil, *Outer continental shelf, Gas exploration and development.

Increased importation of oil and gas resulting from the rapid decline of domestic supplies of these resources could be slowed by the exploitation of substantial quantities of oil and gas contained in the Outer Continental Shelf (OCS). This article examines the national interest in prompt exploration and development of the OCS and in the possibility that the Coastal Zone Management Act of 1972 (CZMA) may be used to delay exploratory drilling. The federal government has exclusive jurisdiction over the oil and gas resources of the OCS. Section 307 of the CZMA, however, enlarges the state's authority by requiring federal government activities to be consistent with approved state management programs. To insure that this power is used properly, the CZMA provides three constraints on state authority: (1) the management program must adequately consider the national interests involved; (2) the Secretary of Commerce has within his power the right to permit a license to be issued: and (3) the exercise of state authority must be consistent with the Commerce Clause of the United States Constitution. Also included is a discussion of the national interest in prompt development of the energy resources of the Atlantic OCS. (Griffith-Florida)
W76-10734

ENERGY CRISIS, SUPERTANKERS AND ECOLOGY,
R. C. Morris.
Insurance Counsel Journal, Vol. 42, No. 4, p. 511-25 (1975). 15 p.

Descriptors: *Ships, *Oil spills, *Oil pollution, *Federal jurisdiction, *International law, Insurance, Water pollution, Water pollution sources, Oceans, Harbors, Federal government, State governments, Legislation, Florida, Federal Water Pollution Control Act, Oil spills, Standards, Legal aspects, Governmental interrelations, International commissions, Judicial decisions.
Identifiers: *Supertankers, Absolute liability, Oil Pollution Act, Certification, National Environmental Policy Act, Coastal Zone Management Act, Deepwater oil terminals.

Transcribed here are the remarks of speakers at a forum on the problems of super-tankers in relation to oil pollution. Topics discussed include: the expanding role of supertankers in transporting petroleum; internationa l standards for tanker design, construction and operation; and the legal ramifications of marine pollution. Oil pollution has been dealt with by international conventions, including conventions on Pollution of the Sea by Oil, Civil Liability and Ocean Dumping. The United States has treated oil pollution problems by ratifying several international conventions and by passing federal legislation such as the Oil Pollution Act, National Environmental Policy Act, Coastal Zone Management Act and the Deepwater Port Act. One speaker discussed a Florida law, upheld by the Supreme Court, which imposed absolute liability on a shipowner for oil spills. He concluded that federal legislation preempting state laws was necessary to allow uniformity in marine pollution law. Another speaker covered the problems of insuring for oil pollution liability with special emphasis on problems caused by a lack of uniformity of laws between states and between nations. (Capehart-Florida)
W76-10735

WATER QUALITY AND THE WATER AND SOIL CONSERVATION ACT 1967,
D. A. R. Williams.
The New Zealand Law Journal, Vol. 1975, p. 650-62, 13p.

Descriptors: *Water conservation, *Water pollution control, *Classification, *Water quality control, *Foreign countries, Vegetation, Administrative agencies, Legal aspects, Administration, Conservation, Governments, Water quality, Legal review, Water pollution, Treatment, Supply, Water policy, Water rights, Regulation, Water resources development, Waste water treatment, Jurisdiction, Water law.
Identifiers: *New Zealand, *Water and Soil Conservation Act 1967(NZ).

The growing demand for water coupled with serious water quality problems has prompted New Zealand to undertake sweeping water law changes. This article analyzes the effects of the Water and Soil Conservation Act of 1967. The Act completely replaces common law riparian rights with statutory rights. It governs all 'natural water' which is defined to include substantially all water within territorial limits. A classification system establishes minimum quality standards for all affected water. Because the Act is so all-encompassing and so new, the application of statute to facts is still evolving. Nevertheless, some general principles have been set forth by the administrative board responsible for enforcement. With regard to classifications, the board has decided that the highest practical standards should be used for low quality water and that high quality water should not be impaired. Use of water is a matter of permit and the board has decided to weigh each case rather than establish rules. Standing to sue and to appeal are subjects as yet unresolved. (Comer-Florida)
W76-10737

BURNING WATERS,
H. L. Markow.
The Florida Bar Journal, Vol. 50, No. 1, p. 20-23 (1976). 4 p, 3 photo.

Descriptors: *Penalties(Legal), *Water pollution control, *Oil spills, Oily water, *Coast Guard regulations, State jurisdiction, Federal jurisdiction, Law enforcement, Disasters, River regulation, Legislation, Judicial decisions, Water pollution sources, Oil pollution, Oil wastes, Oil industry, Ships.
Identifiers: *Oil Pollution Act, *FWPCA Amendments of 1972, Water rights(Non-riparians), Absolute liability.

Burning water is an ever present danger of oil pollution. From 1952 to 1969 at least three major holocausts occurred in inland waters of this nation. This article focuses on the means by which the danger of burning waters has been reduced since 1970. Federal and state legislation require equipment usage to reduce spills and impose liability for pollution damage. The Coast Guard engages in constant surveillance with modern equipment and National Strike Force Teams are available for immediate response to any oil spillage. Reporting requirements have been strictly enforced by courts with resulting liability for violators. In some cases, private parties have been allowed to sue pollutors for damages. However, cleanup costs and legislatively imposed penalties will not prevent oil fires once pollution has occurred. The author examines the court imposed reporting standard of 'if you can see it, report it', and concludes that until oil spills are reduced to non-combustible limits, private reporting is the best safeguard to prevent oil spills from turning into holocausts. (Comer-Florida)
W76-10740

ROOKERY BAY: ECOLOGICAL CONSTRAINTS ON COASTAL DEVELOPMENT,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10741

A SOUND WATER PLAN FOR SOUTH FLORIDA IMPLEMENTATION OF THE 1972 WATER RESOURCES ACT,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-10742

U. S. POSITION ON LAW OF THE SEA REVIEWED,
For primary bibliographic entry see Field 6E.
W76-10743

HERE COME DE SLUDGE,
For primary bibliographic entry see Field 6E.
W76-10746

THE GREAT MAINE LOBSTER WAR,
For primary bibliographic entry see Field 6E.
W76-10747

THE NEW TREATY ON VESSEL POLLUTION,
For primary bibliographic entry see Field 6E.
W76-10748

LAWYERS AND ECOMANAGEMENT,
Puerto Rico Univ., Mayaguez. Inst. for Policy Studies and Law.
For primary bibliographic entry see Field 6E.
W76-10753

MATERIALS TRANSPORTATION BUREAU: TRANSPIRATION OF NATURAL AND OTHER GAS BY PIPELINE,
C. DeLeon.
Federal Register, Vol. 40, No. 191, p. 45192-97, October 1, 1975. 6 p.

Descriptors: *Offshore platforms, *Pipelines, *Natural gas, *Safety, *Transportation, Pollutants, Safety factors, Environmental engineering, Water pollution, Pollution abatement, Natural resources, Oil industry, Regulation, Coastal structures, Mechanical engineering, Public health, Legislation, Water law, Pressure conduits.
Identifiers: *Coastal waters, Administrative regulations.

The safety standards in Part 192 of Title 49 govern the design, construction, operation and maintenance of gas pipeline facilities and the transportation of gas in or affecting interstate or foreign commerce. These safety standards apply to gas pipeline facilities and the transportation of gas onshore as well as on the 'lands beneath navigable waters' and on the 'outer continental shelf' as those terms are defined in the Submerged Lands Act and the Outer Continental Shelf Lands Act. In view of the increasing development of offshore natural gas resources, the Materials Transportation Bureau (MTB) is considering amending Part

192 more clearly to delineate the applicability of Part 192 to offshore pipelines as well as to enhance the level of safety of gas pipeline facilities and in the transportation of gas offshore. (Reinders-Florida)
W76-10756

NEW SOURCE NPDES PERMITS PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10757

SOAP AND DETERGENT MANUFACTURING CATEGORY PRETREATMENT STANDARDS FOR NEW SOURCES,
Environmental Protection Agency, Washington, D. C.
J. Quarles.
Federal Register, Vol. 40, No. 126, p. 27454-56, June 30, 1975. 3 p. 7 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Detergents, Standards, *Federal Water Pollution Control Act, Water pollution sources, Chemical wastes, Water pollution, Water law, Water policy, *Water quality standards, Administration, Regulation, Control, Water quality, Legislation, Management, Water pollution treatment, Treatment facilities.
Identifiers: *FWPCA Amendments of 1972, *Point sources(Pollution), Administrative regulations, Hazardous substances, Effluent limitations, Environmental Protection Agency(EPA).

The Environmental Protection Agency (EPA) has promulgated final pretreatment standards for new sources for the manufacture of spray dried detergents, liquid detergents, drum dried detergents, and the manufacture of detergents by dry blending subcategories which discharge to publically owned treatment works. This final rulemaking is promulgated pursuant to section 307(c) of the Federal Water Pollution Control Act as amended. Set forth in the regulation are the numerical limitations which constitute the pretreatment standards for the appropriate subcategories. Presented within the notice are: (1) a summary of comments received by the EPA; (2) the revisions of the proposed regulations made prior to promulgation; and (3) the final rulemaking. (Reinders-Florida)
W76-10759

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY, PROPOSED PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
R. F. Train.
Federal Register, Vol. 40, No. 106, p. 23829-30, June 2, 1975. 2 p.

Descriptors: *Effluents, *Sewage effluents, *Classification, *Industrial wastes, *Waste water disposal, Treatment facilities, Cities, Waste treatment, Water treatment, Water pollution sources, Liquid wastes, Decision making, Pollutants, Wastes, Water pollution sources, Discharge(Water), Water pollution.
Identifiers: Administrative regulation, *FWPCA Amendments of 1972, Effluent limitations.

The Environmental Protection Agency (EPA) has proposed standards for pollutants introduced into publicly owned treatment works. The EPA believes the analysis supporting the effluent limitations guidelines is adequate to make a determination regarding the application of those standards to users of publicly owned treatment works; but to insure that these standards are appropriate in all cases, the EPA is seeking additional comments. Set forth are proposed effluent limitations guidelines and pretreatment standards for the introduction of incompatible pollutants into municipal systems by existing sources in the wood furniture and fixture production without water wash spray booth(s) or laundry facilities, and the wood furniture and fixture production with water wash spray booth(s) or with laundry facilities subcategories. The Agency has three options: (1) allow unrestricted discharge of materials known to be adequately treated (compatible pollutants); (2) require application of best practicable control technology based (1977) limitations to those pollutants which interfere with, pass through, or otherwise are incompatible with such works; or (3) establish a different discharge limitation for those pollutants treated to a known degree in publically owned treatment works where treatment is relatively inadequate. Pollutant categories and proposed pretreatment standards are presented. (Reinders-Florida)
W76-10760

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C.
R. F. Train.
Federal Register, Vol 40, No 106, p 23824-28, June 2, 1975. 5 p.

Descriptors: *Federal Water Pollution Control Act, *Waste water treatment, *Water quality standards, *Industrial wastes, Water pollution sources, Administrative decisions, Waste water disposal, Effluents, Industrial plants, Treatment facilities, Water pollution, Discharge(Water), Pollution abatement, Water pollution control, Federal government, Control, Regulation, Water law, Environmental effects, Cost-benefit analysis, Economics, Water policy.
Identifiers: Administrative regulations, *FWPCA Amendments of 1972, Effluent limitations, *Point sources(Pollution).

The Environmental Protection Agency (EPA) has established final effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources in the timber products processing category of point sources. This category is amended by the addition of the wood furniture and fixture production without water wash spray booth(s) or laundry facilities sub-category, and the wood furniture and fixture production with water wash spray booth(s) or with laundry facilities subcategory. The EPA's final rulemaking is promulgated pursuant to the Federal Water Pollution Control Act Amendments of 1972. Included within the notice are: (1) a summary of comments received by the Environmental Protection Agency; (2) the revisions of the proposed regulations made prior to promulgation; (3) the projected economic impact of compliance for these industry sectors; (4) a cost-benefit analysis; (5) publication references; and (6) the final amendments. (Reinders-Florida)
W76-10761

ENVIRONMENTAL PROTECTION AGENCY: POLICIES AND PROCEDURES FOR STATE CONTINUING PLANNING PROCESS,
Environmental Protection Agency, Washington, D. C.
R. F. Train.
Federal Register, Vol. 40, No. 137, p. 29882-87, July 16, 1975. 6 p.

Descriptors: *Planning, *Governmental interrelations, *Comprehensive planning, *Water allocation(Policy), *Water resources development, Management, Programs, Water management(Applied), Coordination, Decision making, Governments, Forecasting, Long-term planning, Projections, Administration, Budgeting, State governments, Future planning(Projected), Legislation.
Identifiers: Administrative regulations.

The Environmental Protection Agency has proposed regulations prescribing and providing procedures for review, revision, and approval of a State's continuing planning process. In addition, these regulations provide the mechanism for states to satisfy the Statewide requirements of Section 208 of 40 CFR Part 130 as well as portions of the following sections: Section 303(d) concerning critical waters and total maximum daily loads; Section 305(b) concerning annual assessment and projection of water quality and related information, including nonpoint sources; Section 314(a) concerning clean lakes; and Section 516(b) concerning Federal and State estimates of publicly owned treatment works construction needs. The broad goals of the continuing planning process are: (1) to assure that states develop the water quality assessment expertise and establish the management programs necessary to make coordinated water quality management decisions; (2) to establish water quality objectives which take into account overall Federal, state, and local policies and programs, including those for land use and other related natural resources; and (3) to develop the strategic guidance for preparing the annual State program submittal under Section 106 of the Act. (Reinders-Florida)
W76-10762

PREPARATION OF STATE WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol. 40, No. 137, p. 29887-91, July 16, 1975. 5 p.

Descriptors: *Federal Water Pollution Control Act, Water quality, *Environmental effects, *Water quality standards, *Project planning, Environment, Federal government, Legislation, State governments, Governments, Administrative agencies, Governmental interrelations, Political aspects, Water law, Water policy, Water pollution, Water resources, Water control, Environmental control, Programs, Regulation.
Identifiers: *State Water Quality Management Plan, *FWPCA Amendments of 1972.

The Environmental Protection Agency (EPA) has proposed an amendment to 40 CFR Part 131 which would alter requirements for state preparation of Water Quality Management Basin Plans. The amendment would change procedures governing plan adoption, submission, revision, and EPA approval. It also includes provisions for statewide planning responsibility under Section 208 of the Act. The primary objective of State Water Quality Management Programs is to achieve the 1983 'National water quality' goal of the Act by establishing attainable water quality goals. This means identifying necessary control and regulatory programs and determining the resulting environmental, social and economic impact. Each plan would include: planning boundaries; water quality assessment and segment classifications; inventories and projections; non-point source assessment; water quality standards; total maximum daily loads; point source land allocation; municipal facility needs; industrial facility needs; non-point source control needs; residual waste control needs; and urban and industrial stormwater needs. (Hadoulias-Florida)
W76-10763

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, UREA SUBCATEGORY,
Environmental Protection Agency, Washington, D. C.
J. Quarles.
Federal Register, Vol. 40, No. 162, p. 36337-39, August 20, 1975. 3 p, 2 tab.

Descriptors: *Federal Water Pollution Control Act, *Ureas, *Nitrogen compounds, *Ammonium compounds, *Regulation, Administrative agencies, Water pollution sources, Industrial wastes,

Water pollution control, Water pollution treatment, Fertilizers, Classification, Pollution abatement, Administrative decisions.
Identifiers: *FWPCA Amendments of 1972, Administrative regulation.

As a result of comment received and continued evaluation and review the Environmental Protection Agency has revised its proposed amendment to the Fertilizer Manufacturing Point Source Category, Urea Subcategory effluent limitation and guidelines regulation. The revision limits application of the regulation to prilled urea plants in which production began after January 1, 1970. The average daily values for thirty consecutive days for organic nitrogen has been increased to the highest monthly average of thirty-five months of exemplary plant operation. The maximum organic nitrogen for any day has been increased to 99% of the average daily values. Limitations for urea plants other than prilled urea have been suspended for reconsideration. Additional data and information evaluation and analysis is contemplated for development of limitations for older plants. The 1983 limitations are expected to be reconsidered after industry evaluation. The revision is promulgated in final form effective September 1975. (Comer-Florida)
W76-10764

ENVIRONMENTAL PROTECTION AGENCY: GRANTS AND OTHER FEDERAL ASSISTANCE, STATE AND LOCAL ASSISTANCE.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol. 40, No. 230, p. 55321-26, p. 55334-42, November 28, 1975. 15 p.

Descriptors: *Administrative agencies, *Grants, Governmental interrelations, *Federal project policy, *Project planning, Cost allocation, Cost sharing, Cost repayment, Project purposes, Water policy, Water quality control, State governments, Federal government.
Identifiers: Administrative regulations, *FWPCA Amendments of 1972.

Consistent with the Federal Water Pollution Control Act Amendments of 1972 the Environmental Protection Agency (EPA) has promulgated rules governing the policies and procedures for establishment and funding of state and regional continuing planning processes. The regulations require the designation of approved state and areawide planning agencies and the development of state water quality management plans. Relationships between the planning process and other programs, including municipal facilities programs, federal, state and local planning programs, federal properties programs and the National Pollutant Discharge Elimination System, are specified. The regulations also specify requirements for state planning process adoption, approval and revision procedures. The planning process must become self sufficient; however, in the initial stages planning will be eligible for federal grants. A ratio of allotment set forth for state and areawide fund allocation governs payment formulation. Requirements for grant eligibility are specified. (Comer-Florida)
W76-10765

DEEPWATER PORT SITE EVALUATION,
Coast Guard, Washington, D.C.
D. J. Riley.
Federal Register, Vol. 40, No. 217, p. 52581-82, November 10, 1975. 2 p.

Descriptors: *Coast Guard regulations, *Offshore platforms, *Coastal structures, *Administrative agencies, *Permits, Navigation, Coastal engineering, Port authorities, Construction, Rivers, Sites, Ships, Oil.
Identifiers: *Administrative regulations, Coastal waters, Navigation obstructions.

Under the provisions of the Deepwater Port Act of 1974 the Coast Guard has proposed an amendment to the deepwater port regulations. This amendment adds requirements to activities relating to site evaluation and preconstruction testing at potential deepwater port locations. Persons subject to the amendment must submit an application for authorization to conduct site evaluation and preconstruction testing. The application must include: the identification of persons or agencies participating; the type of activity and manner of conduct; location of the activity and locations of offshore structures, pipelines or cables in or around the area; the specific purpose; the proposed commencement and completion dates: environmental data including consequences of the proposed activity; and a report on the historic and archeological significance of the area. The Coast Guard may limit authorization terms and conditions. No activity may be conducted except in compliance with authorization terms. Suspension or revocation of authorization may result if environmental damage threatens or if there is any violation of laws, regulations or authorization conditions. (Comer-Florida)
W76-10766

DEEPWATER PORTS: LICENSING PROCEDURES AND DESIGN CONSTRUCTION, EQUIPMENT AND OPERATIONS,
Coast Guard, Washington, D.C.
O. W. Siler.
Federal Register, Vol. 40, No. 217, p. 52540-80, November 10, 1975. 41 p.

Descriptors: *Construction, *Offshore platforms, *Coastal structures, *Permits, *Administrative agencies, Regulation, Navigation, Coast Guard regulations, Coastal engineering, Specification, Design standards, Materials, Building codes, Federal government, Port authorities.

Pursuant to the Deepwater Port Act of 1974 the Coast Guard has promulgated regulations governing the licensing, design, construction, equipment and operation of deepwater ports beyond the territorial sea of the United States. The licensing procedure requires the applicant to identify himself and his affiliates, to describe their design, financial and technical backgrounds, and to show compliance with all applicable laws and regulations. Both formal and informal hearings are provided in the specified licencing procedures. Licensing is for a maximum twenty year term. Exemption from any regulation requirement is available upon specified factual determinations. Design, construction and equipment of parts must meet certain standards. Areas of applicability include safety equipment, pollution prevention equipment and navigational aids. Regulations governing operation of ports include personnel requirements, vessel navigation safety precautions, oil transfer controls and general maintenance and safety requirements. Required reports and records are specified. (Comer-Florida)
W76-10767

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS FOR NEW SOURCES FOR THE PHOSPHATE SUBCATEGORY,
Environmental Protection Agency, Washington, D.C.
R. F. Train.
Federal Register, Vol. 40, No. 152, p. 33052-54, August 6, 1975. 3 p, 3 tab.

Descriptors: *Industrial effluents, *Phosphates, *Fertilizers, *Water pollution sources, *Discharge(Water), Administrative agencies, Decision making, Environmental effects, Impoundments, Rainfall disposition, Water management(Applied), Waste water(Pollution), Industrial wastes, Effluents, Industrial water, Water policy, Water law, Water quality, Administrative decisions.
Identifiers: Effluent limitations, *FWPCA Amendments of 1972, Administrative regulations.

Pursuant to the authority of the Federal Water Pollution Control Act, notice is given that the Environmental Protection Agency (EPA) has proposed to amend Subpart A of the Phosphate Subcategory. After due consideration of phosphate fertilizer manufacturers' claims, the EPA believes that the allowance for discharge from a water impoundment due to rainfall events can be restated so as to make its application less cumbersome and more easily understood. Additionally, the EPA concurs that in some situations it may be appropriate to allow some discharge from the facility due to leaks and spills which are otherwise unavoidable. The agency believes, however, that any allowance for such discharge must require prompt management attention to and correction of the leaks and spills. The amount of pollutants discharged by facilities affected by this subpart should not be substantially altered by this change in regulatory language, nor is there likelihood of any significant effect on the energy necessary for pollution control or any other non-water quality related environmental impacts. (Reinders-Florida)
W76-10768

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY, ETHYLENE OXIDE, ETHYLENE GLYCOL, METHYL AMINES AND OXO CHEMICALS PROCESSES,
Environmental Protection Agency, Washington, D.C.
R. F. Train.
Federal Register, Vol 40, No 159, p 34409-17, August 15, 1975. 9 p, 17 tab.

Descriptors: *Chemical industry, *Water quality standards, *Waste water treatment, *Industrial wastes, Water quality, Effluents, Administrative agencies, Federal Water Pollution Control Act, Chemical wastes, Chemical oxygen demand, Biochemical oxygen demand, Regulation, Standards, Water pollution sources, Federal government, Pollutants, Water pollution control.
Identifiers: *Administrative regulations.

The Environmental Protection Agency has proposed amended guidelines for limitations on discharges in the organic chemical manufacturing point source category. Included in the proposed regulation are the ethylene oxide, methyl amines, ethylene glycol and oxo chemicals manufacturing processes. Reconsideration of the four product/processes was required by the Fourth Circuit Court of Appeals following petitions filed for review by corporations in the chemical industry. The corporations submitted data to be used in formulating the guidelines. The degree of effluent reduction required for the discharge of BOD5, TSS and pH by the four processes is specified. The ethylene oxide and methyl amines processes also require reduction of COD. The standards of performance required for discharge by new sources are similarly specified. (Capehart-Florida)
W76-10769

OIL POLLUTION PREVENTION,
Environmental Protection Agency, Washington, D. C.
R. L. Baum.
Federal Register, Vol. 40, No. 132, p. 28849, July 9, 1975. 1 p.

Descriptors: *Federal Water Pollution Control Act, *Oil spills, *Environmental effects, *Costs, *Storage tanks, Environment, Pollution, Legislation, Legal aspects, Federal government, Regulation, Administration, Remedies, Pollutants, Water pollution, Water pollution sources, Oil, Penalties(Legal), Planning, Environmental control, Oil pollution, Ships.
Identifiers: *Spill Prevention Control and Countermeasure Plan, Non-petroleum oil.

Section 311 of the Federal Water Pollution Control Act (FWPCA) requires owners or operators of any vessel, onshore facility, or offshore facility from which oil is discharged in harmful quantities into or upon the navigable waters of the United States to notify the appropriate agency of such discharge, and to suffer the removal costs of any discharged oil in addition to appropriate civil or criminal penalties. Furthermore, the Environmental Protection Agency (EPA) requires those owners or operators having oil storages over certain capacities and who may reasonably be expected to discharge oil in harmful quantities, to prepare for certification a Spill Prevention Control and Countermeasure (SPCC) Plan. Given the objectives of the FWPCA, the EPA is giving notice that section 101(a) will be interpreted to include owners and operators of facilities storing or using fat and oils from animal and vegetable sources. Consequently, all facilities processing and storing non-petroleum oils in violation of section 101(a) will be subject to EPA enforcement actions and civil penalties if certified plans or requests for extensions are not immediately implemented. (Hadoulias-Florida)
W76-10772

INK FORMULATING POINT SOURCE CATEGORY, PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 40, No 145, p 31730-31, July 28, 1975. 2 p.

Descriptors: *Water quality standards, *Water pollution sources, *Chemical wastes, *Oily water, *Regulation, Administrative agencies, Water purification, Water quality control, Federal Water Pollution Control Act, Waste treatment, Effluents, Waste dilution, Classification, Administrative decisions.
Identifiers: *FWPCA Amendments of 1972, *Point sources(Pollution), Administrative regulations.

Pursuant to the Federal Water Pollution Control Act, the Environmental Protection Agency has proposed a regulation applicable to existing sources in the Ink Formulating point source category. The proposal governs pretreatment standards and requires that an existing source within the oil-base solvent wash ink subcategory may not discharge process water pollutants to a publicly owned treatment works. The regulation does not treat discharges of pollutants into navigable waters. The Environmental Protection Agency intends that the proposal will complement the general regulation for pretreatment standards for existing point sources. The basis of the standard proposed is the best practicable control technology currently available. (Comer-Florida)
W76-10774

ENVIRONMENTAL IMPROVEMENT AUTHORITIES ACT OF 1969 (FORMATION OF PUBLIC CORPORATIONS TO DEAL WITH POLLUTION),
For primary bibliographic entry see Field 6E.
W76-10777

STATE WATER CONTROL BOARD--AUTHORITY TO INVESTIGATE ALL PROBLEMS CONCERNED WITH THE QUALITY OF WATER,
For primary bibliographic entry see Field 6E.
W76-10779

POLLUTION--ASSEMBLY BILL 128--TO CREATE A SYSTEM OF STATE DISCHARGE PERMITS CONGRUENT WITH NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM,
For primary bibliographic entry see Field 6E.
W76-10780

WATER POLLUTION--CIVIL REMEDIES.
For primary bibliographic entry see Field 6E.
W76-10782

NATURAL RESOURCES, DEPT OF; NUISANCES: WATER.
For primary bibliographic entry see Field 6E.
W76-10783

NATURAL RESOURCES, DEPT OF; NAVIGABLE WATERS.
For primary bibliographic entry see Field 6E.
W76-10786

NORTH DAKOTA WATER QUALITY STANDARDS FOR THE SURFACE WATERS OF NORTH DAKOTA.
For primary bibliographic entry see Field 6E.
W76-10788

VILLAGE SAFE WATER ACT.
For primary bibliographic entry see Field 6E.
W76-10790

WATER MANAGEMENT DISTRICTS--WATER RESOURCES--AUTHORITY TO CONSIDER AND PROTECT AGAINST DEGRADATION OF WATER QUALITY THROUGH PERMITTING PROCESSES.
For primary bibliographic entry see Field 6E.
W76-10791

EI DU PONT DE NEMOURS AND COMPANY V TRAIN (FEDERAL WATER POLLUTION PREVENTION AND CONTROL ACT QUALITY STANDARDS OF WATER AND EFFLUENT DISCHARGED INTO THAT WATER).
For primary bibliographic entry see Field 6E.
W76-10799

PEOPLE EX REL YOUNGER V SUPERIOR COURT (DAMAGE ASSESSMENT TO PUBLIC ENTITY CONSTITUTIONAL BECAUSE NOT PUNITIVE).
For primary bibliographic entry see Field 6E.
W76-10800

SAN FRANCISCO CIVIL SERVICE ASS'N, LOCAL 400 V STATE EX REL REGIONAL WATER QUALITY CONTROL BOARD (DAMAGES ASSESSMENT FOR POLLUTANTS TO PUBLIC ENTITY CONSTITUTIONAL).
For primary bibliographic entry see Field 6E.
W76-10801

A SELECTED ANNOTATED BIBLIOGRAPHY ON FISH AND WILDLIFE IMPLICATIONS OF MISSOURI BASIN WATER ALLOCATION,
Colorado Univ., Boulder, Colo. Inst. of Behavioral Science.
For primary bibliographic entry see Field 4C.
W76-10825

FISH AND WILDLIFE IMPLICATIONS OF UPPER MISSOURI BASIN WATER ALLOCATION, A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 4C.
W76-10826

AN INVESTIGATION OF EFFLUENT CONTROL STANDARDS AND PRACTICES (ATOMIC ENERGY PRODUCTION),
Douglas United Nuclear, Inc., Richland, Washington.
J. W. Loe.
Available from the National Technical Information Service, Springfield, Va 22161, as DUN 3155, $4.50 in paper copy, $3.00 in microfiche. Document No. DUN-3155, September 1967. p. 1-65 p, 10 fig, 9 tab, 8 append.

Descriptors: *Columbia River, *Water pollution control, *Sewage effluents, *Industrial wastes, *Chemical wastes, Radioactive wastes, Evaluation, Quality control, Investigations, Inspection, Sampling, Testing procedures, Federal government, Rivers, Ponds, Settling basins, Water treatment, *Water quality standards.
Identifiers: *Effluent limitations.

Recent emphasis on air and water quality standards for federal facilities led Douglas United Nuclear, Inc. to investigate and analyze chemical discharges to three hundred area lagoons. Navigable waters pollution was measured after a comprehensive sampling survey of the Columbia River. Based on standards used the study showed that chemical and sanitary effluent release does not contribute a significant amount of pollution to nearby waters. The standards applied were those of Executive Orders 11282 and 11288, Proposed Washington State Quality Standards for Interstate and Coastal Waters, Tentative Stanford Air Quality Guide, and RL Manual Appendix 0510. Along with measuring chemical and sanitary wastes released to process ponds and septic tanks, the study produced data indicating that no significant chemical pollution would occur in the event of an accidental rupture of liquid chemical storage facilities. In addition, no significant amount of contaminated wastes was shown to have been discharged into process ponds. Certain chemicals are listed, however, which are routinely discharged into process ponds and which eventually reach the river through seepage. (Comer-Florida)
W76-10828

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS: FEEDLOT POINT SOURCE CATEGORY,
Environmental Protection Agency, Office of Air and Water Programs, Washington, D. C.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402 Price $3.25. EPA Report Number EPA-440/1-74-004-a, January, 1974, 319 p. 68 fig, 41 tab, 257 ref.

Descriptors: *Effluent, *Waste water disposal, *Regulation, *Feed lots, *Livestock, *Poultry, *Farm wastes, Federal Water Pollution Control Act, *Water quality standards, Bibliographies, Performance, Water pollution sources.

Findings are presented of an extensive study of the feedlot industry for the purpose of developing proposed regulations, providing guidelines for effluent limitations and Federal standards of performance for the industry to implement sections 304 and 306 of the Federal Water Pollution Control Act Amendments of 1972. Feedlots for the following animal types were considered: beef cattle, dairy cattle, swine, chickens, turkeys, sheep, ducks and horses. Guidelines are set forth for effluent reduction attainable through the application of the 'Best Practicable Control Technology Currently Available,' the 'Best Available Technology Economically Achievable' and for New Source Performance Standards. The proposed recommendations require no discharge of process wastewaters to navigable water bodies by July 1, 1977 except for precipitation event(s) in excess of the 10 year, 24 hour storm for the location of the point source for all animal types except ducks. Duck growing operations will be required to meet a limitation on BOD and bacterial pollutants using biological treatment (e.g. 2.0 pounds of BOD per 1000 ducks). By 1983, the no discharge limitation will apply to all animal types except for precipitation event(s) in excess of the 25 year, 24 hour rain-

fall. The latter limitation also applies to all new sources. Supportive data and rationale for development of the proposed guidelines for effluent limitations are presented. (East Central)
W76-10829

LONG-TERM STABILITY OF WASTE LIGNINS IN AQUATIC SYSTEMS. PART 2. STABILITY IN SALINE WATER,
Swedish Water and Air Pollution Research Laboratory, Stockholm, Sweden.
For primary bibliographic entry see Field 5B.
W76-10838

REASONS FOR HAVING THE IVL-INSTITUTE FOR WATER AND AIR POLLUTION CONTROL RESEARCH. (VARFOR ETT IVL-INSTITUT FOR VATTEN- OCH LUFTVARDSFORSKNING.),
I. Eidem.
Svensk Papperstidning, Vol. 79, No. 5, p 143-145, March 25, 1976. 1 tab. (English summary).

Descriptors: *Research facilities, *Water pollution control, *Air pollution, Foreign research, Foreign countries, Europe, Capital costs, Estimated costs, Treatment facilities.
Identifiers: *Sweden.

The Swedish Water and Air Pollution Research Laboratory (IVL) was established in February 1966. Since then, Swedish industries have spent about 3 billion Swedish crowns on external environment-protection measures, resulting in marked pollution abatement. Additional investments of about 3.5 billion Swedish crowns during 1975-1980 are deemed necessary be a Swedish state commission. Thereafter, the Swedish industry must reckon with an annual investment of 2.5 billion Swedish crowns (at the 1974 price level), which is more than 2% of the estimated value of all goods manufactured in 1980. An annual investment of 5 billion Swedish crowns would be needed for the industry to meet all of society's demands. (Brown-IPC)
W76-10853

TOUGH ILLINOIS EFFLUENT STANDARDS ARE MET BY CELOTEX BOXBOARD MILL,
K. E. Lowe.
Pulp and Paper, Vol. 50, No. 3, p 106-109, March, 1976. 6 fig.

Descriptors: *Illinois, *Pulp wastes, *Treatment facilities, *Waste water treatment, Activated sludge, Filtration, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, *Water pollution control, Water purification, Tertiary treatment, Biochemical oxygen demand, Suspended solids, Equipment, Sewage treatment, *Water quality standards.
Identifiers: Boxboard mills, Board mills.

The secondary activated-sludge process and tertiary filtration effluent treatment systems installed at the boxboard mill of Celotex (division of Jim Walter Corp.), Quincy, Illinois, are described. The secondary system is a contact-activated sludge process, designed to reduce BOD by 90% with a 12-hr retention time. The overflow from the secondary clarifier is filtered through a deep-bed filtration system to remove the last traces of suspended solids, which are primarily composed of the hard-to-settle portions of activated sludge. Equipment utilized in the system is described. (Sykes-IPC)
W76-10856

NEW BOILER WATER CHEMICAL TREATMENT REDUCES CORROSION AND SCALE BUILDUP.
For primary bibliographic entry see Field 3E.
W76-10859

SEQUENTIAL CHLORINATION -- IMPACT ON THE ENVIRONMENT,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y.
For primary bibliographic entry see Field 5D.
W76-10860

ENVIRONMENTAL AND SOCIAL FACTORS (IN THE PAPER INDUSTRY),
Crown Zellerbach Corporation, Camas, Wash.
H. R. Amberg.
Tappi, Vol. 59, No. 4, p 68-71, April, 1976. 1 fig, 5 ref, 4 tab.

Descriptors: *Pulp and paper industry, *Water pollution control, *Air pollution, *Pollution abatement, Environment, Regulation, Capital, Economics, Technology, Economic impact, Social impact, *Pulp wastes.

Environmental demands upon the U. S. pulp and paper industry have increased to the point where the industry is now spending about 30% of its capital on pollution control facilities, and those demands are expected to continue through 1983. Present regulatory requirements, many of which will not achieve measurable environmental improvements but will actually have an adverse effect upon the overall environment, can also be expected to have a profound impact upon future technology and technological trends. Large amounts of capital are being mandated for these nonproductive facilities, leaving little capital for the development of much needed new technology. Present environmental regulations based upon the availability of technology regardless of environmental needs are acting as a deterrent to the development of effective problem-oriented technology. There is a need today for the development of more cost-effect controls as well as a major change in regulatory philosophy that will permit the development of site-specific controls designed to resolve environmental problems rather than the mere implementation technology regardless of environmental needs. (Sykes-IPC)
W76-10861

THE COST OF COMPLYING WITH FEDERAL WATER POLLUTION LAW.
Industrial Water Engineering, Vol. 12, No. 6, p 6-9, December 1975/January 1976. 2 tab.

Descriptors: *Federal Water Pollution Control Act, *Water pollution control, *Costs, Pulp and paper industry, Oil industry, Chemical industry, Heavy metals, Legislation, Water quality act, Water pollution, Water pollution sources, Wastes, Industrial wastes.

The impact of the 1972 Amendments to the Water Pollution Control Act on the annual water pollution control costs in the paper, chemicals, petroleum, and primary metals industries is discussed. (Witt-IPC)
W76-10872

AGRICULTURAL RUNOFF, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-10879

SOURCES OF INFORMATION IN WATER RESOURCES, AN ANNOTATED GUIDE TO PRINTED MATERIALS,
California Univ., Berkeley. Water Resources Center Archives.
For primary bibliographic entry see Field 10C.
W76-10881

INCIDENCE DE LA CHARGE POLLUANTE DES EAUX SUR LE COMPORTEMENT DES RADIONUCLEIDES, (EFFECT OF THE POLLUTANT BURDEN OF WATER ON THE BEHAVIOUR OF RADIONUCLIDES),
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses (France).
For primary bibliographic entry see Field 5C.
W76-10893

OIL PORTS ON THE CONTINENTAL SHELF,
Exxon Research and Engineering Co., Florham Park, N. J.
J. F. Flory.
Oceanus, Vol. 19, No. 1, p. 45-55, 1975. 14 fig.

Descriptors: *Oil, *Harbors, *Deep water, *Safety factors, Import, Ships, Design, Offshore platforms, Buoys, Oil pollution, Oil spills, Environmental effects, Continental shelf.
Identifiers: *Deep water ports, Moorings, Single point moorings, Tankers.

In order to handle increasing oil imports, very large tankers and offshore ports are the best solution for carrying large quantities of oil safely, economically, and with minimal environmental damage. Multiple-buoy berths and sea islands are not practical in exposed sea locations, thus the installation of single point moorings is a widely adopted method of accommodating large carriers. Terminal operations cause less than 1.5% of all petroleum pollution in oceans and all tanker activities result in less than 30% of the pollution, which is from non-LOT (load-on-top) sources; LOT, when oil tank washings are retained inside the vessel, as practices on most very large crude carriers (VLCC). Nevertheless, tanker and terminal operations do contribute to ocean pollution. Coast Guard estimates indicate that VLCCs used in conjunction with deepwater ports would reduce both the number and the volume of oil spills by a factor of 10 as compared with transhipping. The development, design and world-wide installations of single point moorings--the Catenary Anchor Leg Mooring, the Single Anchor Leg Mooring--are described. Regulations are being promulgated for design, construction, and operation of deepwater ports and several are being planned in the United States. (Auen-Wisconsin)
W76-10984

'WARE THE WADDEN SEA,
Foundation for Applied Ecology, ' Edam (Netherlands).
For primary bibliographic entry see Field 6G.
W76-10985

HEAT EXCHANGERS FOR USE IN THE CULTURING OF MARINE ORGANISMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
J. E. Huguenin.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 147-157. 1 tab., 15 ref. NOAA SG04-4-158-5.

Descriptors: *Hydroponics, *Heat exchangers, *Marine microorganisms, *Laboratory tests, Temperature control, Sea water, Design, *Aquiculture.
Identifiers: Sea food farming.

Seawater temperature control in flowing culture systems is often required in marine biological research. Cross-leakage can damage mechanical systems and harm culture organisms, and sea water can develop superheated levels of dissolved gasses during heating. Several heat exchanger materials and designs have been developed that are compatible to seawater, such as impervious carbon, glass coils, modular glass shells, teflon, titanium, and tube heat exchanger units. Electrical quartz immersion heaters with thermostats can be used, but the high voltages required present a safety hazard. Electrical, over-the-side heating

units sometimes have carbon and titanium outer surfaces. Titanium is biologically inert, but stainless steel leaches chromium and pits. A household cast iron radiator painted with a thin layer of epoxy paint may be adequate. A heat exchanger can be made from glass tubing, plastic pipe, and flexible hose. Polyvinyl chloride tubing, polyethylene tubing, and a chlorinated polyvinyl chloride heat exchanger have also been used. Practical heat exchangers for large scale aquaculture applications are needed. A long thin thermally conductive bulkhead with two fluids counter flowing in channels on either side would have large heat transfer areas; negligible pressure drops, and temperature control capability. (See also W76-109861) (Buchanan-Davidson--Wisconsin)
W76-10990

SOCIAL, POLITICAL, REGULATORY AND MARKETING PROBLEMS OF MARINE WASTE-FOOD RECYCLING SYSTEMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
J. E. Huguenin, and J. T. Kildow.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 158-178. 3 tab., 23 ref.

Descriptors: *Recycling, *Aquiculture, *Sewage effluents, *Regulation, *Marketing, *Attitudes, Marine animals, Hazards, Monitoring, Risks, Operations research, Thermal water, Viruses, Human diseases, Public health, Food chains.
Identifiers: Sea food farming.

Promising marine waste-food recycling concepts are the use of power plant thermal effluents, secondarily treated domestic sewage as marine plant fertilizer, agricultural and fishery processing in feeds, compacted solid wastes as artificial reef construction material, and sewage sludge for protein production in animal feeds. Potential sources of opposition to aquaculture are land and water rights, illegal use of chemicals, conservation and game regulations, competition for sites, fear of pollution, secondary products flooding small markets, poaching and vandalism prevention, alteration of coastal areas, transplants of organisms, and public health hazards. Legitimate public health concerns must be resolved, public policy decisions made, and realistic safe contamination levels established before societal acceptance can occur. Policies concerning marketing and design will mitigate the type and severity of opposition. Effort is needed to resolve problems concerning public health hazards, pollutant levels, food chain dynamics, application of technology to monitoring and control, pilot plant and demonstration projects, economic potential, market testing for quality and acceptance, and development of public and private institutional infrastructure. Demands for coastal zones for waste disposal and food production must be controlled to regulate risks and increase production. (See also W76-10986) (Buchanan-Davidson-Wisconsin).
W76-10991

OUTER CONTINENTAL SHELF RESOURCE DEVELOPMENT SAFETY: A REVIEW OF TECHNOLOGY AND REGULATION FOR THE SYSTEMATIC MINIMIZATION OF ENVIRONMENTAL INTRUSION FROM PETROLEUM PRODUCTS.
Assembly of Engineering Marine Board, Washington, D. C.
Panel on Operational Safety in Offshore Resource Development, National Academy of Engineering, Marine Board, December 1972. 197 p, 11 fig, 3 tab, 109 ref, 4 append.

Descriptors: *Continental Shelf, *Fossil fuels, Water resources, *Environmental effects, *Offshore platforms, *Resources development, Area redevelopment, Oil industry, Oil pollution, Oil spills, Safety factors, Hazards, Operations, Accidents, Exploration, Exploitation, Research and development, Regulation, Inspection, Water pollution sources, Contracts, Conferences.
Identifiers: *Outer Continental Shelf, *Technology assessment, *Offshore technology.

The subject of offshore oil resource development safety is considered from the standpoint of minimizing the potential for sudden massive and small continued releases of oil to the environment. The numerous aspects of technology ranging from geophysical exploration to well workover and abandonment are described briefly, and evaluated for possible hazards. The effectiveness of present regulations and inspections is evaluated. Precedents for improved practices in other areas of government regulatory responsibility are examined and recommendations are made. The need for additional safety-related information is examined and means for improvement are recommended. Included are extracts from 'Applicability of NASA Contract Quality Management and Failure Mode Effect Analysis Procedures to the USGS Outer Continental Shelf Oil and Gas Lease Management Program'; OTC Papers: Technical Papers Presented at the 1972 Offshore Technology Conference, May 1-3, Houston, Texas. Preprints, Volume II; and Outer Continental Shelf Lands Act, 7 August 1953. (See W76-11002 thru W76-11006) (Sinha - OEIS)
W76-11001

TECHNICAL CAPABILITIES IN OFFSHORE COMPLETION AND WORKOVER OPERATIONS TO MAXIMIZE SAFETY,
Standard Oil Co. of California, Huntington Beach. Western Operations Div.
W. H. Silcox.
In: Outer Continental Shelf Resource Development Safety. A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering, December 1972. p 116-121. Also In: Fourth Offshore Technology Conference, Vol II, held in Houston Texas May 1-3, 1972. Paper No. OTC 1710.

Descriptors: *Water quality control, *Fossil fuels, *Environmental effects, *Oil pollution, *Resources development, Offshore platforms, Safety, Oil spills, Continental Shelf, Oil wells.
Identifiers: *Outer Continental Shelf, *Offshore technology, Well completion operations, Artificial islands, Gas well.

During completion and workover operations on oil and gas wells, producing zones are exposed in the well bore, consequently the presence of oil and gas under pressure in the well is always a real possibility. The oil industry, operators, contractors and suppliers, have long recognized the sensitive nature of offshore completion and workover operations and through the years have worked continuously to improve the procedures and equipment necessary to insure proper well control. Well completion and workover operations will be reviewed along with the respective procedures and equipment utilized to maximize safety. Consideration will be given to the oil industry's ability to comply with the offshore rules and regulations promulgated by governmental agencies. The author concludes that the oil industry has the capability, equipment and experience required to insure safe, clean offshore completion and workover operations. (See also W76-11001) (Sinha - OEIS)
W76-11002

TECHNICAL CAPABILITIES IN OFFSHORE PIPELINE OPERATIONS TO MAXIMIZE SAFETY,
E. A. Milz, and D. E. Broussard.
In: Outer Continental Shelf Resource Development Safety. A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering, December 1972. p 122-139, 7 fig, 3 tab, 7 ref. Also In: Fourth Offshore Technology Conference, Vol II, held in Houston, Texas May 1-3, 1972. Paper No. OTC 1711.

Descriptors: *Resources development, *Water quality control, *Pipelines, *Fossil fuels, *Environmental effects, Continental shelf, Safety, Operations, Regulations.
Identifiers: *Outer continental shelf, Offshore technology, *Offshore pipelines.

Design, construction and operation of offshore liquid and gas trunklines have many similarities to lines onshore. However, there is one major difference; cost. Offshore pipelines are significantly more expensive than those onshore to construct and to operate, and failures are also more expensive. Other factors which make offshore pipelines different from those onshore are environmental conditions (wind, waves, and currents; bottom soils which are usually soft and easily deformed; and seawater as a corrosive medium), inability to physically see the pipe once it is in place, and relatively great distances between locations at which contact is made with the pipe. For these reasons, offshore pipeline construction is usually conservative and offshore pipelines are operated and maintained so as to minimize risk of failure. This paper reviews the design, construction, and operation of offshore pipelines, with emphasis on steps which are normally taken to maximize safety and thereby to minimize the cost of failures. Offshore pipeline failure experience is reviewed and governmental regulations which govern offshore pipelines are discussed. (See also W76-11001) (Sinha - OEIS)
W76-11003

TECHNICAL CAPABILITIES OF OFFSHORE EXPLORATION OPERATIONS TO MAXIMIZE SAFETY AMD ENVIRONMENTAL PROTECTION,
Humble Oil and Refining Co., Houston, Tex.
R. A. Bray, and F. B. Rees.
In: Outer Continental Shelf Resource Development Safety. A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering, December 1972. p 140-147, 10 fig. Also In: Fourth Offshore Technology Conference, Vol II, held in Houston, Texas May 1-3, 1972. Paper No. OTC 1712.

Descriptors: *Water quality control, *Fossil fuels, *Environmental effects, *Resources development, *Offshore platforms, Continental shelf, Safety, Operation, Oil pollution, Oil industry, Exploration, Ecosystems.
Identifiers: *Outer Continental Shelf, *Offshore technology, Energy resources, Artifical reefs, Environmental impact.

The oil industry is spending millions of dollars annually to develop and utilize improved technology to maximize safety and protect the environment in offshore operations. Considerable publicity has been given to these efforts in the areas of petroleum production and transportation. Environmental protection efforts during the exploration phase of offshore operations have been less publicized but are no less impressive. This paper describes these 'safety and environment conscious' exploration operations. Basic data obtained in the early stages of marine petroleum exploration allows an oil company to conduct subsequent exploration, production and transportation operations in a safe and prudent manner. They also contribute significantly to the general understanding of the natural processes active in the marine eco-system. Exploration related studies of current patterns, waves, sediment distribution, and the biota have promoted a healthy regard for the importance of proper development of our coastal areas and marine resources. (See also W76-11001) (Sinha - OEIS)
W76-11004

REGULATION AND SUPERVISION OF OUTER CONTINENTAL SHELF OPERATIONS ON THE PACIFIC COAST,
Geological Survey, Reston, Va.
M. V. Adams.
In: Outer Continental Shelf Resource Development Safety. A review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering, December 1972. p 148-156. Also In: Fourth Offshore Technology Conference, Vol II, held in Houston, Texas, May 1-3, 1972. Paper No. OTC 1713.

Descriptors: *Water quality control, *Resources development, *Environmental effects, *Fossil fuels, *Oil pollution, *Regulation, Operations, Safety, Offshore platforms, Continental shelf.
Identifiers: *Outer continental shelf, *Offshore technology, Energy sources, Outer Continental Shelf Lands Act.

The regulation and supervision of OCS operations is implemented by formally numbered OCS Orders issued by the Regional Oil and Gas Supervisor, with the prior approval of the Chief, Conservation Division, Geological Survey. The enforcement of these OCS Orders is performed by the District Engineer and his staff. Legislative and regulatory authority for these orders is contained in the Outer Continental Shelf Lands Act of August 7, 1953, and Part 250 of Title 30 of the Code of Federal Regulations. There are presently ten OCS Orders for the Pacific Coast which were effective June 1, 1971. The present Orders evolved from the earliest ones, dated March 31, 1965. They are the field level implementation of that portion of the OCS Lands Act which delegates administrative authority to the Secretary of the Interior. The presently effective orders cover a wide range of operations such as: marking of wells, platforms, and fixed or mobile structures; drilling and completion procedures for oil and gas wells; plugging and abandonment of wells; determination of well producibility; requirements for subsurface safety devices; pollution and waste disposal; procedure for installation and operation of platforms, fixed and mobile structures, and artificial islands; procedure for design and installation of pipelines; and procedure for the drilling of twin core holes. Enforcement of OCS Orders can be accomplished under the punitive provisions of the OCS Lands Act, but, on the Pacific Coast, good compliance is through a cooperative and persuasive relationship with the lessees. (See also W76-11001) (Sinha - OEIS)
W76-11005

GULF COAST LEASE MANAGEMENT INSPECTION PROGRAM,
Geological Survey, Reston, Va.
R. B. Krahl, and D. W. Moody.
In: Outer Continental Shelf Resource Development Safety. A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering, December 1972. p 157-162, 4 tab. Also in: Fourth Offshore Technology Conference, Vol. 11, held in Houston, Texas, May 1-3, 1972. Paper No. OTC 1714.

Descriptors: *Water quality control, *Resources development, *Environmental effects, *Fossil fuels, Oil pollution, Regulations, Operations, Safety, Offshore platforms, Continental Shelf, Inspection, On-site investigations.
Identifiers: *Outer Continental Shelf, *Offshore technology, Gulf Coast, Energy sources, Outer Continental Shelf Lease Management Program.

Since December 1970 the U. S. Geological Survey has modified its OCS Lease Management Program in the Gulf of Mexico to include periodic, systematic, inspections based on statistical sampling theory. To insure a consistent interpretation and enforcement of OCS Orders and Regulations, the substance of these requirements has been expressed as a list of specific items of safety equipment and procedures. The items reflect the existence of potentially hazardous conditions if the specified equipment is missing (or not operable) or the specified procedures are not followed. Although Geologcal Survey technicians are inspecting operations daily, special inspections or randomly selected operations are conducted periodically. The special inspection results provide management with an indication of the degree of compliance with the regulations and identify operating problem areas where inspection efforts should be concentrated, based on the items found most frequently in non-compliance. Incidences of non-compliance have decreased since the initiation of the program in late 1970, and it is expected that increased industry initiative in the installation and maintenance of platform safety equipment and the development of new equipment and procedures will further reduce the incidences of non-compliance and the inherent danger thereof. (See also W76-11001) (Sinha - OEIS)
W76-11006

CHEMICAL COMPOSITION: A CONTROL ON THE PHYSICAL AND CHEMICAL PROCESSES ACTING ON PETROLEUM IN THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5B.
W76-11013

IMPACT OF CHRONIC AND ACUTE OIL POLLUTION ON SEA BIRDS,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-11020

IS OUR APPROACH TO THE OIL POLLUTION PROBLEM TOO CRUDE,
For primary bibliographic entry see Field 5C.
W76-11031

ANIMAL WASTE MANAGEMENT CONFERENCE.
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11032

ANIMAL WASTE MANAGEMENT--COMMENTS ON THE NATIONAL SITUATION,
Agricultural Research Service, Peoria, Ill. Agricultural and Natural Resources Div.
For primary bibliographic entry see Field 5D.
W76-11033

THE STATE AND REGIONAL SITUATION,
Iowa Agricultural and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5D.
W76-11034

EPA'S ROLE IN THE ANIMAL WASTE PROBLEM: PANEL DISCUSSION,
Agricultural Stabilization and Conservation Service, Des Moines, Iowa.
H. Andrew.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 6 p.

Descriptors: *Farm wastes, Farms, *Costs, *Federal government, Pollution abatement, Iowa, Waste treatment.

Agricultural Stabilization and Conservation Service, an agency of the United States Department of Agriculture, administers several programs. Included are loans to farmers on corn, soybeans, and other farm produced commodities; loans for storage facilities; the feed grain and wheat programs which involve direct payments to farmers; a commodity storage program; and, the Rural Environmental Assistance Program (REAP). All of these programs are administered at the county level by a local office staff headed by a three man committee of farmers elected by community committeemen who were elected by their neighbors. These county committees oversee the handling of millions of dollars of government funds each year. They make yield adjustments. They are also charged with the job of deciding who to approve for REAP assistance. Under REAP the Federal Government shares the cost with farmers for doing certain approved conservation and pollution abatement work including animal waste management practices. A brief history of conservation work done on farms is given. (See also W76-11032) (Cartmell-East Central)
W76-11045

SOIL CONSERVATION SERVICE PROGRAM IN ANIMAL WASTE MANAGEMENT,
Soil Conservation Service, Des Moines, Iowa.
D. T. Bondurant.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 6 p.

Descriptors: *Soil conservation, *Farm wastes, *Lagoons, *Anaerobic conditions, *Runoff, Storage tanks, Waste treatment.

The feedlot registration program in Iowa went into effect on July 1, 1969, and in September, 1969, rules were adopted regulating feedlot runoff from cattle operations. The Soil Conservation Service believed that it could help with this program and, after consulting with the staff of the Iowa Water Pollution Control Commission, formulated a policy regarding activities in this work. Since then standards and specifications have been established for runoff control, anaerobic lagoons and waste storage tanks. Any operator who feels that he has a potential pollution problem, even if his operation does not require registration, may be assisted, provided that he secures the approval of the plans developed for his runoff control facilities from the Iowa Pollution Control Commission. The policy of the Service in giving assistance on manure storage tanks is to furnish one of the available standard plans if it can be used directly or can be safely adapted. The Service will not design concrete storage tanks for individual installations. (See also W76-11032) (Cartmell-East Central)
W76-11046

FARM ANIMAL WASTE MANAGEMENT: WHAT OUR MILK MARKET REQUIRES,
Wisconsin State Dept. of Agriculture, Madison. Food and Standards Div.
For primary bibliographic entry see Field 5D.
W76-11050

HOW TO PLAN AND MANAGE A LAGOON,
For primary bibliographic entry see Field 5D.
W76-11052

LEGAL ASPECTS OF ODOR AND DUST FROM FEEDLOTS,
Texas Agricultural Extension Service, College Station.
M. D. Paine.
Cattle Feeders' Information, 1972, p. 7451-7454.

Descriptors: *Legal aspects, *Odor, *Dust, *Feed lots, *Air pollution, *Regulation, Zoning, *Farm wastes, Waste treatment.
Identifiers: *Nuisance laws, Site selection, Waste management, Licenses, Non-point pollution.

Because of the current emphasis on environmental quality, all businesses, including feedlots, will become more subject to pollution regulation. A feedlot is subject to both public and private regulation. Public regulation is conducted by most states through an agency to abate, prevent, and police air

pollution. These 'clean air commissions' have made their initial efforts in major cities. Private influence on air pollution occurs through the so-called 'nuisance' laws. All persons have the basic right to enjoy their property. Any unreasonable interference with such enjoyment is legally a nuisance. In past nuisance cases, the complaining party has asked for: (1) An injunction, (2) Damages, (3) Both an injunction and damages. There are two types of nuisances--public and private. When a feedlot is run in such a manner as to disturb the rights of a large number of people, this is said to be a public nuisance. If the rights of only a few are disturbed, this constitutes a private nuisance. Selection of a remote site may be the most important thing a feedlot can do to avoid nuisance lawsuits. Feedlot operation in an area zoned for agriculture does not give absolute protection against nuisance lawsuits. There are three areas of pollution law affecting agriculture which may change in the future. These are: (1) A balancing of interest test used to determine the outcome of an injunctive action, (2) Expanding the concept of legal standing so that private citizens may, in the public interest, initiate actions against 'polluters' and (3) A model act to regulate animal feeding operations. (Cartmell-East Central)
W76-11054

A SUMMARY OF STATE REGULATIONS PERTAINING TO ANIMAL WASTE MANAGEMENT IN THE NORTH CENTRAL REGION OF THE UNITED STATES,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
L. J. Connor, J. B. Johnson, and C. B. Hoglund.
Report No. 193. Department of Agricultural Economics, Michigan State University, May 1971, 25 p, 22 ref.

Descriptors: *Regulation, *Water pollution, *Air pollution, Economics, *Farm wastes, *State governments, Legal aspects, Waste treatment, Management, *Central U.S.
Identifiers: *Waste management.

A summary is presented of present and proposed State regulations pertaining to animal waste management in the North Central Region of the United States. The regulations reported are those in effect or being proposed as of April, 1971. Summaries of regulations of the following states are included: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. State water and air pollution control agencies for these states are listed. (Cartmell-East Central)
W76-11060

DECISION MAPPING - TOOL FOR UNDERGROUND WASTE MANAGEMENT,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W76-11063

SAFE DRINKING WATER ACT - IMPLICATIONS FOR GROUND WATER QUALITY PROTECTION,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5F.
W76-11064

GREATER PITTSBURGH REGIONAL STUDIES, REPORTS AND MAPS, APRIL 1976.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-11072

OFFSHORE OIL: TECHNOLOGY - AND EMOTION,
Woods Hole Oceanographic Institution, Mass.
K. O. Emery.
Technology Review, Vol 78, No 4, p 31-32, 35-37, February 1976.

Descriptors: *Continental Shelf, Resources development, Fossil fuels, *Oil, *Offshore platforms, *Environmental effects, Gases, *Oil spills, *Oil pollution, Energy sources, Management, United States.
Identifiers: *Outer Continental Shelf, Offshore technology.

Peak production of oil and gas in the United States has passed, but the continental shelves offer the best apparent chance for a fairly large immediate source of supplementary oil and gas, with the best prospects for the Atlantic coast being structures in the Wilmington Canyon Trough off Delaware and the Georges Bank Trough off New England. Other short-term sources of oil and gas are from inland deposits of oil shale and coal. Additional supplementary energy in the short term can come from increased use of nuclear fission reactors and perhaps in the long term from nuclear fusion. Wind, tides, waves, and temperature differences in the oceans are considered long-term sources of energy, but ones that will not heat the earth as do fossil fuels and nuclear reactors. All of these energy sources must be investigated and those that are deemed feasible must be developed rapidly before the options of the United States become limited by continued loss of capital by purchasing oil from abroad. (Sinha-OEIS)
W76-11090

OIL SPILLS AND OFFSHORE PETROLEUM,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
R. J. Stewart.
Technology Review, Vol 78, No 4, p 47-59, February 1976. 19 fig, 7 ref.

Descriptors: *Continental Shelf, *Resources development, *Oil spills, *Oil pollution, *Offshore platforms, *Environmental effects, Fossil fuels, Water resources, Production, Estimating, Leases.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact.

The possible consequence of oil spills from offshore production has been the central issue in debate over the recent expansion of the federal government's offshore leasing program. It is possible to make some estimates of the magnitude and frequency of oil spillage from offshore production. While long-term environmental damage can't be estimated with predictive data, some qualitative judgments of short-term importance can be made by comparison with known spills of similar size in similar climates. Spill data can be used to look at some issues of equity: to what extent will a local region be forced to bear the brunt of the disadvantages of offshore oil, while the nation as a whole shares in the benefits. Drilling in certain OCS regions appears less likely to have adverse effects upon some regions than upon others. Offshore oil production as now practiced in the Gulf of Mexico contributes a relatively small portion to the total U.S. spillage figure. Compared to the alternative of increased imports, offshore oil appears to be a messier means of acquiring crude oil, although offshore oil proponents have not attempted to sell it on the basis of its environmental advantages. Modern technological developments, although not aimed primarily at reducing spills, may provide superior spill prevention performance. Also significant and often neglected is that future offshore oil developments will introduce oil spillage to regions currently relatively free of this form of pollution. The assertion that because one region can apparently withstand the stress of oil pollution, others can too, should not be accepted unproven. (Sinha-OEIS)
W76-11092

OFFSHORE OIL SPILLS AND THE MARINE ENVIRONMENT,
Massachusetts Inst. of Tech. Cambridge. Dept. of Civil Engineering.
S. F. Moore.
Technology Review, Vol 78, No 4, p 61-67, February 1976. 8 fig, 3 ref.

Descriptors: *Continental Shelf, *Resources development, Water resources, *Oil spills, *Oil pollution, *Environmental effects, Monitoring, Ecosystems, Data, Population, Habitats.
Identifiers: *Outer Continental Shelf, Settlement(Biological), Environmental impact.

There are two phases in the effects of an oil spill on the environment. First come the initial impacts of a spill, which are the actual perturbations of an area's physical/chemical and biological features. Then follows the recovery period, which is the return to pre-spill conditions following initial impacts. This recovery doesn't just include biological recovery, but also physical/chemical recovery of the water, sediments, etc. Our present state of understanding does not allow a comprehensive and definitive answer to the question of biological effects of Atlantic/Alaskan offshore spills. Any apparent attempt to answer this question systematically implies that the problem is understood well enough to warrant an attempted answer when, in fact, so many basic requisite facts are unknown that there is no way of knowing the validity of the analysis. To make these environmental decisions in an environmentally and economically acceptable way a closer cooperation is advocated among decision-makers, modelers, and monitors. And, this interaction must be adaptive and reconsidering, so that if new data indicates undesirable outcomes of a decision, it will immediately be reassessed and adapted to fit improved knowledge. Monitoring becomes essential not just for regulation and enforcement, but as an integral part of an on-going, adaptive decision-making process, which is as flexible as the ecological system of which it is a part. (Sinha-OEIS)
W76-11093

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A MULTI-OBJECTIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT USING GOAL PROGRAMMING,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
D. Panagiotakopoulos.
Journal of Environmental Systems, Vol. 5, No. 2, p. 133-147, 1975. 4 fig., 6 ref.

Descriptors: *Environment, *Management, *Optimum development plans, *Decision making, Methodology, Alternative planning.
Identifiers: *Goal programming, *Multi-objective planning.

A method is presented which allows for a sufficiently realistic representation of the total region, deals systematically with multiple objectives through goal programming optimization techniques, and suggests an effective interaction between the decision maker and the analyst for devising compromises among conflicting objectives. Essentially, the procedure is directed toward establishing the economic growth/environmental quality possibility frontier and allows alternative waste management policies or schemes to be generated and presented to the decision maker, along with their evaluation on the basis of each policy's impact on the economic, environmental, and technological components of the system; measures of effectiveness for the alternatives; and the decision maker's preferences. The desirable levels of these criteria are referred to as objectives (or

oals, or targets) of the decision maker, with the nalyst's function to develop policies for getting as lose to these objectives as is economically, echnically, practically, and legally feasible. The echnique provides means for generating policies orresponding to one or more equally desirable ompromises among goals, on the basis of objective' marginal rates of substitution and subective priority rankings. The method is based on etwork flow models representing transformation f quantities--a quantity is 'transformed' when it hanges form or location in a way that affects the ypes and attributes of further transformations. Auen-Wisconsin)
W76-10582

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: THEORY AND APPLICATIONS, (VOL 1),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
M. A. Collins, and J. C. Jurkovich.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 656, $10.00 in paper copy, $3.00 in microfiche. Completion Report, (one of three companion volumes), December 1975. 318 p, 34 fig, 45 tab, 13 ref. OWRT C-3355(3739) (2).

Descriptors: *Reservoir operation, *Dynamic programming, *Water allocation(Policy), *Municipal water, *Operating costs, Water distribution(Applied), Electric power costs, Water supply, Optimization, Water policy, Water management(Applied), Reservoir storage, Reservoir yield, Water costs, Reservoirs, Water requirements, Systems analysis, Water resources, Texas, Computer models.
Identifiers: *Multiple reservoir system, Dallas(Tex), *Parallel and series reservoir systems, *Block rate costs, Nonlinear costs, Sectioning search, Penalty costs, Deterministic streamflow, System states, Water distribution simulation, Intracity distribution costs.

A deterministic forward dynamic programming optimization computer model was developed to find a least cost sequence of withdrawals or releases from a system of single purpose reservoirs supplying a central demand area. Optimal solutions for parallel and series systems of up to four reservoirs were determined. Inaccuracies in the dynamic programming model produced by reservoir volume discretization were reduced by a modified sectioning search. A realistic cost structure is permitted. Nonlinear water treatment, water purchase, and pumpage power costs are included. Block rate power cost structures are utilized. The demand area is decomposed into service areas, with additional costs being dependent on the particular service area. Approximate flow dependent pumping costs for intracity pumping can be included. For water conserving policies, penalty costs for evaporation water losses of lowering of reservoirs below critical levels are included. Constraints include bounds on pumpages, releases, reservoir levels, and service area flows. The model is applied to the City of Dallas multiple reservoir system. Results are given for actual operational problems faced by the City of Dallas, including supply from four parallel reservoirs currently used by the City and supply from a future series system of two reservoirs to be operated with a minimum water loss objective. (See also W76-10605 and W76-10606)
W76-10604

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: APPENDICES, (VOL. 2),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
M. A. Collins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 657, $18.75 in paper copy, $3.00 in microfiche. Completion Report, (one of three companion volumes), December 1975. 748 p, 13 append. OWRT C-3355(3739) (3).

Descriptors: *Reservoir operation, *Dynamic programming, *Water allocation(Policy), *Municipal water, *Operating costs, Water distribution(Applied), Electric power costs, Water supply, Optimization, Water policy, Water management(Applied), Reservoir storage, Reservoir yield, Water costs, Reservoirs, Water requirements, Systems analysis, Water resources, Texas, Computer models.
Identifiers: *Multiple reservoir system, Dallas(Tex), *Parallel and series reservoir systems, *Lewisville reservoir, Grapevine reservoir, Tawakoni reservoir, Hubbard reservoir, Aubrey reservoir, *Block rate costs, Nonlinear costs, Sectioning search, Penalty costs, Deterministic streamflow, System states, Water system operation, Water distribution simulation, Intracity distribution costs.

This report presents appendices referenced in a companion report entitled 'Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications' by M. A. Collins and J. C. Jurkovich. The appendices provide documentation of data sources and listings of various inputs and outputs for the dynamic programming optimization model discussed in the companion volume. (See also W76-10604 and W76-10606)
W76-10605

SOLVING DISCRETE-VARIABLE MULTIPLE-CONSTRAINT NON LINEAR PROGRAMS: THE DECISION STATE METHOD, (VOL. 3),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
V. K. Dharmadhikari, and M. A. Collins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 709, $8.00 in paper copy, $3.00 in microfiche. Completion Report, (one of three companion volumes), June 1975. 115 p, 4 fig, 11 tab, 27 ref, 4 append. OWRT C-3355 (3739) (4).

Descriptors: *Dynamic programming, *Resource allocation, *Optimization, Reservoir design, Operations research, Optimum development plans, Mathematical studies, Reservoir operation, Decision making.
Identifiers: *Decision state method, *Algorithm 2, *Discrete variable optimization, Nonlinear optimization, Nonlinear programming, MMDP algorithm, Mixed integer programming, Decision space, State space, Zero-one problems, Programming tactics, Block angular constraints, Split-block-angular constraints.

A new method for obtaining exact optimal solutions for a class of discrete-variable resource-allocation problems is presented. This decision-state method, unlike conventional dynamic programming method which works only in state space, works in state and decision spaces. It uses only a fraction of the points in the state space at which the state functions are discontinuous; and thus overcomes to some extent the curse of dimensionality. It carries the cumulative decision-strings associated with these points and thus avoids backtracking to recover optimal decisions. The method is given in Algorithm 2; it is proved that the algorithm finds all exact optimal solutions. The method is adapted for solving problems with special structures such as block-angular or split-block-angular constraints and resultant substantial advantages are demonstrated. A computer implementation of Algorithm 2 is given which combines the flexibility and adaptability of the algorithm with the characteristics of a digital computer and good programming practices. The Algorithm 2 performance on many resource-allocation problems is reported and compared with that of the MMDP algorithm. It is shown for the class of problems at which the two are aimed, the decision-state Algorithm 2 performed uniformly and substantially better. (See also W76-10604 and W76-10605)
W76-10606

INTERDISCIPLINARY/INTERINSTITUTIONAL REQUIREMENTS FOR WATER RESOURCE PLANNING: PROCESSES TO ENHANCE COOPERATION,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6B.
W76-10609

6B. Evaluation Process

STRATEGIES FOR NATURAL RESOURCE DECISION-MAKING: COMMENTS ON THE STAFF REPORT,
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6E.
W76-10503

INTERBOARD PLAN FOR THE GREATER FINGER LAKES - OSWEGO RIVER BASIN,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 4A.
W76-10506

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE - 1970 (1974 SUPPLEMENT),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley Pa.
For primary bibliographic entry see Field 5G.
W76-10508

WATER POLLUTION CONTROL ACT OF 1972, SOCIAL IMPACTS, EIGHT CASE STUDIES.
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-10569

BENEFITS FROM WATER POLLUTION ABATEMENT, PROPERTY VALUES,
Dornbusch (David M.) and Co., Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10580

THE ECONOMIC IMPACT OF RECREATIONAL LAND-USE IN AN ISLAND ENVIRONMENT: A CASE STUDY OF JEKYLL ISLAND, GEORGIA,
Georgia Marine Science Center, Savannah.
C. F. Floyd, and C. F. Sirmans.
Technical Report No. SG 75-7. 199 p. 3 fig., 104 tab., 27 ref., 3 append 1975.

Descriptors: *Recreation, *Economic impact, *Georgia, *Islands, *Regional analysis, Tourism, Employment, Projections, Human population, Social impact, Migration, Access routes, Use rates, Recreation facilities, Alternative planning, Decision making, Recreation demand, Direct benefits, Indirect benefits, Coasts.
Identifiers: *Jekyll Island(Ga), *Demography, Economic base, Multiplier effects, Case study.

Data were compiled to indicate the process by which recreational land utilization affects employment, income, population and migration patterns, and housing (type of structure, density, and location). The demand for coastal area recreation facilities was classified, and inter-island comparative land use patterns analyzed, providing estimates of the economic impact of Jekyll Island on

the eleven coastal counties of Georgia and the State. While the per capita income had more than doubled in all counties between 1950 and 1971, it was still below the national average. Computations indicate that expenditures caused by the demand for services provided by Jekyll Island had a substantial primary and secondary impact on the income and employment of the total travel industry in Georgia. The key role of Jekyll Island is that it serves as a major 'destination' area for visitors. The island does not create much employment, but it is possible that the entire recreational resources along the Georgia coast would significantly impact employment. In order for the Georgia travel industry to grow, the travel image of the State as a whole needs progressive enhancement. The provision of more destination areas for out-of-state visitors should be a key policy for decision makers. The entire coastal area has potential importance in both the local and total State economy. (Auen-Wisconsin)
W76-10581

A MULTI-OBJECTIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT USING GOAL PROGRAMMING,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 6A.
W76-10582

PROBLEMS AND SOLUTIONS IN ESTIMATING THE DEMAND FOR AND VALUE OF RURAL OUTDOOR RECREATION,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
R. L. Gum, and W. E. Martin.
American Journal of Agricultural Economics, Vol. 57, No. 4, p. 558-566, 1975. 4 tab., 13 ref.

Descriptors: *Recreation demand, *Estimating, *Evaluation, *Arizona, Resource allocation, Elasticity of demand, Model studies.

Described is a large-scale empirical study of outdoor recreation in Arizona which used the individual observations approach for estimating demand relationships, by including the influence of substitute recreation activities, by allowing for individual tastes and preferences, and by developing resource values based upon estimated individual demand relationships. The methodology is detailed and illustrative and summary results are included. Of special importance is that fact that estimates of resource value are as large as estimates of value obtained by the gross expenditures method. The procedure is an efficient and reasonably accurate method for estimating demand and value and can be easily adapted to other areas. The study used a large number of individual observations (by mail questionnaire) and includes the mileage variable. By focusing on all types of rural recreation activities in all regions of the state, it was possible to include the prices of substitute attractions in the regression equations; and by using the individual observation approach, the problems of multicollinearily between cost variables and the distance variables are avoided. It is suggested that the most fruitful area for additional conceptual analysis is in the interpretation of estimates of value developed for nonpriced goods rather than in additional estimation procedures. (Auen-Wisconsin)
W76-10585

THE ECONOMICS OF DEVELOPING THE RESOURCES OF THE WORLD'S OCEANS,
Akademiya Nauk SSSR, Moscow.
P. Bunich.
Problems of Economics, Vol. 28, No. 4, p. 76-98, 1975. (Translated from 'Voprosy ekonomiki, No. 11, 1974).

Descriptors: *Oceans, *Resources development, *Economic feasibility, *Regulation, Assessments, Comprehensive planning, Integrated control measures, International law, Legal aspects, Foreign countries, Water pollution control, Oil, Metals, Chemicals, Marine fisheries, Transportation, Economic rent, Sinking fund.

Prefaced by a comprehensive discussion of the wealth, the economic actualities and the potential of harvesting protein, oil, minerals, chemicals, and sources and effects of various pollutants, the discussion centers on the USSR position of an integrated approach to ocean development. In the seas within its jurisdiction, the USSR proposal is a system of rent payments and fines for complete and economically integrated utilization of the ocean's mineral and food resources into cost-accounting collectives to form an incentive fund. The calculation of rent norms presupposes the construction of prices on the basis of marginal sales conditions, i.e., the difrerence between the enterprise cost of production of the less efficient operation and the average, or more efficient, enterprises will reflect the amount of rent. By taking into account the interest rate for credit according to the Marxian method, it would be possible to economically appraise each individual ocean resource. Of significant economic importance are material sanctions imposed on polluters, on those that violate established quotas on biological resources, and activities that are detrimental to other branches of the ocean economy. These sanctions would include full restitution of damages, including shortfalls in profits. Proposals for the long-range USSR 'Ocean Economic Plan' are also outlined. (Auen-Wisconsin).
W76-10587

WATER TO THE FIELDS: INDIA'S CHANGING STRATEGY,
Sussex Univ., Brighton (England). Inst. of Development Studies.
For primary bibliographic entry see Field 3F.
W76-10589

NATIONAL OCEAN POLICY: PRIORITIES FOR THE FUTURE,
Committee on Commerce (U. S. Senate). Committee on Commerce National Ocean Policy Study.
For primary bibliographic entry see Field 6E.
W76-10591

RATIONALE FOR A WATER POLLUTION CODE (PART II): SOCIAL ASSESSMENT,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5G.
W76-10592

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE ANIMAL FEED, BREAKFAST CEREAL, AND WHEAT STARCH SEGMENTS OF THE GRAIN MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10594

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE, FRICTION MATERIALS AND SEALING DEVICES SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10595

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: THEORY AND APPLICATIONS, (VOL I),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10604

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: APPENDICES, (VOL. 2),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10605

INTERDISCIPLINARY/INTERINSTITUTIONAL REQUIREMENTS FOR WATER RESOURCE PLANNING: PROCESSES TO ENHANCE COOPERATION,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
G. W. Reid, and J. O. Dritt.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 632, $6.00 in paper copy, $3.00 in microfiche. Completion Report, January 1976. 130 p, 10 illus, 35 ref, 7 append. OWRT X-122(3749) (1).

Descriptors: *Organizations, *Administrative agencies, *Institutions, *Planning, Constraints.
Identifiers: Interdisciplinary research, Processes to enhance cooperation.

This report focuses on the difficulties and opportunities for effective cooperation within an interdisciplinary research group. While emphasizing such research within an academic environment and on water resources related cases, this study is directed toward a broad spectrum of research project leaders and team participants. The analytical framework was designed to point out differences that exist between single, multidisciplinary and interdisciplinary team research. An opportunity to respond and share future results is provided. Several steps were suggested for the optimal use of interdisciplinary personnel in water resources research. The salient organizational and situational conditions include the establishment of favorable internal relationships and coalitions as a basis for administrative support and cooperation. The choice of the team leader is extremely important with particular emphasis apparently not on technical expertise but on interpersonal abilities. Defending the program against external pressures and the setting of policies and procedures to promote effective interpersonal and interinstitutional communications are perhaps the leader's most important tasks. His personal work habits and ability to work with people are critical characteristics. An oversight committee has been suggested as an extremely useful and necessary tool to guide and advise program activities from the viewpoint of a separate, but concerned, entity. Such a committee would interface with the program during all phases of a project, especially during technology transfer (those affected by the study results, such as concerned agencies, and publics).
W76-10609

MULTIOBJECTIVE PLANNING AND ENVIRONMENTAL EVALUATION OF WATER RESOURCE SYSTEMS,
State Univ. of New York at Binghamton. Dept. of Geological Sciences; and State Univ. of New York at Binghamton. School of Advanced Technology.
For primary bibliographic entry see Field 6G.
W76-10610

ECONOMIC FRAMEWORK FOR GROUNDWATER QUALITY MONITORING,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-10657

MATCHING RESOURCES AND PEOPLE,
Soil Conservation Service, Washington, D. C.
N. A. Berg.
Water Spectrum, Vol. 6, No. 3, p. 19-25, 1974. 7 p, 11 photo.

Descriptors: *Land development, *Recreation facilities, *Land use, Land, Environmental effects, Recreation demand, Recreation, Rural areas, Land management, Land resources, Winds, Rain, Soil erosion, Erosion, Sedimentation rates, Storm water, Flood damage.

The great increase in leisure time in America has multiplied the demand for land suitable for recreational purposes. A related demand has been the increase in land purchases in rural areas by those from the city desiring second homes. Serious environment consequences have resulted from these changes: the tearing up of large tracts of land left exposed to wind and rainstorms for long periods has sped the process of soil erosion and greatly increeased sedimentation rates; the paving of a large percentage of the land without considering the likely changes in stormwater runoff and groundwater levels has increased flood damages and ruined thousands of miles of stream banks. In the Rural Development Act of 1972 the Department of Agriculture received authority to intensify its fact gathering in land inventorying and monitoring. The Secretary of Agriculture has established a Committee on Planning and Policy for Land Use and Land Correction to stimulate interagency thinking on land use and to ready the Department to give more effective assistance to states and local governments in setting land-use policies. Such integrated action is necessary since the individual landowner is not always able to cope with the land-use agencies. (Gagliardi-Florida)
W76-10723

DAMS OF PORK,
J. McCaull.
Environment, Vol. 17, No. 1, p. 11-16, (1975). 6 p, 1 illus, 4 photo, 4 ref.

Descriptors: *Dams, *Cost allocation, *Cost analysis, *Cost-benefit analysis, *Cost-benefit ratio, *Cost-benefit theory, Costs, Economics, Economic impact, Economic justification, Economic prediction, Inflation(Economic), Environment, Environmental control, Water management(Applied), Water, Water policy.
Identifiers: Administrative regulations, Evidence.

A recent government report on a cross section of dam-construction projects shows that advantages have been grievously overstated and costs greatly understated. As a result, estimated annual economic benefits from the projects have been inflated by many millions of dollars. The benefit-cost determination should be reassessed so that allowance is made for unexpected expenses, environmental costs, and less-than-anticipated financial gains. A General Accounting Office (GAO) report shows many specific instances in which sponsoring agencies, intent on having the projects authorized, overstated expected annual monetary gains to be realized from water management activities and simultaneously sharply understated estimated costs for annual operations and maintenance. The study clearly suggests a strong prejudice toward exaggerated benefit-to-cost ratios used by agency officials to justify water-use projects. In the past, if the ratio has been greater than one-to-one (benefits exceeding costs), the project has generally been judged economically acceptable. As a potential solution to the prejudice factor, it is suggested that a two or three-to-one ratio be implemented. The recommended action would allow the benefit-to-cost ratio a much larger margin for error to compensate for rising costs and environmental destruction. (Gagliardi-Florida)
W76-10738

ENVIRONMENTAL PROTECTION AGENCY: POLICIES AND PROCEDURES FOR STATE CONTINUING PLANNING PROCESS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10762

PREPARATION OF STATE WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10763

ADJUSTMENTS DUE TO A DECLINING GROUNDWATER SUPPLY: HIGH PLAINS OF NORTHERN TEXAS AND WESTERN OKLAHOMA,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4B.
W76-10874

COMPREHENSIVE WATER SUPPLY STUDY FOR NEW YORK STATE,
New York State Dept. of Health, Albany. Bureau of Public Water Supply.
J. C. Bumstead.
Journal American Water Works Association, Vol. 68, No. 1, p. 31-376, 1976.

Descriptors: *Comprehensive planning, *Water supply, *New York, Economies of scale, Municipal water, Legislation, Water districts, Water management(Applied), Future planning(Projected), Long-term planning.

Between 1964 to 1974 the New York State Comprehensive Public Water Supply Study and Regional Program prepared reports designed to develop master plans for area-wide water utility systems; to make municipalities aware of and accept responsibility for correcting current and impending inadequacies in quantity and quality aspects of community water systems; and to promote implementation of needed projects in conformity with accepted master plans. Implementation of the reports has not been encouraging as shown by the efforts in the various counties. Approximately 76% of the systems studied need major improvements (source, transmission, treatment, pumping, storage, distribution). The reports have added value in that they provide information for land-use planning. Intermunicipal or regional cooperation would be desirable, but needs financial incentives and statutory amendments. Economies of scale of area-wide utilities, coordinated management of water systems, and integrated services have potential benefits for cooperating communities. Long-range planning for future water needs is necessary and must be part of routine operations. Local officials should consider expediting project planning to avoid added inflationary costs and serious water shortages. The data, conclusions, and recommendations of the report should be adjusted periodically. (Buchanan-Davidson--Wisconsin)
W76-10982

WATER SUPPLY FOR THE GREATER NEW YORK METROPOLITAN AREA,
Corps of Engineers, New York. Northeastern U.S. Water Supply Study.
K. E. Schilling.
Journal American Water Works Association, Vol. 68, No. 1, p. 37-40, 1976.

Descriptors: *Future planning(Projected), *Water supply, *New York, *Northeast U. S., *Baseline studies, New Jersey, Connecticut, Recycling, Water demand, Water transfer, Diversion, Groundwater recharge, Water resources development, Hudson River, Delaware River, Water management(Applied), Measurement.
Identifiers: Metering, Waste water recycling.

The Northeastern U.S. Water Supply Study authorized evaluation of present and long-term water supply needs, institutional and cost-sharing options to implement water supply projects; and preparation of water supply development and management plans. The study area contains thirteen states and the District of Columbia. The objective of the study was to guarantee water supply under drought conditions. Water supply and waste water management alternatives; environmental impacts; and legal institutional, and economic issues were considered. Federal financing is needed for some projects. Possible choices appear to be inter- and intra-state source areas to be developed, demonstration projects, and resolution of technical uncertainties which might impede the solution of water supply problems. Continuing studies are devoted to a demonstration project for total resource management combined nuclear electric powerplant cooling with a land application and waste water treatment system for groundwater recharge. Hudson and Delaware River development is imperative. Instate sources can probably supply New York and Connecticut through the year 2000, but after 2000 to 2020 New Jersey will need outside water. New York and New Jersey must share the Hudson River. High flow skimming unsupported by reservoirs until 2000-2020 is the least damaging and most flexible solution. Metering in New York City and wastewater management should be considered. (Buchanan-Davidson--Wisconsin)
W76-10983

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

AN ECONOMIC APPRAISAL OF ALTERNATIVE DAIRY WASTE MANAGEMENT SYSTEMS DESIGNED FOR POLLUTION CONTROL,
Economic Research Service, East Lansing, Mich. Farm Production Economics Div.
For primary bibliographic entry see Field 5D.
W76-10547

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, METAL FINISHING INDUSTRY,
Lancy Labs., Zelienople, Pa.
For primary bibliographic entry see Field 5D.
W76-10555

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, METAL FINISHING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10556

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRON AND STEEL INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10557

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, IRON AND STEEL INDUSTRY,
McKee (Arthur G.) and Co., Cleveland, Ohio.
For primary bibliographic entry see Field 5D.
W76-10558

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PULP AND PAPER INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10559

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PETROLEUM REFINING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10560

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, LEATHER TANNING INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-10561

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, FERTILIZER INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-10562

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PLANT CLOSURES.
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10563

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRRIGATED AND NON-IRRIGATED AGRICULTURE.
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 5G.
W76-10564

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, NON-FERROUS METALS INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10565

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, TEXTILE INDUSTRY.
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10566

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, CONTROL OF WATER POLLUTION FROM SELECTED NONPOINT SOURCES.
Mid West Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-10567

WATER POLLUTION CONTROL ACT OF 1972, MUNICIPAL OPTIONS.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-10568

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 1).
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W76-10570

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 2),
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W76-10571

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME I),
Little (Arthur D.), Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10572

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME II),
Little (Arthur D.), Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10573

BENEFITS FROM WATER POLLUTION ABATEMENT, PROPERTY VALUES,
Dornbusch (David M.) and Co., Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10580

PRICES AND PROPERTY RIGHTS IN THE FISHERIES,
Delaware Univ., Newark. Dept. of Economics.
R. J. Agnello, and L. P. Donnelley.
Southern Economic Journal, Vol. 42, No.2, p. 253-262, 1976. 3 tab., 12 ref.

Descriptors: *Ownership of beds, *Commercial fishing, *Demersal fish, *Shellfish, *Competitive prices, Fish harvest, Seasonal, Public access, *Fisheries, *Prices.
Identifiers: *Property rights, Common property, Private property.

The shortrun effect of the property right structure on the exvessel prices and harvest quantities of demersal fisheries catch was investigated. Whenever fish harvesting is treated as a common property resource, distortions occur in the intraseasonal production patterns of the industry, which take the form of relatively large price variations. Where both private and common property resources are present, common property price distortions take the form of lower exvessel prices. In this situation arbitrage from private property mitigates price variations across property right structures in addition to reducing intertemporal price variations in general. A model is developed using the oyster catches in the Atlantic and Gulf coast oyster fishery. The oyster industry was chosen as it provided varying property right structures between coastal states. The conclusion is that property right structures do indeed make a difference in harvesting patterns, and if the oyster industry at the harvesting level is reasonably competitive, the indication is that common property generates social losses in oyster harvesting. When a state sets aside some part of the oyster grounds for private use, harvesters tend to reap a benefit of the common grounds during the initial part of the season, postponing catch on their private grounds, which tends to smooth intraseasonal price movements. (Auen-Wisconsin).
W76-10586

ENABLING LEGISLATION: POSSIBILITIES FOR THE COMMERCIAL FISHING INDUSTRY,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6E.
W76-10593

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE ANIMAL FEED, BREAKFAST CEREAL, AND WHEAT STARCH SEGMENTS OF THE GRAIN MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10594

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE, FRICTION MATERIALS AND SEALING DEVICES SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10595

ECONOMIC EFFECTS OF AGRICULTURAL LAND-USE MANAGEMENT ON SOIL EROSION AND FARM INCOME IN THE OBION-FORKED DEER RIVER BASIN,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 4A.
W76-10612

DO REGULATED FREIGHT RATES DISCOURAGE RECYCLING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W76-10676

THE EFFECT OF CHANGING INPUT AND-PRODUCT PRICES ON THE DEMAND FOR IRRIGATION WATER IN TEXAS,
Texas A and M. Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 3F.
W76-10810

A CLEAN PIECE OF PAPER,
Beak Consultants Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5D.
W76-10842

REASONS FOR HAVING THE IVL-INSTITUTE FOR WATER AND AIR POLLUTION CONTROL RESEARCH. (VARFOR ETT IVL-INSTITUT FOR VATTEN- OCH LUFTVARDSFORSKNING.),
For primary bibliographic entry see Field 5G.
W76-10853

THE COST OF COMPLYING WITH FEDERAL WATER POLLUTION LAW.
For primary bibliographic entry see Field 5G.
W76-10872

ADJUSTMENTS DUE TO A DECLINING GROUNDWATER SUPPLY: HIGH PLAINS OF NORTHERN TEXAS AND WESTERN OKLAHOMA,
Texas A and M Univ., College Station. Water Resources Inst.

For primary bibliographic entry see Field 4B.
W76-10874

PROBLEMS OF PUBLIC WORKS PROJECTS IN THE PRESENT ECONOMIC CLIMATE,
San Bernardino Valley Municipal Water District, Calif.
J. A. Beaver, and J. G. Thon.
Journal American Water Works Association, Vol. 68, No. 1, p. 26-35, 1976.

Descriptors: *Water resources development, *Economic feasibility, *California, Water distribution(Applied), Water districts, Operation and maintenance, Construction costs, Financing, Materials, Labor supply, Interest rates, Investment, Capital costs, Inflation(Economic), Water demand.
Identifiers: *Santa Ana River(Calif), San Bernardino Water District.

Demand for major water transmission and distribution projects in many areas of California is close to peaking. Experiences of the San Bernardino Valley Municipal Water District are described. After many legal battles, the principal water districts on the Santa Ana River watershed created an agency to draft and adopt a water quality management plan. The plan's objectives were to prevent further degradation of surface and groundwater and to improve water quality of areas along the river that had been seriously abused and threatened. The Santa Ana Watershed Project Authority was established to guide and direct financing, construction, and operations. Recent rising costs, material shortages, problems with labor contract renewals, and failure to market bonds authorized by the electorate have presented many difficult problems to public works projects. However, shortages of material and labor and increasing prices and interest rates on investment capital provide a self-correcting mechanism, since they encourage curtailment of capital expenditures. Most utilities are revising their construction programs downward; this will affect materials and labor and means that plants now working full production will have spare capacity. This will slow the rate of inflation, reduce interest rates, make capital more available, and consequently increase unemployment. (Buchanan-Davidson--Wisconsin)
W76-10980

ECONOMIC CONSIDERATIONS INVOLVED IN SELECTING TYPES OF CONFINEMENT AND WASTE DISPOSAL SYSTEMS FOR SWINE AND BEEF,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11043

THE IMPACT ON DAIRY FARM ORGANIZATION OF ALTERNATIVE MANURE DISPOSAL SYSTEMS. A METHOD OF ASSESSING THE COST OF ENVIRONMENTAL REGULATION,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 5D.
W76-11061

SHARING THE OFFSHORE OIL BONANZA.
Technology Review, Vol 78, No 4, p 39-45, February 1976. 4 fig.

Descriptors: *Continental Shelf, *Resources development, Economics, Water resources, *Oil industry, *Fossil fuels, Management, Leases, Income.
Identifiers: *Outer Continental Shelf.

This article is an adaptation by the Editors of Technology Review of 'The O.C.S. Petroleum Pie,' by John W. Devanney, III, published in February, 1975, by the M.I.T. Sea Grant Program as Report Number MITSG 75-10, Index Number 75-310-Nme. (Copies of the full report are available at the Marine Resources Information Center, Room 5-331, M.I.T., Cambridge, Mass., 02139, for $2.50.) Alternative policies for managing petroleum which may exist on the outer continental shelves of the U.S. are the subject of considerable current contention. The purpose of this report is to analyze the present system and the principal alternatives and their likely consequences. Offshore oil is not basically an environmental issue and not basically an issue of shoreside jobs and development; it is, rather, primarily a question of the amount and distribution of the national income involved -- the difference in the cost of offshore oil and imported oil and the allocation of this difference between the developer and the public and between the adjoining coastal state and the rest of the nation. Slicing up the offshore petroleum pie will be a tricky business; but if the knife is sharp -- that is, if the debate is informed -- and if the slicing is done in clear public view, there should be quite a piece for all concerned. (Sinha-OEIS)
W76-11088

A THOROUGH LOOK AT CURRENT OFFSHORE PETROLEUM OPERATIONS.
Marine Technology Society Journal, Vol 7, No 7, p 16-23, October-November 1973. 7 fig.

Descriptors: *Continental Shelf, *Resources development, Water resources, *Oil industry, Fossil fuels, *Environmental effects, *Offshore platforms, Leases, Drilling, Operation, Planning, Management.
Identifiers: *Outer Continental Shelf, Environmental impact.

The article contains excerpts from the study by D. E. Kash and I. L. White, 'Energy Under the Oceans,' sponsored by the National Science Foundation and undertaken by the Science and Public Policy program at the University of Oklahoma. (Completed in September, 1973, the full report is available through the University of Oklahoma Press for $4.50.) The summary quoted here was also prepared by the interdisciplinary team which conducted the 21-month study. Four areas from which it might be possible to increase domestic oil and gas production within the next twelve years are: onshore in the lower 48 states, Alaska, state lands offshore, and the outer continental shelf (OCS). Of the four, only Alaska and the OCS offer a potential for significant increases. There are objections to each of the domestic aternatives and to imports. The principal objections to Alaska and the OCS are environmental. Proponents of developing either Alaska or the OCS contend not only that imports are likely to be more of an environmental threat, but also that imports create national security, balance of trade, and economic problems. Policy-makers who have to choose from among these three aternatives must seek to balance demands for more energy. Technology assessment, an attempt to identify, analyze, and evaluate potential environmental, legal/political, and other social impacts, is one approach that can be used for informing policy-makers of what the consequences of the choice or choices are likely to be. (Sinha-OEIS)
W76-11091

OIL SPILLS AND OFFSHORE PETROLEUM,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5G.
W76-11092

6D. Water Demand

PROBLEMS AND SOLUTIONS IN ESTIMATING THE DEMAND FOR AND VALUE OF RURAL OUTDOOR RECREATION,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W76-10585

SOUTH DAKOTA'S SYSTEM OF WATER MANAGEMENT AND ITS RELATION TO LAND USE AND ECONOMIC DEVELOPMENT,
South Dakota Univ., Vermillion. School of Law.
For primary bibliographic entry see Field 4A.
W76-10721

COAL MINING, DEVELOPMENT AND PROCESSING -- THE ASSOCIATED WATER PROBLEMS,
Clyde and Pratt, Salt Lake City, Utah.
For primary bibliographic entry see Field 6E.
W76-10727

THE EFFECT OF CHANGING INPUT AND-PRODUCT PRICES ON THE DEMAND FOR IRRIGATION WATER IN TEXAS,
Texas A and M. Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 3F.
W76-10810

A METHOD FOR DETERMINING THE IRRIGATION REQUIREMENT IN ANTIGUA, W. I.,
MacDonald Coll., Montreal (Quebec).
For primary bibliographic entry see Field 3F.
W76-10981

6E. Water Law and Institutions

STRATEGIES FOR NATURAL RESOURCE DECISION-MAKING: COMMENTS ON THE STAFF REPORT,
New England River Basins Commission, Boston, Mass.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 028, $5.00 in paper copy, $2.25 in microfiche. Report NERBC-004, December 6, 1972. 89 p, append.

Descriptors: *Decision making, *Natural resources, *Planning, *Regional development, *State governments, Programs, Land use, Social aspects, Water quality.
Identifiers: *Policy planning, *Program planning, National Land Use Policy Act, Coastal Zone Management Act, Citizen participation.

The proceedings of a conference sponsored by the NERBC on Opportunities for Coordinating Natural Resource Planning Programs, September 14, 1972 are summarized. Five formal statements are summarized along with reactions from 7 panelists and other comments received later. A national overview is given. Initiatives at the federal level are viewed in relation to their potential to reestablish government credibility and to make the bureaucracy responsive to people. These objectives are strengthened by strategies which reduce federal requirements and return control of programs to the states. Reorganization at the federal level has gone in this direction. The National Land Use Policy Act and Coastal Zone Management Act are regulatory bills which strengthen existing means of public control. Land use programs at the state level will have to be well conceived to reconcile environmental and social concerns. These bills draw attention to areas of environmental concern, key facilities, large scale development, and lands of regional benefit. Similarly the 1972 Water Quality Amendments demand that the states take action in the form of programs to stop water pollution in navigable rivers. A coordinated program of environmental planning, waste disposal, recreation, and flood control, is necessary for benefits to be large. Regional agencies can serve roles as experts, as leaders, and as a focus for integration of planning efforts. At the state level citizen participation is needed but difficult to obtain. At all

levels the question of policy versus program planning is important. (See also W76-07735) (Smith-North Carolina)
W76-10503

CONTROL OF POLLUTION FROM ANIMAL FEEDLOTS,
For primary bibliographic entry see Field 5G.
W76-10533

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT, VOLUME I,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10574

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT VOLUME II,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10575

DIPLOMATIC AND LEGAL ASPECTS OF REMOTE SENSING,
Department of State, Washington, D. C.
R. F. Stowe.
Photogrammetric Engineering and Remote Sensing, Vol. 42, No. 2, p. 177-180, 1976.

Descriptors: *Remote sensing, *Legal aspects, *Foreign countries, Satellites(Artificial), Regulation, Treaties.
Identifiers: *International relations.

The enthusiasm generated by the Earth Resources Technology Satellite (ERTS-1) appears to be dampened by the international community due to concern about national sovereignty and unfair exploitation of natural resources, eliciting arguments that sovereignty should include complete control over all dissemination and use of information relating to natural resources, regardless of where such dissemination or use may take place. Proposals before the United Nations Outer Space Committee are being negotiated and debated on the U. S. position of open-dissemination vs. a prior-consent system. Aside from fears that national security would be threatened, particularly by the disclosure of data such as crop surveys that have economic implications, there exists a pervasive if vague and ill-defined feeling that yet another area of national if not personal privacy is being violated and that somehow this results in increased vulnerability. Efforts to find acceptable solutions to the differing views and concerns are being made in the Legal and Scientific and Technical Subcommittees of the UN. Fears have been expressed on one hand that the technological progress would outpace policy considerations, creating a fait accompli; and on the other hand, that adoption of legal standards before clarifying what is technically practicable and useful would create artificial and perhaps irrelevant guidelines to future development of remote sensing. (Auen-Wisconsin).
W76-10584

THE ECONOMICS OF DEVELOPING THE RESOURCES OF THE WORLD'S OCEANS,
Akademiya Nauk SSSR, Moscow.
For primary bibliographic entry see Field 6B.
W76-10587

WATER TO THE FIELDS: INDIA'S CHANGING STRATEGY,
Sussex Univ., Brighton (England). Inst. of Development Studies.
For primary bibliographic entry see Field 3F.
W76-10589

SETTLEMENT OF DISPUTES ARISING UNDER THE LAW OF THE SEA CONVENTION,
Ministry of Foreign Affairs, Nairobi (Kenya). Legal Div.
A. O. Adede.
American Journal of International Law, p. 798-818, 1975.

Descriptors: *Law of the Sea, *Boundary disputes, *Adjudication procedure, Equity, Treaties, Negotiations, United Nations, Foreign countries.

The efforts of the Third United Nations Conference on the Law of the Sea to adopt a comprehensive Law of the Sea Convention containing an appreciable degree of flexibility in the settlement system of disputes arising out of the Convention are discussed in connection with a series of draft articles prepared by the Informal Working Group on the Settlement of Disputes. The fundamental issues involved are first, whether or not states will indeed agree to include in the Convention a system of third-party settlement with compulsory jurisdiction; secondly, whether states will agree to submit to such compulsory procedures all disputes or only a limited category of cases. Essential to such a comprehensive system is the inclusion of wide choices of modes of settlement, incuding third-party procedures entailing binding decisios; a system that includes copsory procedures from which only limited and justifiable exceptions are permitted; a system that would ensure a wide measure of uniformity in the interpretation and application of the Law of the Sea Convention; that it should be an integral part of the Law of the Sea and not an optional protocol to the Convention; the establishment of a Law of the Sea Tribunal; and that both the substantive law of the Convention and the procedural mechanisms established therein must protect the rights and interests of all states equally. (Auen-Wisconsin).
W76-10590

NATIONAL OCEAN POLICY: PRIORITIES FOR THE FUTURE,
Committee on Commerce (U. S. Senate). Committee on Commerce National Ocean Policy Study.
E. F. Hollings.
Oceanus, Vol. 19, No. 1, p. 8-21, 1975.

Descriptors: *Oceans, *Regulation, *Natural resources, *Management, Continental slope, United States, Jurisdiction, Federal government, Resources development, Seashores, Marine fisheries, Administration, Comprehensive planning, Legislation, Institutions, Environmental effects, Submerged Lands Act, Oil, Drilling, Exploration, Contract administration, Bids, State governments, Mining.
Identifiers: *U.S. ocean policy, Outer Continental Shelf, Seabed mining, 200-mile economic zone, Outer Continental Shelf Lands Act.

The fragmented institutional jurisdiction for the management of the United States coastal zones, the Outer Continental Shelf, and seabed resources, and the absence of a comprehensive regulating policy pose an environmental and economic threat. The critical needs for developing a sound marine resource management program by the federal government are: (1) Creation of a 200-mile economic zone; (2) reassessment and reorganization of federal ocean programs; (3) revision of the Outer Continental Shelf Lands Act to reflect current national and regional values; (4) strengthening the Coastal Zone Management Act to provide the coastal states with greater capacity to deal with problems of energy facility siting and deep water ports; (5) establishment of a marine fisheries management system at the federal level; and (6) a federal policy and licensing system for seabed mining. The federal government's conscious promotion of the development of private and public natural resources through incentive policies for extraction, harvesting, and conversion of raw materials to goods based on inexaustible resources must be revised to reflect the concept of obviously limited resources. Institutions must be restructured, policy must be formulated on the basis of sustained and scientific management of the resource and more knowledge must be gained to focus on the problems of the oceans. (Auen-Wisconsin)
W76-10591

ENABLING LEGISLATION: POSSIBILITIES FOR THE COMMERCIAL FISHING INDUSTRY,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
J. C. Cato.
Staff Paper No. 8, June 1975. 20 p. 1 tab., 12 ref.

Descriptors: *Cooperatives, *Commercial fishing, *Legislation, *Florida, *Marketing, Regulation, Prices, Assessments.

How the Florida commercial fishing industry can enhance its returns by marketing orders initiated through enabling legislation is illustrated by describing what enabling legislation and marketing orders are and what they are designed to accomplish. A marketing order program promotes an orderly marketing system with concurrent price stability. Under marketing agreements and orders it is possible to improve marketing news and even sponsor research programs to help solve specific problems. Grade, size limitations, and quality controls can be used which can create buyer confidence in product quality. Marketing orders can be tailored to meet a wide range of problems, restricted only by appropriate legislation. Enabling state legislation allows fishermen to work on marketing problems cooperatively guided by simple rules. The differentiation between a marketing agreement and a marketing order is that the former is a voluntary contract between producers and handlers to follow certain rules set by enabling legislation; the latter allows fishermen to hold a referendum and vote a mandatory assessment on everyone involved in selling a particular species, for example, to try to improve their collective bargaining position in the market. The fishery enabling legislation enacted in Oregon and North Carolina are cited as examples, illustrating the legislative scope and procedures and costs of assessment. (Auen-Wisconsin)
W76-10593

OCEAN BOUNDARIES AND PETROLEUM RESOURCES,
Princeton Univ., N.J. Dept. of Geology.
H. D. Hedberg.
Science, Vol 191, No 4231, p 1009-1018, March 12, 1976. 6 fig, 9 ref.

Descriptors: *Continental Shelf, Water resources, *Boundary disputes, *Oil industry, *Environmental effects, Continental margin, Continental slope, Resources development, Management, Boundaries(Property), Drilling, Exploration, Exploitation, International law, *Law of the Sea.
Identifiers: *Outer Continental Shelf, *Petroleum resources, *Offshore drilling, Deep ocean, Geomorphic features.

The development of marine geophysical prospecting and various types of marine drilling installations suited to various water depths has now made exploration and production in shallow and moderately deep offshore waters of the continental shelf entirely feasible and, in some respects, less difficult than in some land areas. Currently, there are hundreds of offshore fields producing oil and gas in the world; 17% of U.S. production and 18% of world production in 1973 came from these offshore sources. It is recognized that there should be an outer limit to the areal extent of a coastal state's jurisdiction over the ocean floor extending outward from its shores. It is also generally agreed that the great central regions of the deep ocean

floor should be under international jurisdiction. The big problem is just how far out the boundary between national and international domains should be drawn. It is concluded that the United States has everything to gain and nothing to lose by supporting a boundary formula that gives it its natural subsea territory out to the base of the adjacent continental slope, plus such additional selvage as may be provided by whatever width boundary zone the nations-in-concert decide is desirable. Conversely, the United States would definitely lose by accepting a 200-mile limit. In several places this would deprive it of potential petroleum territory which naturally should belong to it, while in other places it would give it an excess of deep-ocean bottom poor in sediments. Perhaps, the U.S. and other countries may yet be willing to speak out for the simpler, more effective principle that gives all nations the sub-sea bottom resources that naturally belong to them through the natural prolongation of their land masses beneath the oceans. (Sinha-OEIS)
W76-10596

INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SENSING AND ASSESSMENT, VOLUMES 1 AND 2.
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.
W76-10637

SOME INTERNATIONAL ACTIVITIES IN ENVIRONMENTAL MONITORING,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.
W76-10644

NETWORK DESIGN CONSIDERATIONS FOR THE GLOBAL ENVIRONMENTAL MONITORING SYSTEM (GEMS) OF THE UNITED NATIONS,
Smithsonian Astrophysical Observatory, Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-10646

ENVIRONMENTAL MONITORING IN LATIN AMERICA AND THE CARIBBEAN,
Pan American Health Organization, Washington, D. C.
For primary bibliographic entry see Field 5A.
W76-10654

ENVIRONMENTAL QUALITY SURVEILLANCE IN INDONESIA,
National Inst. of Health, Research and Development, Djakarta (Indonesia).
For primary bibliographic entry see Field 5A.
W76-10655

LEGAL REQUIREMENTS FOR MONITORING GROUNDWATER QUALITY,
Banks (Harvey O.), Inc., Belmont, Calif.
For primary bibliographic entry see Field 5G.
W76-10656

OWRT INTEREST IN NEW TECHNOLOGIES FOR WATER TREATMENT,
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10677

ILLINOIS LAWS RELATING TO WATERWAYS 1973.
Illinois State Dept. of Transportation, Springfield. Div. of Waterways.
Available from Division of Waterways, Dept. of Transportation State of Illinois, 1973. 180 p.

Descriptors: *Illinois, *Administrative agencies, *Water resources development, *Legislation, *Supervisory control(Power), Water management, Water utilization, Rivers, Streams, Flood contures, Coordination, Federal government, Stae governments, Local governments, Navigation, Jurisdiction.

This booklet collects statutes pertaining to the use of rivers, lakes and streams in Illinois, and to the authority, duties and jurisdiction of the Department of Transportation and its Division of Waterways over those waters. These statutes cover a multitude of water related areas, including flood and pollution control, dam and canal construction, and the development of water resources for all types of public utilization. Reference is made to the chapters and paragraphs of the Illinois Revised Statutes, wherein can be found the complete acts from which this material has been excerpted. (Parrish-Florida)
W76-10720

SOUTH DAKOTA'S SYSTEM OF WATER MANAGEMENT AND ITS RELATION TO LAND USE AND ECONOMIC DEVELOPMENT,
South Dakota Univ., Vermillion. School of Law.
For primary bibliographic entry see Field 4A.
W76-10721

DREDGED MATERIAL DISPOSAL--EFFECTS AND ALTERNATIVES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W76-10724

A NEW INTERNATIONAL LAW FOR THE DEEP SEABED REGIME,
Columbia Univ., New York. School of Law.
O. L. Lissitzyn.
Columbia Journal of Transnational Law, Vol 14, No 1, p 30-55 (1975). 26 p.

Descriptors: *Law of the sea, *United Nations, *Exploitation, Exploration, Economics, International law, Legal aspects, Navigation, Oceans, Water law, Management, Regulation, Water policy, Legislation, Foreign waters, Foreign trade, International waters, Administrative agencies, Judicial decisions, Treaties, Oil, Natural resources, Water resources, Resources development, Research and development, Boundary disputes, Political constraints, Governmental interrelations.
Identifiers: Common heritage.

Efforts to arrive at a new international law of the deep sea hinge on the resolution of several key differences. Developing nations want seabed resources distributed according to the 'common heritage' principle by an international seabed authority. Developed nations, however, want the right to do their own mining for their own benefit. Also to be considered are land-based metal producers who will lose money from seabed mining, and who want broad regulatory powers. Concern exists over the domination of resources by developed nations, as well as over what type of body will ultimately govern the seabed. (Frank-Florida)
W76-10726

COAL MINING, DEVELOPMENT AND PROCESSING -- THE ASSOCIATED WATER PROBLEMS,
Clyde and Pratt, Salt Lake City, Utah.
E. W. Clyde.
Rocky Mountain Mineral Law Institute, Vol. 21, p. 163-197 (1975), 34 p, 74 ref.

Descriptors: *Water resources development, *Interstate compacts, *Central U. S., *Coals, *Water utilization, Water resources, Water requirements, Mining, Mine drainage, Electricity, Water rights, Legal aspects, Groundwater, Dams Appropriation, Energy, Power plants, Federal government.
Identifiers: *Flood Control Act of 1944.

America is looking to greatly expand its coal production. Significant quantities of water will be needed in all known coal processes. Since the water problems that will arise will be legal as well as physical, interstate agreements must be reached to provide proper apportionment. This is especially true for the states comprising the Lower Colorado River Basin. REciprocal legislation is one way to ensure cooperation; however, there are various alternatives to meet the future water needs of the West which must also be explored. For example, deep groundwater could provide some of the water needed. The author favors large, publicly-financed multi-purpose projects under the 1944 Flood Control Act. This Act allows the Secretary of the Army to make contracts among several states for water diversion or transport. Since the Federal Government has the right to transport its water as it pleases, it is up to the states to prepare for their imminent water needs by regional cooperation. Otherwise, the federal government will push through a unilateral solution for obtaining water for its energy processes. (Frank-Florida)
W76-10727

EQUITABLE APPORTIONMENT OF INTERSTATE GROUND WATERS,
Fischer and Beatty, Fort Collins, Colo.
For primary bibliographic entry see Field 4B.
W76-10728

INDIAN WATER RIGHTS: SOME EMERGING FRONTIERS,
Native American Rights Fund, Boulder, Colo.
R. S. Pelcyger.
Rocky Mountain Mineral Law Institute, Vol 21, p 743-775 (1975). 35 p, 111 ref.

Descriptors: *Indian reservations, *Pacific Northwest U. S., *Groundwater, *Groundwater resources, *Surface-groundwater relationships, Surface waters, Treaties, Legal aspects, Legal review, Federal reservations, Federal government, Federal jurisdiction, State governments, State jurisdiction, Fishing, *Water rights.

Indians in the west and northwest have encountered problems in protecting their fishing rights from state encroachment. District and circuit courts have overturned state court decisions holding against Indian fishing rights at a rapid and unanimous rate. Indian water rights also have been subject to state encroachment, but because they have long been recognized to be under federal jurisdiction, states have had much less success. The author explains the legally recognized similarities between ground and surface waters. This prefaces his stance that Indians have rights to ground waters under Federal treaties and that the needs of the reservation should be met first. (Frank-Florida)
W76-10729

AN INTEGRATED INTERNATIONAL AND DOMESTIC APPROACH TO CIVIL LIABILITY FOR VESSEL-SOURCE OIL POLLUTION,
For primary bibliographic entry see Field 5G.
W76-10730

A PROPOSAL FOR ADOPTION OF A LEGAL DOCTRINE OF GROUNDSTREAM WATER INTERRELATIONSHIP IN TEXAS,
Saint Mary's Univ., San Antonio, Tex. School of Law.
For primary bibliographic entry see Field 4B.
W76-10731

THE LAW OF THE SEA AT THE CARACAS SESSION: A BRIEF EVALUATION,
Law of the Sea Conference, New York.
H. Caminos.
Columbia Journal of Transnational Law, Vol. 14, No. 1, p 80-86 (1975). 7 p.

Descriptors: *Law of the Sea, *United Nations, *Continental shelf, *Resources development, *International law, Legal aspects, Navigation, Oceans, Water law, Management, Regulation, Exploration, Exploitation, Administrative agencies, Licenses, Permits, Treaties, Water pollution, Pollutants, Research and development, Water pollution, Boundaries(Property), Legislation, International waters, Foreign trade, Economics.
Identifiers: *Territorial seas, *Economic zones.

Transcribed here is a speech made at Columbia University describing developments within the three main committees of the Third United Nations Conference on the Law of the Sea which met in Caracas. Topics discussed by the First Committee included: who may explore and exploit international areas; the merits of a strong authority having comprehensive powrs to direct exploration and exploitation versus the merits of a weak authority licensing others to conduct these activities; conditions of exploration and exploitation and degree of control to be given to the Authority over activities in the area; and economic aspects of seabed exploitation. The Second Committee covered the traditional fields in Law of the Sea with major emphasis on the various 'package deals' proposed regarding economic zones in territorial seas. The Third Committee dealt with pollution, scientific research and transfer of technology. The speaker concluded that there is a need for more negotiation and cooperation if unilateral action regarding seabed resources is to be avoided. (Hadoulias-Florida)
W76-10732

THE THIRD U. N. LAW OF THE SEA CONFERENCE: MAJOR UNRESOLVED FISHERIES ISSUES,
National Oceanic and Atmospheric Administration, Washington, D. C. Task Force on the Law of the Sea.
G. Taft.
Columbia Journal of Transnational Law, Vol. 14, No. 1, p. 112-17 (1975). 6 p.

Descriptors: *Fish conservation, *Marine fisheries, *Anadromous fish, *Catadromous fish, *International commissions, Law of the sea, Foreign waters, Treaties, International waters, Conferences, Commercial fish, Fish management, Fish populations, Fish harvest, Marine fish, Foreign waters, Coasts.
Identifiers: Coastal waters, Contiguous zone, Economic zone.

Broad general agreement exists within the Third United Nations Conference on the Law of the Sea that a 200-mile economic zone be established. This article focuses on six specific unresolved issues: coastal state duties within the zone; special treatment of anadromous species; special treatment of migratory species; right of landlocked and geographically disadvantaged nations; provisional treaty application; and coastal state enforcement jurisdiction. Developing nations favor exclusive coastal nation rights with exclusive enforcement jurisdiction and without international conservation or utilization duties. Furthermore, these states favor no special treatment for any fish species. The United States favors exclusive coastal state regulation with accompanying obligation to conserve and utilize resources and with limited coastal enforcement jurisdiction. The United States also favors special anadromous and migratory species treatment. Western European nations adopt a middle position, stressing regional or sectoral fisheries together with coastal state rights and duties. Landlocked nations present special problems. It is generally agreed that these states have access rights; however, the extent of the right is unclear. A compromise solution satisfactory to all the various states will not be easily found. Nonetheless, the need for immediate protection of ocean resources will probably result in a tentative treaty being adopted soon. (Comer-Florida)
W76-10733

THE ROLE OF THE COASTAL ZONE MANAGEMENT ACT OF 1972 IN THE DEVELOPMENT OF OIL AND GAS FROM THE OUTER CONTINENTAL SHELF,
Morgan, Lewis and Bockius, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10734

ENERGY CRISIS, SUPERTANKERS AND ECOLOGY,
For primary bibliographic entry see Field 5G.
W76-10735

THE CONVEYANCER, WATER RIGHTS AND THE ENVIRONMENT,
F. M. Brookfield.
The New Zealand Law Journal, Vol. 1975, p. 645-50. 6 p.

Descriptors: *Water rights, *Water allocation(Policy), Foreign countries, *Relative rights, Legislation, Diversion, River regulations, Legal aspects, Water law, Administrative agencies, Jurisdiction, Regulation, Common law, Administration, Water policy, Water conveyance, Governments, Public rights, Water.
Identifiers: *New Zealand, *Water and Soil Conservation Act of 1967(NZ), Water rights(Non-riparian), Conveyancers.

Prior to the Water and Soil Conservation Act of 1967, common law rights in New Zealand consisted of two classes: natural rights of the landowner, and acquired rights. These rights, which include both the right to take and discharge water, are examined to determine the extent which they are affected by the 1967 Act. Special emphasis is placed on section 21(1) of the Act which takes and vests in the Crown certain rights as to 'natural water', including the right to take and use natural water and to discharge natural water into natural water. The right to convey water, however, is not taken by the Crown. Sections 24 and 25 of the Act dealing with priorities among competing rights and interests along with other remedies before the Act are also examined. Finally, the article discusses the duties of the conveyancer both before and after passage of the Act. (Griffith-Florida)
W76-10736

WATER QUALITY AND THE WATER AND SOIL CONSERVATION ACT 1967,
For primary bibliographic entry see Field 5G.
W76-10737

DAMS OF PORK,
For primary bibliographic entry see Field 6B.
W76-10738

BURNING WATERS,
For primary bibliographic entry see Field 5G.
W76-10740

ROOKERY BAY: ECOLOGICAL CONSTRAINTS ON COASTAL DEVELOPMENT,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10741

A SOUND WATER PLAN FOR SOUTH FLORIDA IMPLEMENTATION OF THE 1972 WATER RESOURCES ACT,
Spessard L. Holland Law Center, Gainesville, Fla.
F. E. Maloney.
Florida Environmental and Urban Issues, Vol. 1, No. 4, p. 1-4 (1974). 4 p, 1 photo.

Descriptors: *Florida, *Water management(Applied), *Water conservation, *Water districts, *Planning, Water resources, Administrative agencies, Flood control, Water pollution, Groundwater resources, Groundwater movement, Groundwater potential, Water supply, Surface water availability, Legislation, Regulation, Control, Groundwater management, Water policy, Project planning, Projet purposes, conservation, Water allocation(Policy), Permits, Water storage, Water quality, Water resources development, Water utilization.
Identifiers: *Florida Water Resources Act(1972).

South Florida needs development of a sound long-range water plan to meet emerging water resources problems, enforced by an agency with knowledge and power to do so fairly and equitably. The Central and Southern Florida Flood Control District when created did not deal with water pollution. In 1972, however, the Florida Resources Act, based upon the Model Water Code, converted the Flood Control District into a true Water Management District with full authority to control both surface and groundwater. The Act also charged the District with developing long-range plans for use of Florida's water resources and with conserving and preserving water resources in the public interest. The Act calls for either the Water Management District or Department of Natural Resources to devise and promulgate detailed rules and regulations for implementation of general water management. These rules should specify procedures for obtaining permits for use, management and storage of water, and design criteria for wells. Problems remaining to be solved include: increasing urban concentrations; disposal of municipal and industrial water, reuse of treated water; backpumping problems; protection of wildlife in the Everglade National Park and the FCD Conservation Areas; and rampant development. (Hadoulias-Florida)
W76-10742

U. S. POSITION ON LAW OF THE SEA REVIEWED,
J. N. Moore.
Department of State Bulletin, Vol 70, p 397-402, April 15, 1974. 6 p.

Descriptors: *United States, *Law of the sea, *Treaties, *Continental shelf, *Water resources development, International law, Legal aspects, Foreign trade, Foreign waters, International waters, Commercial fishing, United Nations, Navigation, Straits, Navigable waters, Fish, Anadromous fish, Fish management, Jurisdiction, Continental margin, Resources, Resources development, Water pollution, Oil pollution, Research and development, Legislation.
Identifiers: *Territorial zone, Arbitration.

The Chairman of the National Security Council Task Force on the Law of the Sea has summarized the United States position on the following crucial issues confronting the Law of the Sea Conference: (1) The United States has agreed to a twelve mile territorial zone provided rights of unimpeded transit through straits used for international navigation are recognized by international treaty; (2) To meet the problem of management jurisdiction over fish stocks, the U. S. has proposed broad coastal state control over coastal and anadromous species. The U. S. has also urged broad jurisdiction over continental margin mineral resources; (3) Development of deep seabed resources will be best accomplished by allowing access to such resources under reasonable conditions set by international administrative machinery. In addition, international standards are needed to regulate vessel pollution. Finally the United States has proposed the creation of a new ocean tribunal calling for compulsory third-party settlement of

disputes arising under the treaty. (Hadoulias-Florida)
W76-10743

DEPARTMENT OPPOSES UNILATERAL EXTENSION OF U. S. FISHERIES JURISDICTION,
Department of State, Washington, D. C.
K. Rush.
Department of State Bulletin, Vol. 70, p. 555-558, May 20, 1974. 4 p.

Descriptors: *Legislation, *Federal jurisdiction, *Law of the Sea, *Fisheries, *Commercial fishing, International law, Federal government, Water law, Treaties, Governments, Regulation, Political aspect, Legal aspects, Jurisdiction, Water rights, Foreign waters, Foreign trade, International waters, Atlantic Ocean, Pacific Ocean, Governmental interrelations.

The executive branch is opposed to Senate bill S. 1988, which calls for unilateral extension of U. S. fisheries jurisdiction to 200 miles, because of serious foreign policy implications. It is feared that the establishment of a 200 mile zone would be very difficult to enforce and could possibly frustrate satisfactory settlement of other aspects of the fisheries question at the Law of the Sea Conference. Other critics of the bill claim it would impair U. S. international credibility, prejudice short and long term interests of American distant-water fishermen, and set a precedent contrary to established principles of international law. During the interim period prior to establishment of a new international legal system by the Law of the Sea Conference, ways to solve the fisheries problem, including the strengthening of both bilateral and multilateral agreements with nations conducting fishing operations, will be undertaken. (Hadoulias-Florida)
W76-10744

THE OCEANS: WILD WEST SCRAMBLE FOR CONTROL,
Time, Vol. 104, p 51-54, July 29, 1974. 4 p, 1 map, 1 illus, 1 photo.

Descriptors: *Law of the Sea, *Treaties, *International law, *Resource development, *Continental shelf, United Nations, Boundary disputes, Regulation, Federal government, Foreign trade, International waters, Navigation, Transportation, Licensing, Fisheries Commercial fishing, Administrative agencies, Legislation, Pollution, Water resources, Administration, Economics, Governments, Management, Political aspects, Jurisdiction, Foreign waters, Exploitation, Mining, Leases, Exploration.
Identifiers: Territorial zone, Economic zone.

The major issues discussed at the Caracas Law of the Sea Conference included: the boundaries for coastal nation territorial zones and economic jurisdiction; ownership of high seas resources; and creation of an international association settling ocean disputes and parceling out resources. The Conference split into two factions with the 120 developing countries generally squared off against the 29 modern industrial nations. The United States, having much to lose at Caracas if satisfactory laws are not developed, has urged that coastal nations be given a twelve mile territorial sea, a 200 mile wide 'economic zone' for exploitation of minerals and fish, and control over anadromous and coastal fish species except for certain licensing rights granted to foreigners and an international fishing commission in charge of wide-ranging oceanic species. The international authority would set up rules for deep sea mining, license qualified miners, and collect 5% of revenues for distribution to non-coastal or needy nations. The Caracas delegates have chosen to sidestep the issue of pollution. Nevertheless, the Caracas Conference represents a global attempt to steer away from a 'colonial mentality' by setting fair ground rules for sharing the oceans resources. (Hadoulias-Florida)
W76-10745

HERE COME DE SLUDGE,
G. Soucie.
Audubon, Vol. 76, p. 108-113 July 1974. 6 p, 1 illus, 1 map.

Descriptors: *Sewage sludge, *Sludge disposal, *New York, Sludge treatment, *Organic wastes, Industrial wastes, Sewage, Sludge digestion, Solid wastes, Wastes, Waste disposal, Environmental sanitation, Municipal waters, Water quality, Water pollution, Federal government, Governmental interrelations, Administrative agencies, Ecology, Water quality control, Environmental effects, Regulation.
Identifiers: *New York Bight.

Sewage sludge, dredge spoils, construction rubble, derelict vessels and industrial wastes are being dumped in the waters of the New York Bight producing changes in area marine life, public health hazards, and concentrations of heavy metals in offshore waters. Federal responsibility for sludge dumping is shared by (1) the Environmental Protection Agency (EPA), in charge of issuing permits and monitoring acute, short-term effects, (2) the National Oceanic Administration (NOAA), for delineating the long-term environmental impact, defining the extent of present dumping grounds, and for selecting alternative sites, and (3) the Coast Guard for policing the vessels and barges doing the dumping. The EPA does not see any other immediate alternatives to ocean dumping since incineration adds additional dirty air and releases aerosols of toxic heavy metals while composting of sludge for fertilizers is economically unfeasable. The EPA suggests a bi-state regional sludge management authority to seek alternatives such as pipelines to remote landfills, regional incineration with energy recovery, or advanced treatment processes. Presently the EPA has succeeded in getting the NOAA to identify two alternative dumping areas further out at sea. (Hadoulias-Florida)
W76-10746

THE GREAT MAINE LOBSTER WAR,
G. Soucie.
Oceans, Vol. 74, p. 66-68, May 1974. 3 p.

Descriptors: *Oil pollution, *Lobsters, *Maine, *Canada, *New Hampshire, *Boundary disputes, Treaties, Fisheries, Fishing, Continental Shelf, Oil, Resources, Oil spills, Benefits, Economics, Legal aspects, Political aspects, Water rights, Water law, Costs, Marine fish, Marine fisheries, Commercial fishing, Boundaries(Property).
Identifiers: *Great Maine Lobster War, *Machias Seal Island.

Maine is feuding over marine boundaries with both her neighbors, Canada and New Hampshire, in what has become known as the Great Maine Lobster War. The Canadian-Maine dispute centers around the still unsettled question of the boundaries and ownership of Machias Seal Island and neighboring North Rock. The Maine-New Hampshire boundary dispute centers around whether the line connecting the harbour midpoints mentioned in the King's Order of 1740 is a straight or curved line. Reasons for recent flare-ups include cost-price squeeze, declining catches, and competition from large foreign fishing fleets. The offshore areas in dispute between Maine, New Hampshire and New Brunswick are prime lobstering areas. Furthermore, oil companies have been exploring the whole Atlantic Continental Shelf thereby adding problems of oil spills and well blowouts to existing problems and issues. Regarding the Maine-Canada dispute, Maine has several deepwater coves and harbors coveted by the oil industries as potential tanker ports and refineries. Since Canada will not permit tankers bound for the U. S. to sail through Canadian waters because of pollution problems, ownership of Machias Seal Island is crucial to Maine. (Hadoulias-Florida)
W76-10747

THE NEW TREATY ON VESSEL POLLUTION,
R. J. McManus.
Oceans, Vol 74, p 59-65, July 1974. 7 p, 35 ref.

Descriptors: *Oil pollution, *Treaties, *International law, *United Nations, *Ships, Water pollution sources, International waters, Water pollution, Oil, Foreign waters, Water law, Pollutant identification, Water pollution control, Water pollution abatement, Legal aspects, Law of the sea, Oil industry, Political aspects, Water policy, Organization, Foreign countries, Governments.
Identifiers: 1973 Convention for the Prevention of Pollution from Ships.

The 1973 Conference on Marine Pollution was convened in England by the Intergovernmental Maritime Consultative Organization (IMCO), the specialized United Nations agency that regulates and coordinates world shipping. A new treaty, The Convention for the Prevention of Pollution from Ships, 1973, resulted. The treaty is primarily concerned with the incidental discharge of hazardous and polluting substances in the normal course of ocean commerce. The treaty basically requires each signatory nation to enact domestic legislation at least as stringent as the regulations set forth in the treaty concerning domestic ships. Annex I of the treaty regulates discharges of oil in five special areas. Annex II categorizes every noxious liquid substance carried in bulk. Annex III requires contracting parties to issue requirements for packing, labeling and storing harmful substances. Annexes IV and V deal with vessel sewage and garbage. Other treaty provisions include maritime treaties for warships, compulsory arbitration and tacit amendment procedures. Although the treaty relies upon enforcement by flag states, coastal states are granted authority to act if supplementary action is necessary. (Hadoulias-Florida)
W76-10748

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 2).
Hearings--Sub Comm on Pub Lands--Comm on Interior and Insular Affairs, U. S. Senate, February 7, 1974, p 75-220.

Descriptors: *Rivers, *Licensing, *Water resources development, *North Carolina, *Wild Rivers Act, Federal government, Governmental interrelations, Projects, Conservation, Hydroelectric project licensing, Hydroelectric plants, Legal aspects, Electric power, Conservation, Costs, Planning, Resources development, Scenery, Project purposes, Ecology, Recreation facilities, Protection, Water quality.
Identifiers: *Wild and Scenic Rivers Act, Upper New River, Blue Ridge Project.

The Wild and Scenic Rivers Act authorizes Congress to conduct studies to designate qualifying rivers as additions to the Wild and Scenic Rivers System. The Federal Power Commission is prohibited from licensing construction of any water project directly affecting the rivers until such studies have been completed. This bill proposes that Congress include portions of the New River of North Carolina into the System because of outstanding scenic, recreational, geologic and historic values. The Federal Power Commission (FCC), however, may frustrate such inclusion by granting a license for construction of the Blue Ridge Project, a massive hydroelectric project which would destroy the Upper New River. Thus, if this bill is not immediately approved Congress may lose the opportunity to determine the proper use of this remarkably beautiful and historic area. The Environmental Protection Agency carefully evaluated the Blue Ridge project and determined that the Project's benefits do not outweigh its disadvantages which include the uprooting of North Carolina citizens, adverse

affects on reservoir water quality, and adverse impacts in stream biota. (Hadoulias-Florida)
W76-10750

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 4).
Hearings--Sub Comm on Pub Lands--Comm on Interior and Insular Affairs, U. S. Senate, June 20, 1974, p 493-771.

Descriptors: *Wild rivers, *Wild River Act, *Recreation, *National parks, *Water resources development, Bodies of water, Rivers, Scenery, Water policy, Boating, Water sports, Natural resources, Recreation demand, Recreation facilities, Social impact, Water utilization, Wildlife, Interstate rivers.

The Act which created the National Wild and Scenic River System originally obligated the Department of Interior to study 27 rivers to determine priorities for inclusion into the System. This 1974 hearing report contains proposed bills which would designate additional rivers or segments of rivers as components of the system. Statements were made before the committee by the following interested parties: elected officials, representatives of conservation groups, and members of state and national agencies involved in the administration of the program. Additional material considered by the committee included maps and photographs of the areas under consideration, newspaper articles, and letters from local officials and from owners and users of land to be acquired or rezoned under the proposed legislation. The proponents of the legislation were primarily concerned with bringing the additional land and water into the federal system, as state and local financial resources seemed generally inadequate to provide for maintenance of the areas for recreational and aesthetic purposes. Landowners in some areas opposed certain of the bills, as did the Department of Interior, which suggested a substitute list of rivers. (Sloan-Florida)
W76-10751

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 5).
Hearings--Sub Comm on Pub Lands--Comm on Interior and Insular Affairs, U. S. Senate, August 15, 1974, p. 773-96.

Descriptors: *Michigan, *Wisconsin, *Rivers, *Hydroelectric plants, *Wild River Act, Legislation, Federal government, Dams, Islands, Power system operation, Operating costs, Operation and maintenance, Electric power demand, Structures, Facilities, Conservation, Preservation, Economics, United States, Land appraisals, Land use, Oregon.
Identifiers: *National Wild and Scenic River System.

H. R.3903 would authorize and direct the Secretary of the Interior to convey to the Wisconsin Michigan Power Company of Milwaukee, Wisconsin, all right, title and interest of the United States in an island of Iron County, Michigan, upon payment of the fair market value of the land, plus administrative costs. The Company has claimed that it obtained clear title to the island when it took possession of the island in 1917 for the purpose of constructing and operating a dam and hydroelectric power plant. The island is essential for continued operation of the hydroelectric plant. When the Company filed a Color of Title claim the application was denied due to lack of basis. The Power Company is presently operating under license of the Federal Power Commission. H.R.3903 will further the policy of the National Resource Land Management Act using public lands to best serve the public. Also included in these Hearing records is discussion held on S.3835, a bill which would designate the John Day, the Minam, and the Owyhee Rivers, all of Oregon, as 'potential additions' to the National Wild and Scenic Rivers System. (Hadoulias-Florida)
W76-10752

LAWYERS AND ECOMANAGEMENT,
Puerto Rico Univ., Mayaguez. Inst. for Policy Studies and Law.
J. Mayda.
Louisiana Law Review, Vol. 34, p. 975-92 (1974). 18 p, 3 append.

Descriptors: *Legal aspects, *Social function, *Social needs, *Human resources, *Ecosystems, Soil conservation, Water conservation, Wildlife conservation, Natural resources, Economics, Social impact, Psychological needs, Social change, Social adjustment, Social values, Planning.

Pollution of water, air, earth and living resources has reached dangerous levels. Technological developments and growth economics have endangered as well as aided man and his environment. Lawyers have a vital role to play both as citizens and as practitioners of all areas of law, in reducing the dangers of technoculture. Lawyers must go beyond the development of new law to curb pollution; they must learn to develop policy and to use old concepts to reach new results. For example, in 1966 a law passed in 1899 was successfully used to convict a major oil company of oil pollution in navigable waters. In 1972 an Ohio trial court issued a permanent injunction against an air polluting industry on the basis of hundred year old public nuisance statute. The author concludes that in addition to the drafting of new and the enforcement of old anti-pollution laws, lawyers must lead the way in striking a balance between pollution and progress. (Comer-Florida)
W76-10753

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION: COASTAL ZONE MANAGEMENT PROGRAM, ADMINISTRATION GRANTS, ALLOCATION OF SECTION 306 FUNDS TO STATES,
National Oceanic and Atmospheric Administration, Washington, D. C.
R. L. Carnahan.
Federal Register, Vol. 40, No. 104, p. 23274-75, May 29, 1975. 2 p.

Descriptors: *Project planning, *State governments, *Coasts, *Continental shelf, *Oil industry, Federal government, Water resources, Leases, Programs, Project benefits, Project feasibility, Economic feasibility, Economic impact, Regulation, Political aspects, Income, Costs, Coastal engineering, Monetary benefit, Beds under water.
Identifiers: *Coastal Zone Management Act, Seabed.

Pursuant to section 306 of the Coastal Zone Management Act of 1972, interim regulations are established setting forth procedures for allocating 1975 coastal zone management programs administrative grants to state governments. Section 306 authorizes the Secretary of Commerce to make annual grants to any coastal state for administration of state coastal zone management programs provided the following requirements are met: such grants do not exceed 66 2/3% of the yearly cost of administering the program; grants from other federal sources do not supply the state's share of costs; and grants are not awarded for less than 1% of the amount so appropriated. These annual grants, which total $2.1 million, will be awarded to qualifying programs after consideration of such factors as the extent and nature of the shoreline area covered by the plan and the population of the area. Future procedures for fund allocation may differ. (Hadoulias-Florida)
W76-10754

COASTAL ZONE MANAGEMENT PROGRAM DEVELOPMENT GRANTS, OUTER CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Washington, D. C.
R. R. Hagemeyer.
Federal Register, Vol. 40, No. 104, p. 23275-78, May 29, 1975. 4 p.

Descriptors: *Project planning, State governments, Monetary benefits, *Continental shelf, *Oil industry, Federal government, Water resources, Leases, Oil, Gases, Programs, Project benefits, Project feasibility, Economic feasibility, Economic impact, Regulation, Political aspects, Appropriation, costs, Environmental effects.
Identifiers: *Coastal Zone Management Act, *Outer Continental Shelf.

Section 305 of the Coastal Zone Management Act of 1972 authorizes annual grants to coastal states to provide assistance in administering management programs for the land and water resources of their coastal zones. These grants are designed to improve state capabilities in planning for and managing projected environmental impacts resulting from the Department of the Interior's plans to lease extensive offshore seabed tracts on the Outer Continental Shelf (OCS) for the purpose of oil and gas exploration. Although the grants do not mandate specific work elements to be funded, these interim regulations present numerous examples of projects which will be considered eligible for the grants. Because of the adverse effects oil exploration might have on local communities, it is suggested that state and local governments work closely in developing acceptable work projects. The regulations also set forth procedures for fund allocation based upon a supplemental appropriation formula providing uniform allocation of 1% of available funds to affected states, and variable allocation of the balance of the funds. Funds not obligated by the end of 1975 will remain available for future disbursement. (Hadoulias-Florida)
W76-10755

MATERIALS TRANSPORTATION BUREAU: TRANSPIRATION OF NATURAL AND OTHER GAS BY PIPELINE,
For primary bibliographic entry see Field 5G.
W76-10756

NEW SOURCE NPDES PERMITS PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10757

MARINE SANITATION DEVICE STANDARD,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-10758

SOAP AND DETERGENT MANUFACTURING CATEGORY PRETREATMENT STANDARDS FOR NEW SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10759

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY, PROPOSED PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10760

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.

W76-10761

ENVIRONMENTAL PROTECTION AGENCY: POLICIES AND PROCEDURES FOR STATE CONTINUING PLANNING PROCESS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10762

PREPARATION OF STATE WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10763

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, UREA SUBCATEGORY,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10764

ENVIRONMENTAL PROTECTION AGENCY: GRANTS AND OTHER FEDERAL ASSISTANCE, STATE AND LOCAL ASSISTANCE.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10765

DEEPWATER PORT SITE EVALUATION,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10766

DEEPWATER PORTS: LICENSING PROCEDURES AND DESIGN CONSTRUCTION, EQUIPMENT AND OPERATIONS,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10767

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS FOR NEW SOURCES FOR THE PHOSPHATE SUBCATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10768

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY, ETHYLENE OXIDE, ETHYLENE GLYCOL, METHYL AMINES AND OXO CHEMICALS PROCESSES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10769

WATER PROGRAMS SECONDARY TREATMENT INFORMATION,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10770

DOMESTIC WASTEWATER DISINFECTION, SECONDARY TREATMENT,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10771

OIL POLLUTION PREVENTION,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10772

IDENTIFICATION OF SPECIAL HAZARD AREAS LIST OF COMMUNITIES WITH SPECIAL HAZARD AREAS,
Federal Insurance Administration, Washington, D. C.
For primary bibliographic entry see Field 6F.
W76-10773

INK FORMULATING POINT SOURCE CATEGORY, PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10774

H.R. 5952 (WATER RESOURCES PLANNING ACT),
U. S. Code Cong and Admin News, p. 2415-19, 1975. 5 p.

Descriptors: *Water Resources Planning Act, *Water resources development, *Budgeting, Expenditures, U. S. Water Resources Council, Jurisdiction, Costs, Resources, Resources development, Economics, Federal budget, Federal government, Governmental interrelations, Legislation, Governments, Administration, Water law.
Identifiers: *Congressional hearings.

The Committee on Interior and Insular Affairs has recommended that H.R. 5952 be enacted as amended. H.R. 5952 would amend the Water Resources Planning Act by revising the membership of the Water Resources Council. It would also affect appropriations authority in two ways: (1) by extending the authorization for state planning grants through fiscal year 1978 at the level of $5,000,000 per year; and (2) by extending the authorization for national assessments and coordination of River Basin plans in the total amount of $10,000,000 for fiscal years 1976 and 1977. Membership of the Water Resources Council is adjusted more nearly to conform to present responsibilities within the Executive Branch. This is accomplished by dropping the Secretary of Health, Education, and Welfare from full voting membership, and by adding the Secretaries of Commerce, Housing and Urban Development, and Transportation, as well as the Administrator of the Environmental Protection Agency. The legislation also authorizes compensation of expert consultants to the council and the River Basin Commissions at the prevailing salary for GS-18 instead of the present flat rate of $100 per day. (Reinders-Florida)
W76-10775

WATER RESOURCES PLANNING ACT,
U. S. Code Cong. and Admin. News, Public Law 94-112; 89 Stat. 575, 1975. 1 p.

Descriptors: *Water law, *Water Resources Planning Act, *Administration, *Grants, Legislation, Resources development, Economics, Federal government, Administrative decisions, Costs.
Identifiers: *Congressional hearings.

The Water Resources Planning Act of 1965 has been amended. The sections amended are: Section 101 concerning Water Resources Council membership; sections 105(a)(5) and 205(a)(4) concerning per diem payments; section 301(a) concerning grant extensions; and section 401(c) concerning appropriation authorizations for fiscal years 1976 and 1977. (Reinders-Florida)
W76-10776

ENVIRONMENTAL IMPROVEMENT AUTHORITIES ACT OF 1969 (FORMATION OF PUBLIC CORPORATIONS TO DEAL WITH POLLUTION),
Ala. Code tit 8 secs 270 thru 287 (Cum Supp 1973).

Descriptors: *Alabama, *Institutions, *Pollution abatement, State jurisdiction, Administrative agencies, Water pollution control, Air pollution, Water pollution treatment, Water quality control, Water resources development, Water pollution sources, Water quality standards, Water policy, Legislation.

Through statutory enactment, the Alabama legislature has authorized the formation of public corporations whose purpose is to promote studies of environmental pollution problems, to acquire and use equipment and facilities for controlling or preventing pollution, and to aid governmental and private entities in undertakings related to pollution control. Formation of such corporations requires a showing that no other public corporation is authorized to carry on activities of the same nature within the proposed geographic area. Certificate of incorporation requires an executive order of the governor. The corporation is granted normal corporate powers; in addition, it may engage in watershed improvement, exercise eminent domain power and cooperate with governmental agencies in pollution control activities. The activities of such corporations, insofar as they concern pollution prevention and control, are declared immune from tort liability and are exempt from state taxation. Furthermore, the authorities may issue bonds provided all moneys received are used solely for pollution purposes and incidental expenses. (Comer-Florida)
W76-10777

BEAR CREEK DEVELOPMENT AUTHORITY,
Ala. Code tit 55 secs 373(6x) thru 373(6pp) (Cum Supp 1973).

Descriptors: *Alabama, *Legislation, *River basin development, *Groundwater development, *Watershed management, Comprehensive planning, River basin commissions, State governments, Administrative agencies, Water resources development, Water policy, Water supply development, Surface waters, Subsurface waters, Land resources, Natural resources.
Identifiers: Bear Creek Development Authority(Ala).

To promote unified development of Bear Creek and its tributaries, the Alabama legislature has authorized the establishment of a watershed development authority. The authority shale be a public corporation and a political subdivision. Powers granted include the power to formulate and execute development plans considering area and statewide economic development, the power to acquire property by lease, purchase, gift condemnation or otherwise, and normal corporate powers. The authority is exempt from taxation and is empowered to issue bonds. While the authority is independent of other political subdivisions of the state, it is required to report annually to the governor. The purposes of the development authority include: water conservation and supply, flood control, irrigation, industrial development, public recreation, and navigation development in the watershed area. (Comer-Florida)
W76-10778

STATE WATER CONTROL BOARD--AUTHORITY TO INVESTIGATE ALL PROBLEMS CONCERNED WITH THE QUALITY OF WATER,
1973-1974 Op Att'y Gen Va 82-84. 3 p.

Descriptors: *Virginia, *Erosion control, *Land management, *Sedimentation, *Local governments, State governments, Legislation, Planning, Water policy, Water law, Pollution control, Pro-

ject planning, Administration, Water management(Applied), Water control, Sedimentation, Water quality control, Land management, Soil management, Watershed management.
Identifiers: Implementation, State control boards(Va), Land-use control.

The State Water Control Board has the duty and the authority to exercise general supervision and control over the quality of all state waters. Furthermore, the Board has the duty and authority to study and investigate all problems concerned with the quality of state waters. Lacking unlimited resources, any decisions by the Board relating to the investigation and regulation of problems caused by pollution should be made within the context of the Board's overall responsibilities and available resources. The Board must determine, as matters of policy and priority, which problems merit investigation and whether its resources are adequate to conduct such investigations. The Virginia Erosion and Sediment Control Law is designed to minimize erosion and sediment problems within State watersheds and to mandate the development of a state-wide control program. Local governing bodies are charged with the responsibility of implementing this control program. The application by local governing bodies of land-use control measures is believed to be the most effective means by which erosion and sediment damage can be minimized. (Reinders-Florida)
W76-10779

POLLUTION--ASSEMBLY BILL 128--TO CREATE A SYSTEM OF STATE DISCHARGE PERMITS CONGRUENT WITH NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM,
1973 Op Att'y Gen Wisconsin 115-18. 4 p.

Descriptors: *Wisconsin, *Federal Water Pollution Control Act, Municipal wastes, *Permits, Waste treatment, Pollutants, Financing, Government finance, Water pollution control, Pollution abatement, Intergovernmental relations, Water pollution sources, Water pollution treatment, State jurisdiction, Federal jurisdiction, Legislation, Waste disposal, Discharge(Water), Water quality.
Identifiers: *National pollutant discharge elimination system, *FWPCA Amendments of 1972, Administrative regulations.

Wisconsin Assembly Bill 128, designed to create a system of state discharge permits congruent with the National Pollutant Discharge Elimination System (NPDES), cannot be amended to tie deadlines under the State law to the availability of federal financial assistance for municipalities without violating the Federal Act. Under the NPDES the federal Environmental Protection Agency (EPA) is to administer a system of permits for all discharges of pollutants to waters of the United States. Section 402(b) of the Act, however, provides that the system of discharge permits can be administered by the states provided they fulfill certain conditions. The EPA cannot approve a state discharge permit program unless state law provides for minimum standards and time limits that are at least as stringent as those promulgated under the federal act. (Reinders-Florida)
W76-10780

ZONING--FLOOD CONTROL.
1973 Op Att'y Gen Wisconsin 264-69. 6 p.

Descriptors: *Wisconsin, *Flood plain zoning, *Local governments, *Intergovernmental relations, *Adoption of practices, Regions, Urban hydrology, Water utilization, Legal aspects, Regulation, Legislation, Control, Water law, Water zoning, Project planning, Land use, Non-structural alternatives.
Identifiers: Shorelands.

County floodplain zoning ordinances may be adopted under the authority of Wisconsin statute 59.971. Such ordinances will not require the approval of town boards in order to become effective within the unincorporated areas of a county. The legislature has evinced an intent that counties act quickly to adopt zoning ordinances to protect their shorelands and floodplains, without the inherent delay and incompleteness that results by requiring town board approval. Thus county floodplain zoning ordinances adopted by the Department of Natural Resources pursuant to section 87.30 do not need approval of town boards in order to become effective within all unincorporated county areas. (Reinders-Florida)
W76-10781

WATER POLLUTION--CIVIL REMEDIES.
1973 Op Atty Gen Wisconsin 101-7. 7 p.

Descriptors: *Wisconsin, *Legal aspects, *Nuisance(Water law), *Penalties(Legal), *Riparian rights, Water pollution, Property values, Evaluation, Water quality, Lakes, Riparian land, Water law, Public health, Equity, Judicial decisions, Public rights, Riparian waters.
Identifiers: Citizen suits, Injunctive relief, *Water rights(Non-riparians), Nuisance(Legal aspects), Standing(Legal).

Polluters can be forced to pay damages for pollution of a Wisconsin lake to a person owning or having some lesser interest in land on or near the affected body of water; however, the damage suffered by such person must be different in type and degree from that suffered by the public in general. It is doubtful that a member of the public not in the above category could recover damages. Damages can be recovered for reduced property values, increased health hazards, reduced water quality and generally impaired use of lakes, although the recovery most likely will be in the name of reduced property values. The Wisconsin Supreme Court has repeatedly couched the riparian owner's cause of action not in terms of a riparian right per se, but in terms of a nuisance action in which the riparian has a particular interest. The nuisance alleged can be either public or private; both are viable causes of action so long as the injury to the plaintiff is particular to him. (Reinders-Florida)
W76-10782

NATURAL RESOURCES, DEPT OF; NUISANCES: WATER.
1974 Op Att'y Gen Wisconsin 260-67. 8 p.

Descriptors: *Wisconsin, *Cities, *Chemcontrol, *Jurisdiction, Governmental interrelations, Nuisance(Water law), Political aspects, Permits, Local governments, Regulation, Administration, Water law, Legal aspects, Riparian rights, Reasonable use, Legislation, Water quality, Water pollution sources, Municipal water.
Identifiers: Administrative regulations, Licenses, Nuisance(Legal aspects), Standing(Legal).

The Wisconsin Department of Natural Resources (DNR) has the authority to grant a permit to chemically control aquatic nuisances not withstanding a municipal policy contrary to such treatment. Municipalities have no jurisdictional authority to prevent the issuance of permits to riparian owners for chemical treatment of adjacent waters. Thus, the City of Madison could not prevent a riparian owner outside the city limits, acting under DNR supervision, from treating his shoreline with weed-killing chemicals. Applications for permits to chemically treat aquatic nuisances may, however, be denied even though statutory and regulatory requirements have been met if such chemical treatment would be counterproductive in achieving the goals set out in section 144.025(1) of the Wisconsin Statutes. The decision to grant or deny permits is subject to judicial review. (Reinders-Florida)
W76-10783

DRAINAGE DISTRICTS.
1974 Op Att'y Gen Wisconsin 355-61. 7 p.

Descriptors: *Administrative agencies, *Wisconsin, *Governmental interrelations, Drainage programs, Institutions, Water districts, Dams, Navigable waters, Soil conservation, Erosion control, Regulation, Administration, Water law, Water control, Nonstructural alternatives, Legal aspects, Political aspects, Local governments.
Identifiers: Dam effects.

In answer to questions regarding drainage districts in Wisconsin, the State Attorney General has stated that the powers of the drainage district board are not superseded by the shoreline zoning board or the Department of Natural Resources. However, drainage ditches which are navigable do come under the jurisdiction of the Department of Natural Resouces, except for those navigable waters which are involved in certain specified agricultural uses of land. Although soil conservation districts and drainage districts are created for a different purpose, some activities of both accomplish similar ends. For this reason, each district retains control over those activities which it undertakes for the purposes for which it was created. Even so, the Department of Natural Resources determines dam regulations for dams on drainage ditches, regardless of the purpose of the dam. In support of these conclusions, the Attorney General cites various sections of the Wisconsin Statutes. (Reinders-Florida)
W76-10784

NAVIGABLE WATERS: RIPARIAN RIGHTS.
1974 Op Att'y Gen Wisconsin 445-52. 8 p.

Descriptors: *Wisconsin, *Navigable waters, *Riparian rights, *Bulkhead line, *Dredging, High water mark, Legal aspects, Water law, Water rights, Riparian waters, Sediment control, Municipal water, Legislation, Ownership of beds, Engineering structures, Bulkheads, Walls, Permits.
Identifiers: Administrative regulations, Certification, Licenses, Fill permits, Navigation obstructions.

Where a bulkhead line has been established a riparian owner must nonetheless obtain a permit or contract prior to removing material from the bed of navigable water landward of the bulkhead line within the original ordinary high water mark. Where a bulkhead line has been established, a riparian owner may place a layer of sand or similar material landward of the bulkhead line without obraining an additional permit. Furthermore, the original ordinary high water mark will then be considered the ordinary high water mark. Particular fact circumstances may dictate, however, that the bulkhead line or the edge of the filled area should be considered the ordinary high water mark. Where a township located on Green Bay wishes to remkoe organic sediment and aquatic vegetation from the shoreline, it would be more appropriate for the town to apply for a zone of removal, than to apply for bulkhead line. (Reinders-Florida)
W76-10785

NATURAL RESOURCES, DEPT OF; NAVIGABLE WATERS.
1974 Op Att'y Gen Wisconsin 493-500. 8 p.

Descriptors: *Wisconsin, *State jurisdiction, *Navigable waters, *Artificial watercourses, *Drainage districts, Non-navigable waters, Natural streams, Governments, Legislation, Planning, Management, Water management, Dredging, Permits, Water quality control, Administration, Bodies of water, Rivers, Streams, Ownership of beds, Water policy.
Identifiers: Licenses, Public trust doctrine Navigability tests, Administrative regulations.

The policy of the Wisconsin legislature concerning the state's waters is to promote a comprehensive program under a single state agency for the quality management and protection of all state waters, ground and surface, public and private. This responsibility extends to regulation of lands adjacent to navigable waters. Consequently, if a navigable ditch was originally a navigable stream, the state has jurisdiction since it holds the beds of navigable waters in trust for all the people. If a navigable ditch was originally nonnavigable or had no previous stream history, then the Department of Natural Resources' jurisdiction depends on the facts of each situation. Whether navigable artificial drainage ditches need be connected to navigable waters for the Department to have jurisdiction also depends upon the facts of each case. The statutory provisions apply to nonnavigable artificial waterways insofar as is necessary to protect navigable waters and owners of flooded lands. To insure compliance with state laws, a permit is necessary for the removal of material from navigable natural or artificial bodies of water. A distinction need not be made between drainage ditches located in active versus inactive drainage districts. (Reinders-Florida)
W76-10786

NAVIGABLE WATERS: RIPARIAN RIGHTS.
1974 Op Att'y Gen Wisconsin 601-05. 5 p.

Descriptors: *Wisconsin, *Navigable rivers, *Riparian rights, *Public rights, *Boating regulations, Water policy, Boating, Public access, Anchors, Regulation, Water law, Trespass, Permits, Recreation, Water Allocation(Policy), Streams, Public benefits, Legal aspects, Rivers, River beds, Streambeds, Reasonable use, Water policy.
Identifiers: *Water rights(Non-riparians), Standing(Legal), Public trust doctrine, Navigational servitude, Navigation obstructions.

Public rights in navigable streams permit reasonable use of the bottom for purposes of anchoring various types of watercraft while and only so long as a public right is being enjoyer. Anchored watercraft may not be left unattended except by a riparian owner. A riparian owner on a navigable stream normally holds title to the bed of the stream to its thread. However, that title is qualified by the rights of the public resulting from the state's governmental trust in navigable waters. The legislature has authorized limited encroachments upon the beds of such waters where the public interest will be served. Watercraft may be used on rivers of the state for floating, fishing, swimming or any of the recognized incidents of navigation without charge or fee by any landowner or municipality. Public rights do not extend to the use of privately owned uplands, or trees thereon, where such use requires entry upon these lands. Riparian owners may tie up their boats when not in use to their own docks, piers or buoys provided they do not unreasonably conflict with public use of the stream. (Reinders-Florida)
W76-10787

NORTH DAKOTA WATER QUALITY STANDARDS FOR THE SURFACE WATERS OF NORTH DAKOTA.
1972-1974 Op Att'y Gen North Dakota 253. 1 p.

Descriptors: *North Dakota, *State jurisdiction, *Water quality standards, Surface waters, *Interstate rives, Legislation, Regulation, Water pollution, Water quality control, Planning, Quality control, Water pollution control, Discharge, Water policy, Standards, Legal aspects, Political aspects, State governments.
Identifiers: Administrative regulations.

Chapter 61-28 of the North Dakota Century Code, as amended, and the North Dakota Water Quality Standards For Surface Waters of North Dakota present the rules and regulations of the North Dakota Water Pollution Control Board. Together they establish water quality standards which are enforceable for the waters into which the various projects of the state discharge. For purposes of the above, 'waters' means both interstate and intrastate waters. (Reinders-Florida)
W76-10788

SOVEREIGNTY OF STATE.
Alas Stat Ann secs 44.03.010 thru 44.03.040 (1967).

Descriptors: *Alaska, *Legislation, Jurisdiction, Boundaries(Property), *Ownership of beds, State jurisdiction, Governments, Legal aspects, State governments, Water rights, Political aspects, International law, Beds.

This chapter of the Alaska Statutes concerns the jurisdiction of the state in offshore waters and lands, and the ownership of waters and submerged lands. Jurisdiction over waters offshore from the coast extends to the outermost limits of the marginal sea as defined or recognized by the United States or by international treaty; to the high seas to the extent jurisdiction is claimed by the United States or recognized by international law; and over submerged lands. The ownership of the above waters and submerged lands is in the state unless ownership is otherwise vested by a valid and effective instrument of conveyance or by operation of law. This chapter does not limit or restrict state jurisdiction over citizens or residents, or state jurisdiction over other waters or lands inside or forming part of the boundaries of the state, nor does it alter the jurisdiction of an area to which jurisdiction extends under another provision or rule of law. (Hadoulias-Florida)
W76-10789

VILLAGE SAFE WATER ACT.
Alas Stat Ann secs 46.07.010 thru 46.07.080 (1962).

Descriptors: *Potable water, *Alaska, *Public health, *Sewage treatment, *Water purification, Water treatment, Domestic wastes, Water pollution sources, Structures, Facilities, Laundering, Social aspects, Cities, Safety, Water quality, State governments, Legislation, Administrative agencies.

The commissioner of health and social services shall develop a program providing for the installation of at least one safe water and hygenic sewage disposal facility in each village of the state. The facility shall include a source of clean water, a means of sewage disposal, shower bath facilities and facilities for washing clothes. If feasible, the building shall also contain quarters for a community health service office. The village governing body will have responsibility for maintenance and operation of the facility. An educational and informational program will be conducted in connection with the facility to explain the health advantages of using the facility to the local residents. (Capehart-Florida)
W76-10790

WATER MANAGEMENT DISTRICTS--WATER RESOURCES--AUTHORITY TO CONSIDER AND PROTECT AGAINST DEGRADATION OF WATER QUALITY THROUGH PERMITTING PROCESSES.
Op Att'y Gen. Fla. 075-16 (1975). 4 p.

Descriptors: *Florida, *Water districts, *Water pollution control, *Permits, Flood control, Water quality, Public health, Planning, Pollution abatement, Legislation, State governments, Water resources development, Water management(Applied), Control, Water control, Water policy, Water law, Regulation.
Identifiers: Certification, Administrative regulations, Water rights(Non-riparians), Dam effects, *Hazardous substances.

The Attorney General of Florida has stated his opinion that: Pursuant to Chapter 373, Florida Statutes, the Central and Southern Florida Flood Control District has general authority to protect through permitting procedures the 'water resources' within its jurisdiction. However, since the primary authority for the control of water pollution rests with the Florida Department of Pollution Control, the best way for the District to carry out its duties would be to require water quality permits or certifications from the Department of Pollution Control prior to considering any permit application under Chapter 373, or alternatively, to enter into an agreement with, or be appointed as agent of, the Florida Department of Pollution Control to carry out water quality permitting pursuant to the provisions of Chapter 403 and the rules and regulations of the Florida Department of Pollution Control. All actions of the District should comply with the Florida Water Plan. (Reinders-Florida)
W76-10791

LEGAL INTERPRETATION OF TERM 'WETLANDS'.
1973 Fla. Att'y Gen. Ann. Rep. 198-99. 2 p.

Descriptors: *Florida, *Wetlands, *Vegetation, Legislation, Water law, Regulation, Legal aspects, Geographical regions, Management, Preservation, Hydrobiology, Plant physiology, Tidal waters, Tidal marshes, Coastal marshes, High water mark, Low water mark.
Identifiers: *Coastal waters, *Coastal zone management, *Definitions(Legal).

The Assistant Attorney General of Florida has responded to a legislative request made in 1973 for a statutory definition of the term 'wetlands'. He stated that he knew of no precise legal meaning or court construction of the term when used without further clarification or definition. The term 'wetlands', in and of itself, has no precise legal interpretation, but legislatures have utilized the term in laws dealing with coastal zones by adding a statutory definition pegged to biological, physiographic, or tidal data or a combination thereof. Moreover, in many cases coastal wetlands are identified and defined separately from interior wetlands. Marine biologists have advised that linking the definition of wetlands with specific types of naturally occurring grasses or other flora can be very precise if the correct types of vegetation are listed. This appears to be the most legally precise method. An example of such a definition appears in the 1973 draft of the proposed Florida Inland and Coastal Wetlands Management and Protection Act. (Reinders-Florida)
W76-10792

VARIANCES AND TEMPORARY PERMITS FOR OPERATION OF NON-CONFORMING SEWAGE DISPOSAL FACILITIES.
1972 Florida Attorney General Annual Report 700-02. 3 p.

Descriptors: *Florida, *Sewage treatment, *Permits, *Sewage treatment, Municipal wastes, Organic wastes, Sanitary engineering, Waste disposal, Waste water disposal, Treatment, Legislation, Water pollution sources, Environmental sanitation, Water pollution, Public health, Water law, Legal aspects.
Identifiers: Administrative regulations, Variances, Temporary permits.

The Florida Department of Pollution Control is authorized to grant variances or temporary operating permits for sanitary sewage disposal facilities which have not met secondary treatment requirements by January 1, 1973, as provided in Section 403.086(2) of the Florida Statues. Furthermore, Section 403.201(1), F.S., provides that the Department of Pollution Control in its discretion may grant variances from the provisions or the rules and regulations adopted pursuant to Chapter 403. Such variances may be granted for any one of

three reasons listed in the statute. Section 403.088(4), after detailing the procedural steps in applying for a permit, requires the department to either issue or deny a temporary operating permit, but only so long as it affirmatively finds that one or more of seven listed factors exist. The department can exercise tight control over sewage treatment facilities by including in the temporary operating permits requirements and restrictions which it deems necessary and desirable to protect the quality of the receiving waters and promote the public interest. (Reinders-Florida)
W76-10793

BEACH AND SHORE RESTORATION; AUTHORITY OF STATE OVER FEDERAL AND LOCAL BEACH RESTORATION PROJECTS.
Op Att'y Gen Fla 074-118 (1974). 4 p.

Descriptors: *Florida, *Submerged Lands Act, *Federal-state water rights conflicts, *Beaches, *Governmental interrelations, Local governments, State governments, Institutional constraints, Shores, Governments, Water law, Regulation, Political aspects, Reservation doctrine, Federal government, Water rights, Legal aspects, Federal jurisdiction, State jurisdiction.
Identifiers: Coastal waters, Coastal zone management, Licenses, Sovereign immunity, Water rights(Non-riparians).

The Attorney General of Florida,has stated that: the State of Florida, through the Board of Trustees of the Internal Improvement Trust Fund and the Department of Natural Resources, has regulatory control over beach restoration projects whether carried out by the United States Army Corps of Engineers or by local governments. The State is the owner of all lands under tidal waters seaward of the mean high water line not otherwise alienated, as specifically recognized by the Submerged Lands Act of 1953. Ownership and control are in the state, subject to the paramount right of Congress to regulate for navigational purposes. Alteration or construction in these waters is controlled concurrently and requires the joint assent of the federal and state governments. Before a city or local governmental body can institute a beach renourishment project the Trustees must approve the project, and the Department of Natural Resources must exercise its permitting or setback line authority. The federal government is authorized only to assist in such projects. Furthermore, since a beach renourishment project would alter state property rights by moving the mean high water line, state concurrence is necessary before the Corps of Engineers can engage in such a project. (Reinders-Florida)
W76-10794

SARGENT LAKE ASS'N. V DANE (RIGHTS OF PROPERTY OWNERS ASSOCIATION IN A DAM, BEACH, AND SHOREFRONT AREA).
351 A2d 54-57 (NH 1976). 4 p.

Descriptors: *Beaches, *New Hampshire, *Dams, *Repairing, *Land tenure, Real property, Legal aspects, Judicial decisions, Water courses(Legal aspects), Public access, Shores, Structures, Water control, Recreation, Recreation facilities, Access routes, Land use, Natural resources, Lakes, Social aspects, Fringe benefits, Damages.

Plaintiff property owner's association sought to compel defendant successors in interest to the original developers to convey to the association all rights to a dam, a beach lot and certain lake property. The plaintiff further sought to compel the defendants to pay the cost of repairs to the dam. When the defendants acquired title to the remaining undeveloped land in the development, their deed required them to convey the dam to a property owner's association 'if and when formed'. The plaintiff contended that the defendants had a duty to maintain the dam prior to such conveyance and that the defendants were bound by an oral agreement made by the defendants' agent to convey the beach lots in question. The trial court held that the language of the deed did not require conveyance of the beach lots. Since the agent's oral agreement was in conflict with the deed, the plaintiff acquired no right to the beach lots. On this point the Supreme Court of New Hampshire affirmed. The trial court had also found, however, that the defendants were under no duty to maintain the dam. The Supreme Court reversed on this point, holding the defendants liable for maintenance for the period after formation of plaintiff association until conveyance of the dam. (Capehart-Florida)
W76-10795

COASTAL INDUSTRIAL WATER AUTHORITY V. YORK (NO CHANGE TO TITLE TO LAND BY AVULSION EVEN THROUGH AVULSION ARTIFICIALLY CAUSED).
532 SW2d 949-54 (Tex. 1976). 6 p.

Descriptors: *Texas, *Avulsion, *Boundary disputes, *Navigable rivers, Ownership of beds, Riparian rights, Boundaries(Property), Legal aspects, Eminent domain, Land subsidence, Surface-groundwater relationships, Beds under water, Regulation, Judicial decisions, Groundwater.
Identifiers: Presumptions(Legal).

In an action related to condemnation proceedings plaintiff riparian landowners sought a declaratory judgement to determine ownership of submergd property. Submersion had resulted from subsidence over a nine year period due to municipal and industrial removal of underground water. The trial court upheld the plaintiffs' ownership claims. The Texas Supreme Court affirmed, finding that the property in question had not been displaced but was covered by shallow water only. No erosion had occurred. Therefore, so long as the general public or public body had not used the area for navigation, no conflict between public and private rights existed. Addressing the title issue, the court held that submersion does not necessarily destroy title in the owner. Riparian or littoral landowners may lose or acquire title as a result of erosion or accretion but generally not through avulsion. The court then went on to hold that the riparian owners were entitled to compensation for their land which had become submerged by defendant's ship channel prior to the time that condemnation was sought. (Comer-Florida)
W76-10796

HYRUP V KLEPPE (RIGHT-OF-WAY FOR PIPELINE TO TAP WATER FROM SPRING ON PUBLIC LAND).
406 F Supp 214-17 (D Colo. 1976). 4 p.

Descriptors: *Colorado, *Right-of-way, *Appropriation, *Pipelines, *Springs, Streams, Permits, Legislation, Penalties(Legal), Land tenure, Administrative decisions, Administrative agencies, Judicial decisions, Groundwater.

Plaintiff landowner filed an application with the Department of the Interior seeking authorization to appropriate water from a nearby state owned spring. The plaintiff also filed an application with the Bureau of Land Management for a right-of-way across public land so that a pipeline could be installed to convey the appropriated spring water. The Bureau rejected the right-of-way application, however, finding that the spring waters had been reserved for the United States by executive order and was not subject to appropriation. After the Bureau's decision was affirmed by the Board of Appeals, the plaintiff appealed, contending that the spring was a tributary to a flowing stream and thus not subject to the executive order. The defendant alleged that plaintiff's application should have been rejected under any circumstnce since the application was made under the wring statute. The court found for the plaintiff, holding that the spring was a tributary to a flowing stream and that the plaintiff had applied under the proper statute. The court then remanded the case for further consideration, finding that the Bureau's discretionary authority made it inappropriate for the court to grant plaintiff's requested relief. (Hoffman-Florida)
W76-10797

ADAMS V MONTANA POWER CO. (DEFINITION OF NAVIGABLE WATERS FOR ADMIRALTY JURISDICTION).
528 F2d 437-41 (9th Cir 1975). 5 p.

Descriptors: *Drowning, *Judicial decisions, *Navigable waters, *Federal jurisdiction, *Navigation, Accidents, Legal aspects, Penalties(Legal), Dams, Boating, State jurisdiction, Discharge(Water), Ships.
Identifiers: Admiralty, Maritime vessels.

Plaintiff administratrix brought this action against defendant power company for the death of decedent who drowned after his boat was capsized as a result of a discharge from defendant's dam. The major issue was whether such a tort claim could properly be based on admiralty jurisdiction when the body of water was no longer open to commercial navigation. After the trial court dismissed the suit for lack of jurisdiction, the plaintiff appealed, contending that federal admiralty jurisdiction did attach since the body of water was a navigable waterway for purposes of the commerce clause. Although agreeing with this contention, the Ninth Circuit found that the tort had no significant relationship to traditional maritime activity. The court noted that the grant of admiralty jurisdiction was for the protection of the maritime shipping industry through the development of a uniform federal law. Since this grant of jurisdiction is an exception to the usual principle of allowing a state to apply its own law in regulating conduct within its borders, the court found that it should not be unduly extended. Thus, the decision was affirmed since no connection between the injury and commercial maritime activity had been alleged. (Hoffman-Florida)
W76-10798

EI DU PONT DE NEMOURS AND COMPANY V TRAIN (FEDERAL WATER POLLUTION PREVENTION AND CONTROL ACT QUALITY STANDARDS OF WATER AND EFFLUENT DISCHARGED INTO THAT WATER).
528 F2d 1136-42 (4th Cir 1975). 7 p.

Descriptors: *Federal Water Pollution Control Act, *Water quality control, *Effluents, *Water quality standards, *Jurisdiction, Pollution, Water pollution sources, Regulation, Waste treatment, Inorganic compounds, Legislation, Legal review, Judicial decisions.

Plaintiff chemical manufacturers sought review of regulations promulgated under the Federal Water Pollution Control Act which established effluent limitations for inorganic chemicals. After the district court dismissed the suit for lack of subject matter jurisdiction, the plaintiffs appealed. The sole question was whether the district court had jurisdiction to review the effluent limitation regulations. The Administrator of the Environmental Protection Agency contended that the regulations were issued pursuant to section 301 of the Act and thus, under section 509, were reviewable only by the court of appeals. The plaintiffs, however, contended that section 301 merely sets forth the Act's statutory objectives, and that the actual authority to implement the Act is granted by section 304. Consequently, since the review procedure set forth in section 509 does not pertain to section 304, the plaintiffs contended that the district court could properly assert jurisdiction. The Fourth Circuit rejected plaintiffs' contention, however, finding that section 509 refers to the review of the Administrator's actions taken pursuant to section 301 or section 306. Since section 306 pertains to new

sources of pollutants, while section 301 is concerned with existing sources, the court held that plaintiffs' interpretation would result in the jurisdictional question being decided by whether a new or existing source of pollutant was involved. Since such a dichotomy would have no rational basis, the court found that the district court lacked subject matter jurisdiction. (Hoffman-Florida)
W76-10799

PEOPLE EX REL YOUNGER V SUPERIOR COURT (DAMAGE ASSESSMENT TO PUBLIC ENTITY CONSTITUTIONAL BECAUSE NOT PUNITIVE).
544 P2d 1322-31 (Cal 1976). 10 p.

Descriptors: *Oil spills, *California, *Penalties(Legal), *Compensation, *Third party effects, Water quality control, Governments, Oil wastes, Oil pollution, Negligence, Legal aspects, Storage tanks.
Identifiers: Vandalism.

Due to vandalism by unknown persons, oil was discharged into state waters from private storage tanks located on the property of defendant Board of Port Commissioners. After the Regional Water Quality Board found that the Commission had failed to provide adequate security around the property, the Attorney General brought an action to impose civil penalties on both the owner of the oil and the Commission. The trial court dismissed the complaint against the Commission, however, finding that a governmental entity is immune from a punitive penalty. As to the oil owners, the court issued an order declaring that liability would arise only upon a showing of negligence. Following these orders, the plaintiff appealed to the California Supreme Court. That court found that the statutory civil penalties were not solely punitive, but were also compensatory since they provided funds to help clean-up the oil wastes. After finding that the complaint against the Board should not have been dismissed, the court reversed the negligence order, construing the statute as imposing absolute liability for oil discharge. (Hoffman-Florida)
W76-10800

SAN FRANCISCO CIVIL SERVICE ASS'N, LOCAL 400 V STATE EX REL REGIONAL WATER QUALITY CONTROL BOARD (DAMAGES ASSESSMENT FOR POLLUTANTS TO PUBLIC ENTITY CONSTITUTIONAL).
544 P2d 1331-35 (Cal. 1976). 5 p.

Descriptors: *California, *Sewage disposal, *Water pollution, *Penalties(Legal), *Municipal wastes, Waste disposal, Judicial decisions, Governments, Pollution abatement, Water pollution effects, Compensation, Constitutional law, Public rights, Public utilities.
Identifiers: Punitive damages, Governmental immunity.

The City of San Francisco was to be assessed civil penalties for the dumping of raw sewage into state waters in violation of a state statute. The city subsequently brought this action seeking a writ of mandate that the penalties to be assessed were of a punitive nature and thus could not be assessed against the city. The city relied on section 18 of the Government Code which states that public entities are immune from liability for punitive damages. After the trial court denied the writ, the decision was appealed. The Supreme Court of California affirmed, finding that the civil penalties imposed, while punitive in nature, were aimed at compensating the people of the state for the unquantifiable harm caused by the unauthorized dumping of raw sewage. Consequently, the city was not entitled to a writ of mandate. (Hoffman-Florida)
W76-10801

BUSHY AND VANGUARD V, LTD V SEVEN LAKES RESERVOIR CO. (SEEPAGE AND PERCOLATION FROM SUBSURFACE DESTROYING ADVERSE POSSESSOR'S CLAIMS).
545 P2d 158-162 (Colo. Ct. App. 1976). 5 p.

Descriptors: *Colorado, *Adverse possession, *Reservoirs, *Water storage, *Basins, Subsurface waters, Land tenure, Judicial decisions, Surfaces, Farms, Legal aspects, Real property, Boundary disputes, Percolation.
Identifiers: Surface estate, Subsurface estate.

Plaintiff landowners brought this action to quiet title to land bordering two reservoirs owned by defendant corporation. While the defendats held a deed to the disputed area, the plaintiffs had fenced and used the area for farmland for eighteen years and were claiming title by adverse possession. The defendant, however, contended that the plaintiffs' use of the land was merely permissive and that the corporation's employees oftern crossed the fence to spray weeds and remove trash. The defendant also noted that it used the subsurface of the disputed area for underground storage of water; consequently, the plaintiffs had failed to show the adverse possession necessary. The Colorado Court of Appeals disagreed, holding that the surface estate can be severed from the subsurface estate for purposes of adverse possession. In this case, the court found that the actions of defendant's employees in spraying weeds and removing trash were not sufficient to prevent the adverse claimant from obtaining title. Nevertheless, the defendants use of the subsurface as a storage basin was sufficient to prevent the establishment of plantiffs' adverse claim to the subsurface area. (Hoffman-Florida)
W76-10802

PROVO CITY V LAMBERT (MODIFICATION OF CITY'S APPROPRIATION CERTIFICATE).
545 P2d 185-187 (Utah 1976). 3 p.

Descriptors: *Water permits, *Utah, *Water allocation(Policy), *Appropriation, *Water supply, Water contracts, Water demand, Water law, Water resources, Water requirements, Water rights, Water users, Administrative decisions, Municipal water.

Plaintiff city brought an action seeking to modify a certificate of water appropriation issued by defendant state engineer in 1949. The certificate, which limited the amount of water the city could obtain, had recently been enforced by the state engineer. During the twenty years prior to this enforcement the city had received more water than the amount specified by the certificate. Consequently, the city contended that the state engineer was estopped from enforcing the certificate's water limitations. The city also contended that the certificate's limitation was based upon mutual mistake at the time of issue. The defendant contended, however, that the certificate was valid when issued and that the city could not attempt to modify it since the time for appeal had long since passed. The defendant also contended that the excessive water supply made available to the city did not constitute a waiver of the provisions of the certificate. After the trial court had refused to grant defendant's motion to dismiss the complaint, the defendant appealed. The Supreme Court of Utah reversed, holding that the city was estopped from attempting to modify the certificate since the authorized time for appeal had long since expired. (Hoffman-Florida)
W76-10803

PHILLIPS RANCH, INC. V BANTA (RIGHTS IN WATER ADJACENT TO PLAINTIFF'S PROPERTY DOESN'T GIVE DEFENDANT EASEMENT TO CARRY WATER OVER PLAINTIFF'S PROPERTY).
543 P2d 1035-41 (Ore. 1975). 7 p, 1 map.

Descriptors: *Oregon, *Obstruction of flow, *Negligence, *Overflow, *Adjacent landowners, Judicial decisions, Topsoil, Penalties(Legal), Legal aspects, Rivers, River flow.
Identifiers: Nuisance.

Plaintiff property owner brought this action for injunctive relief and damages against defendant adjacent land owner. The plaintiff alledged that the defendant's actions in placing obstructions in a river running through both of their properties constituted a nuisance. The plaintiff also alleged that he incurred serious financial injury when his topsoil was washed away by an overflow caused by the obstructions. After the trial court awarded damages and denied injunctive relief, the defendant appealed, contending that the trial court's refusal to grant the injunction indicated that the court premised liability on a negligence theory, and not on the existence of a nuisance. Consequently, the defendant contended that it was entitled to a new trial since a finding based on negligence would involve issues of reasonable care and comparative negligence not addressed at the trial court. The Supreme Court of Oregon rejected these contentions, however, noting that the defendant's basic assumption that a nuisance is a continuing condition was not well founded. Because the defendant had subsequently removed the obstructions, the Supreme Court found that the trial court was correct in denying injunctive relief. The Court also affirmed the award of damages, finding that there was ample evidence to support the award. (Hoffman-Florida)
W76-10804

TEXT AND COMMENTARY FOR WEATHER MODIFICATION CONTROL LAW,
Arizona Univ., Tucson. Coll. of Law.
For primary bibliographic entry see Field 3B.
W76-10809

AN INVESTIGATION OF EFFLUENT CONTROL STANDARDS AND PRACTICES (ATOMIC ENERGY PRODUCTION),
Douglas United Nuclear, Inc., Richland, Washington.
For primary bibliographic entry see Field 5G.
W76-10828

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS: FEEDLOT POINT SOURCE CATEGORY,
Environmental Protection Agency, Office of Air and Water Programs. Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10829

THE LEGAL REQUIREMENT FOR THE ASSESSMENT OF INADVERTENT WEATHER MODIFICATION - AN ENGINEERING VIEWPOINT,
Dames and Moore, Atlanta, Ga.
For primary bibliographic entry see Field 3B.
W76-10912

PROSPECT FOR SEA-BED RESOURCES IN A RECESSION,
U. Wassermann.
Journal of World Trade Law, Vol. 9, No. 6, p. 711-713, 1975. 3 ref.

Descriptors: *Oceans, *Mining, *Economic impact, *Market value, Export, Equitable apportionment, Manganese, Nickel, Copper, Cobalt, Molybdenum, Metals, Income distribution, Law of the Sea, Compensation.
Identifiers: *World markets, *Recession, Developing countries, Sea bed mining.

The UNCTAD Secretariat is studying sea-bed mineral resources. Those most likely to be com-

mercially exploitable soon are manganese nodules containing nickel, copper, cobalt, and manganese plus traces of metals such as molybdenum. A North Pacific area has large quantities of these nodules which are collecting faster than the component metals are being consumed. National and international groups have explored the area and are evaluating it as a potential mining site. Distribution of economic benefits would be uneven if guided by present commercial criteria. Production costs might be lower and adversely affect land-based operations, especially in developing countries. Large-scale capital investments used in exploration and mining of these sea-bed resources would reduce investments in developing countries and lower their export earnings. A compensatory or preventive approach appears to be the solution, but income of a proposed sea-bed authority would be inadequate to provide compensating funds to developing countries for losses. These proposals assume that developing countries not producing these resources want to keep prices high. Resistance of consumers in developing countries to high prices, especially during a recession, is probably underestimated. The effects of the current recession on the consumption of these metals and on world prices has not been considered. (Buchanan-Davidson--Wisconsin)
W76-10979

PROBLEMS OF PUBLIC WORKS PROJECTS IN THE PRESENT ECONOMIC CLIMATE,
San Bernardino Valley Municipal Water District, Calif.
For primary bibliographic entry see Field 6C.
W76-10980

COMPREHENSIVE WATER SUPPLY STUDY FOR NEW YORK STATE,
New York State Dept. of Health, Albany. Bureau of Public Water Supply.
For primary bibliographic entry see Field 6B.
W76-10982

'WARE THE WADDEN SEA,
Foundation for Applied Ecology, Edam (Netherlands).
For primary bibliographic entry see Field 6G.
W76-10985

OUTER CONTINENTAL SHELF RESOURCE DEVELOPMENT SAFETY: A REVIEW OF TECHNOLOGY AND REGULATION FOR THE SYSTEMATIC MINIMIZATION OF ENVIRONMENTAL INTRUSION FROM PETROLEUM PRODUCTS.
Assembly of Engineering Marine Board, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11001

ANIMAL WASTE MANAGEMENT--COMMENTS ON THE NATIONAL SITUATION,
Agricultural Research Service, Peoria, Ill. Agricultural and Natural Resources Div.
For primary bibliographic entry see Field 5D.
W76-11033

LEGAL ASPECTS OF LIVESTOCK PRODUCTION AND WASTE MANAGEMENT,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11044

EPA'S ROLE IN THE ANIMAL WASTE PROBLEM: PANEL DISCUSSION,
Agricultural Stabilization and Conservation Service, Des Moines, Iowa.
For primary bibliographic entry see Field 5G.
W76-11045

SOIL CONSERVATION SERVICE PROGRAM IN ANIMAL WASTE MANAGEMENT,
Soil Conservation Service, Des Moines, Iowa.
For primary bibliographic entry see Field 5G.
W76-11046

LEGAL ASPECTS OF ODOR AND DUST FROM FEEDLOTS,
Texas Agricultural Extension Service, College Station.
For primary bibliographic entry see Field 5G.
W76-11054

A SUMMARY OF STATE REGULATIONS PERTAINING TO ANIMAL WASTE MANAGEMENT IN THE NORTH CENTRAL REGION OF THE UNITED STATES,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-11060

SAFE DRINKING WATER ACT - IMPLICATIONS FOR GROUND WATER QUALITY PROTECTION,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5F.
W76-11064

SHARING THE OFFSHORE OIL BONANZA.
For primary bibliographic entry see Field 6C.
W76-11088

A PUBLIC AUTHORITY TO MANAGE THE ATLANTIC OUTER CONTINENTAL SHELF,
Delaware Univ., Newark. Coll. of Marine Studies.
W. S. Gaither.
Coastal Zone Management Journal, Vol 2, No 1, p 59-64, 1975. 5 ref.

Descriptors: *Continental Shelf, Resources development, *Management, Water resources, Economics, Conservation, *Environmental effects, Commerce, Export, Import, Law of the Sea, Northeast U.S., Southeast U.S., Atlantic Ocean.
Identifiers: *Outer Continental Shelf, 200 mile limit.

The United States is increasingly in need of the Atlantic Continental Shelf for a variety of uses including the recovery of nonliving and living resources. It is proposed that an Atlantic Outer Continental Shelf Authority be established to insure the efficient and economical conservation and development of the Atlantic Outer Continental Shelf. The Authority must consider the special interests of the United States, the bordering states, other nations, and other individuals and organizations who wish to use the Continental Shelf or its resources. Other major issues the Authority must face include finances, maritime commerce, import and export of resources, and marine conservation. (Sinha-OEIS)
W76-11097

6F. Nonstructural Alternatives

DIRECTORY OF DISASTER-RELATED TECHNOLOGY,
Federal Disaster Assistance Administration, Washington, D. C.
For primary bibliographic entry see Field 10C.
W76-10502

INTERBOARD PLAN FOR THE GREATER FINGER LAKES - OSWEGO RIVER BASIN,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 4A.
W76-10506

IDENTIFICATION OF SPECIAL HAZARD AREAS LIST OF COMMUNITIES WITH SPECIAL HAZARD AREAS,
Federal Insurance Administration, Washington, D. C.
F. V. Reilly.
Federal Register, Vol. 40, No. 144, p. 31220-22, July 25, 1975. 2 p, 1 tab.

Descriptors: *Flood plains, *Flood plain zoning, *Flood plain insurance, *Institutional constraints, Law enforcement, Floods, Regulation, Compensation, Protection, Damages, Legal aspects, Insurance, Administration, Legislation, Federal government, United States, Water law.
Identifiers: *Flood Disaster Protection Act, Administrative regulations.

The Flood Disaster Protection Act of 1973 requires communities to purchase flood insurance on or after March 2, 1974 if they are to be eligible to receive any federal funds for acquisition or construction purposes in an identified flood plain area. Effective July 1, 1975 or one year after identification of the community as flood prone, whichever is later, no financial assistance can be provided if the identified community has not entered the program. Therefore, the identification of special hazard areas makes mandatory the purchase of insurance. The community, however, shall be given six months to establish that it is not seriously flood prone or that the alleged flood hazards have been corrected. The regulation amends section 1915.3 of title 24 of the Code of Federal Regulations as authorized by the National Flood Insurance Program. It adds to the list of identified communities having areas of special flood, mudslide, or erosion hazards. (Griffith-Florida)
W76-10773

ZONING--FLOOD CONTROL.
For primary bibliographic entry see Field 6E.
W76-10781

6G. Ecologic Impact Of Water Development

DIRECTORY OF DISASTER-RELATED TECHNOLOGY,
Federal Disaster Assistance Administration, Washington, D. C.
For primary bibliographic entry see Field 10C.
W76-10502

ENVIRONMENTAL INVESTIGATION OF EDEN ISLES,
Burk and Associates, Inc. (New Orleans).
For primary bibliographic entry see Field 5G.
W76-10510

WATER QUALITY ANALYSIS, IOWA-CEDAR RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W76-10576

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, CONNECTICUT RIVER.
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 5G.
W76-10577

WATER QUALITY ANALYSIS, SANTEE RIVER BASIN,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.

W76-10578

WATER QUALITY ANALYSIS, COLUMBIA RIVER.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W76-10579

MARINE TECHNOLOGY SOCIETY EIGHTH ANNUAL CONFERENCE PREPRINTS,
Marine Technology Society, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10600

THE ENVIRONMENTAL IMPACT OF DEEP-SEA MINING,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 5G.
W76-10602

MULTIOBJECTIVE PLANNING AND ENVIRONMENTAL EVALUATION OF WATER RESOURCE SYSTEMS,
State Univ. of New York at Binghamton. Dept. of Geological Sciences; and State Univ. of New York at Binghamton. School of Advanced Technology.
M. Morisawa, and R. Vemuri.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 665, $6.75 in paper copy, $3.00 in microfiche. Completion Report, (1976). 153 p, 72 fig, 12 tab, 19 ref. OWRT C-6065(5208) (1).

Descriptors: Environmental effects, Decision making, Flooding, Runoff, *New York, Planning, Urbanization, Erosion, Sedimentation, Attitudes, Model studies, Optimization, Measurement.
Identifiers: Binghamton(NY), Matrix, Inventory units, Pair-wise preferences, Susquehanna River basin, *Multi-objective planning, *Channelization, Psychophysics.

Urbanization in the binghamton area of the Susquehanna River basin caused increased runoff and flooding. Attempts to 'improve' local tributaries by channelization ignored basic principles of stream equilibrium and were unsuccessful. Adjustment by the streams to man induced environmental changes in the watershed resulted in erosion and sedimentation. Man's impact on rivers can be lessened by actions which are in harmony with fluvial dynamics. Using principles of equilibrium concepts, inventories of watersheds can be made and used in water resources and river planning. An impact matrix based on characteristics and equilibrium of a river can direct the choice of watershed plans. The rows and columns of the impact matrix describe plans and attributes and the entries are the values attained by the attributes in individual plans. Selection of one plan, then, boils down to a multiatribute optimization problem. One of the difficulties in this problem is the task of measurement. Psychophysical measurement techniques are often required as several of the attributes characterizing environmental impact do not lend themselves for measurement. As psychophysics deals with theproblem of subjective discrimination using sensation differences, the above problem was formulated in terms of pair-wise, subjective preference judgments of individual judges as input and an index of quality associated with each plan as output. The resulting problem was solved using a bounded-bariable LP code. This model, which is essentially a paramorphic representation of a single judge's decision making process can be extended to the case of multiple judges.
W76-10610

ASSESSMENT OF POLYVINYL CHLORIDE AS A PACKAGING MATERIAL FOR DISTILLED SPIRITS, (ENIVRONMENTAL IMPACT ASSESSMENT),
Bureau of Alcohol, Tobacco and Firearms, Washington, D. C.
R. C. Bailie, B. T. Riley, and R. Zaltzman.
Available from the National Technical Information Service, Springfield, VA 22161, as EIS-AA-73-0477-F-2., $9.25 in paper copy, $3.00 in microfiche. January 17, 1973. 257 p, 12 fig, 45 tab, 7 append.

Descriptors: *Environmental control, *Environmental effects, *Materials testing, *Research and development(Comprehensive planning), *Waste disposal, Landfills, Municipal wastes, Solid wastes, Economics, Ecology, Analytical techniques, Planning, Technology, Resource development, Administrative agencies.

The study's objective was to provide criteria for the Bureau of Alcohol Tax and Firearms to approve or disapprove the packaging of distilled spirits in glass or polyvinyl chloride (PVC) containers. Environmental evaluations were of foremost concern, yet economic and social factors were assessed. The analysis of container use was primarily confined to an evaluation of impacts upon the environment. The use of PVC's is far superior to glass in its potential for environmental damage. Figures and tables depicted that glass is four (4) times more desirable on a per pound basis. On the other hand only one-eighth as much PVC is needed per package. The greatest environmental impact was energy expended by consumers in obtaining liquor at the retail level. This factor remained the same for either substance. Glass was superior to PvC in its disposal aspects. This, however, represents less than ten percent of the total environmental insult. Likewise, both containers had little impact on solid waste disposal. No reason existed for denying the use of PVC as a packaging material for distilled spirits. Funds derived from taxes on liquor should be channeled into sponsored research to further or subsidize existing recycling programs. (Proctor-Florida)
W76-10722

ENERGY CRISIS, SUPERTANKERS AND ECOLOGY,
For primary bibliographic entry see Field 5G.
W76-10735

ROOKERY BAY: ECOLOGICAL CONSTRAINTS ON COASTAL DEVELOPMENT,
Conservation Foundation, Washington, D. C.
J. Clark.
Florida Environmental and Urban Issues, Vol 11, No 4, p 9-13 (1975). 5 p, 1 photo.

Descriptors: *Florida, *Ecosystems, *Mangrove swamps, *Wetlands, *Estuarine environment, Ecology, Projects, Southeast U. S., Gulf Coastal Plain, Biota, Vegetation establishment, Biological communities, Dominant organisms, Preservation, Protection, Water resources, Water resources development, Scenery, Recreational facilities, Conservation, Land management, Land development, Administration, Planning, Project planning, Population, Human population.
Identifiers: *Rookery Bay(Fla), Collier County(Fla), South Florida.

The Conservation Foundation began a study of Collier County, Florida, in 1967 for purposes of environmental protection and economic welfare. The Rookery Bay area, was chosen for an in-depth study because it represented an ecosystem characteristic of the mangrove-estuarine environment of South Florida. The study suggests that all wetland areas be preserved intact through an integrated program restricting water development by redirecting it to dry-land sites. Purchases of water-area parcels for public recreational and scenic purposes are also suggested. Other recommendations include primary and contingency standards allowing for a variety of environmentally compatible uses of privately owned water areas in a uniform program of water area management. Anticipated objections center around fears that the expected population growth cannot be accomodated if development is limited to dry land areas. However, if the county encourages spot density concentration, this problem can be overcome. (Hadoulias-Florida)
W76-10741

LAWYERS AND ECOMANAGEMENT,
Puerto Rico Univ., Mayaguez. Inst. for Policy Studies and Law.
For primary bibliographic entry see Field 6E.
W76-10753

NEW SOURCE NPDES PERMITS PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS,
Environmental Protection Agency, Washington, D. C.
J. Quarles.
Federal Register, Vol 40, No 197, p 47714-20, October 9, 1975. 7 p, 2 append.

Descriptors: *Permits, *Federal Water Pollution Control Act, *Water pollution sources, *Decision making, *Federal project policy, *Environmental control, Discharge(Water), Management, Project planning, Environment, Pollution control, Environmental effects, Water pollution, Governmental interrelations, Water quality, Pollution abatement, Water law, Water policy, Legislation, Administration, Regulation.
Identifiers: *Licenses, *FWPCA Amendments of 1972, *Environmental impact statement, *National Pollutant Discharge Elimination System, Environmental Protection Agency(EPA), National Environmental Policy Act of 1969, Administrative regulations.

Procedures are established for applying the National Environmental Policy Act of 1969 (NEPA) to the issuance of new source National Pollutant Discharge Elimination System (NPDES) permits as authorized by the Federal Water Pollution Control Act as amended(FWPCA). NEPA requires that all agencies of the Federal Government prepare detailed environmental statements on proposals for legislation and other major actions significantly affecting the quality of the human environment. FWPCA requires that NEPA apply to the issuance of a permit for the discharge of any pollutant by a new source. This regulation shall apply only to the issuance of a new source NPDES permit by the Environmental Protection Agency and not to the issuance of such a permit from any state which has an approved NPDES program. The regulation, when used in conjunction with the National Pollutant Discharge Elimination System will provide the EPA procedures for processing new source NPDES permit applications. (Reinders-Florida)
W76-10757

DEEPWATER PORT SITE EVALUATION,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10766

DEEPWATER PORTS: LICENSING PROCEDURES AND DESIGN CONSTRUCTION, EQUIPMENT AND OPERATIONS,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10767

TEXT AND COMMENTARY FOR WEATHER MODIFICATION CONTROL LAW,
Arizona Univ., Tucson. Coll. of Law.
For primary bibliographic entry see Field 3B.
W76-10809

STUDIES FOR WILDLIFE ON ENERGY AREAS,
Utah State Div. of Wildlife Resources, Salt Lake City.
R. W. Baumann, R. N. Winget, W. H. Behle, W. F. Sigler, and G. W. Workman.
Bureau of Land Management report, Dec. 1975, 276 p.

Descriptors: *Wildlife, *Energy, Wildlife habitats, *Utah, Aquatic invertebrates, *Fish, *Water quality, *Birds, Ecology, Foods, Nesting, Population, Trapping, Tagging, Aquatic habitats, Nongame birds, Distribution, Food chains, Animal populations, Growth rates, Spring waters, Predation.
Identifiers: White River(Utah), Uinta County(Utah), Uinta Basin, Bonanza(Utah), Ouray(Utah), *Oil Shale Area, *Geothermal area, Juab and Millard County, Least Chub, Snake Valley, Tule Valley, Hawks, Raptors, Eagles, Falcons, Owls, Endangered species, Birds of prey.

This is a four part report concerning studies of wildlife on energy areas. Three reports are on the oil shale area of northeastern Utah and are entitled 'Aquatic Macroinvertebrate, Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah', Raptor Study of Utah Oil Shale Area', and 'Nongame Mammal Inventory of the Utah Oil Shale Area'. The fourth is a study of the Least Chub in west central Utah entitled 'Studies on the Least Chub (Iotichthys Phlegethontis - Cope) in Geothermal Activities Area of Snake and Tule Valleys, Utah'. (See W76-10821 thru W76-10824) (BLM)
W76-10820

AQUATIC MACROINVERTEBRATE WATER QUALITY, AND FISH POPULATION CHARACTERIZATION OF THE WHITE RIVER, UINTAH COUNTY, UTAH,
Brigham Young University, Provo, Utah.
R. W. Baumann, and R. N. Winget.
Project conducted for Utah Division of Wildlife Resources, Salt Lake City, Dec. 1975. 55 p, 16 fig, 10 tab, 4 ref. 52500-CT4-450-BLM.

Descriptors: *Invertebrates, *Fish, *Water quality, *Fisheries, *Aquatic invertebrates, Aquatic habitats, *Utah, Fish populations.
Identifiers: *White River(Utah), Uintah County(Utah), Bonanza(Utah), Ouray(Utah), *Oil Shale Area(Utah).

To provide environmental evaluation of proposed oil shale developments along the White River in Uintah County, Utah, macroinvertebrate, fish, and water quality samples were taken. Macroinvertebrate populations are analyzed both qualitatively and quantitatively. A list of fishes collected is given and habitat evaluation summarized. Physical and chemical data collected on August 11 and 12 are provided and analyzed according to water quality requirements. Basic recommendations are given concerning the ecological stability of the White River with reference to possible water uses. (See also W76-10820) (BLM)
W76-10821

RAPTOR STUDY OF UTAH OIL SHALE AREA,
Utah University, Salt Lake City.
W. H. Behle, and M. L. Perry.
Project conducted for; Utah Division of Wildlife Resources, Salt Lake City, 1975. 149p, 26 fig, 6 tab, 19 ref. 52500-CT4-450-BLM.

Descriptors: Birds, *Ecology, Nesting, Population, Animal populations, *Utah, Food chains, Predation.
Identifiers: *Oil shale area(Utah), White River(Utah), Uintah County(Utah), *Raptors, Hawks, Eagles, Falcons, Owls, *Birds of prey.

A study of the raptors in the Utah oil shale area in northeastern Utah was made during the spring and summer of 1974 and 1975. Sixteen kinds of diurnal birds of prey were found. The most common species were, in the order of abundance, (1) the American Kestrel (Sparrow Hawk), (2) Red-tailed Hawk, (3) Golden Eagle, (4) Turkey Vulture, (5) Cooper's Hawk. Less common were the (6) Prairie Falcon, (7) Marsh Hawk, (8) Sharp-shinned Hawk, (9) Swainson's Hawk, (10) Ferruginous Hawk. All these are breeding species. The Osprey occurred in migration and the Goshawk, Rough-legged Hawk, Bald Eagle and Merlin in winter. One endangered species, the Peregrine, still occurs in the general area as an occasional migrant and rare breeder. The Peregrine is the only species for which there is evidence of a decline in numbers. Eleven kinds of nocturnal birds of prey occur in the area. Only the Great Horned Owl is common. Other kinds are the Screech Owl, Pygmy Owl, Burrowing Owl, Long-eared Owl, Short-eared Owl, all in the oil shale area, and in the general peripheral area, the Barn Owl, Flammulated Owl, Snowy Owl, Spotted Owl and Saw-whet Owl. For each species, seasonal status, relative abundance, records of occurrence and ecological data are given. (See also W76-10820) (BLM)
W76-10822

NONGAME MAMMAL INVENTORY OF THE UTAH OIL SHALE AREA,
Natural History State Museum, Vernal, Utah.
M. L. Perry.
Project conducted for: Utah Division of Wildlife Resources, Salt Lake City, 1975. 50p, 1 fig, 6 tab, 9 ref. 52500-CT4-450-BLM.

Descriptors: *Nongame animals, Mammals, Vegetation, Predation, *Utah, Small game, Trapping, *Surveys.
Identifiers: *Oil shale area(Utah), Uintah County(Utah), Uinta Basin(Utah), White River(Utah), Evacuation Creek(Utah), Snap traps.

During the spring and summer of 1974 and 1975 a field inventory of nongame mammals was conducted on Utah's oil shale lands in northeastern Utah. The area, located south of Bonanza, Utah, is characterized as a dry, semi-arid plateau sloping gently to the north where it meets the Uinta Basin. Mammal studies conducted by previous researchers revealed a diversity of sixty-three different kinds. In 1973 Olsen collected and studied small nongame mammals of the oil shale area and identified abundance and densities. The present study is a continuation of Olsen's small mammal investigation and thus serves as a 'monitor' to his study. Six vegetative types were sampled during the survey: 1) Cottonwood, willow, and tamarix 2) desert shrub 3) salt desert 4) greasewood 5) sagebrush and 6) pinyon-juniper. The ecological preference, relative abundance, and density were determined for each of the species. Specimens were collected with snap traps set at 30 foot intervals for two to three consecutive nights at each site. Twenty-five localities were sampled in the study area. Eighteen kinds of small mammals were found to occur in the area. The most common species were in order of their abundance, Deer Mouse (Peromyscus maniculatus), Colorado Chipmunk (Eutamias quadrivittatus), Apache Pocket Mouse (Perognathus apache), Ord's Kangaroo Rat (Dipodomys ordii) Desert Woodrat (Neotoma lepida), and the Pinyon Mouse (Peromyscus trueii). (See also W76-10820) (BLM)
W76-10823

STUDIES ON THE LEAST CHUB (IOTICHTHYS PHLEGETHONTISCOPE) IN GEOTHERMAL ACTIVITIES AREA OF SNAKE AND TULE VALLEYS, UTAH,
Utah State Univ., Logan.
W. F. Sigler, and G. W. Workman.
Project conducted for Utah Division of Wildlife Resources, Salt Lake City, 1975. 22 p, 5 fig, 6 tab, 8 ref. 5250-CT4-450-BLM.

Descriptors: *Fish, Growth rates, Management, *Utah, Distribution, *Geothermal studies, Fish populations, Fish types, Water pollution.
Identifiers: *Least chub, Endangered species, Snake River Valley(Utah), Tule River Valley(Utah).

Least chub, an endangered fish species is apparently limited to one water source (LeLand Harris Springs area) in Juab and Millard counties. Information relative to habitat requirements, potential habitat, predators and pollution was studied. Recommendations for future management of this species is also presented. (See also W76-10820) (BLM)
W76-10824

A SELECTED ANNOTATED BIBLIOGRAPHY ON FISH AND WILDLIFE IMPLICATIONS OF MISSOURI BASIN WATER ALLOCATION,
Colorado Univ., Boulder, Colo. Inst. of Behavioral Science.
For primary bibliographic entry see Field 4C.
W76-10825

FISH AND WILDLIFE IMPLICATIONS OF UPPER MISSOURI BASIN WATER ALLOCATION, A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 4C.
W76-10826

HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI. APPENDIX E, F, G, (ENVIRONMENTAL IMPACT STATEMENT.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W76-10827

THE LEGAL REQUIREMENT FOR THE ASSESSMENT OF INADVERTENT WEATHER MODIFICATION - AN ENGINEERING VIEWPOINT,
Dames and Moore, Atlanta, Ga.
For primary bibliographic entry see Field 3B.
W76-10912

URBAN AEROSOLS AND INADVERTENT WEATHER MODIFICATION,
Rockwell International, Thousand Oaks, Calif. Science Center.
For primary bibliographic entry see Field 4C.
W76-10913

OIL PORTS ON THE CONTINENTAL SHELF,
Exxon Research and Engineering Co., Florham Park, N. J.
For primary bibliographic entry see Field 5G.
W76-10984

'WARE THE WADDEN SEA,
Foundation for Applied Ecology, Edam (Netherlands).
W. Dieren.
New Scientist, Vol. 69, No. 981, p. 16-18, 1976.

Descriptors: *Management, *Estuaries, *Europe, *Protection, Tourism, Environmental effects, Water pollution effects, Fish conservation, Wildlife conservation, Recreation, Industries, Land reclamation, Powerplants, Oil industry, Dikes, Pesticides, International commissions.
Identifiers: *Waddensea(The Netherlands), West Germany, Denmark, North Sea, River Rhine.

The Waddensea, an estuary north of The Netherlands, west of Germany, and west of Denmark is an important habitat for wildlife and is the main nursery grounds for North Sea fish. Its environment is threatened by recreation, tourism, indus-

trialization, land reclamation, oil drilling, power plant installations, uncontrolled land use, and pollutants. A tripartite scientific working party recently met to draw up detailed recommendations on which the concerned governments are being asked to act. The mobilization of public opinion and the pressures of the European Community and World Wildlife Fund have resulted in the formation of the Waddensea Working Party as a private initiative. It has prepared a list of proposals, including that the three governments should manage the region as an entity and in accordance with international conventions on pollutants. Evaluation of the need for and siting of industrial plants is requested; industrial sprawl and development must be limited; recreation pressure should be limited to the local carrying capacity; flying and hunting should be restricted; oil and gas drillings should be restricted as to quantity and pollution; and that no major alterations, either industrial or recreational, should be allowed without scientific advice. The involvement of a group of scientists, public opinion, and an unofficial convention is setting a trend in environmental conservation. (Auen-Wisconsin)
W76-10985

OUTER CONTINENTAL SHELF RESOURCE DEVELOPMENT SAFETY: A REVIEW OF TECHNOLOGY AND REGULATION FOR THE SYSTEMATIC MINIMIZATION OF ENVIRONMENTAL INTRUSION FROM PETROLEUM PRODUCTS.
Assembly of Engineering Marine Board, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11001

TECHNICAL CAPABILITIES OF OFFSHORE EXPLORATION OPERATIONS TO MAXIMIZE SAFETY AMD ENVIRONMENTAL PROTECTION,
Humble Oil and Refining Co., Houston, Tex.
For primary bibliographic entry see Field 5G.
W76-11004

OFFSHORE OIL: TECHNOLOGY - AND EMOTION,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5G.
W76-11090

A THOROUGH LOOK AT CURRENT OFFSHORE PETROLEUM OPERATIONS.
For primary bibliographic entry see Field 6C.
W76-11091

OIL SPILLS AND OFFSHORE PETROLEUM,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5G.
W76-11092

OFFSHORE OIL SPILLS AND THE MARINE ENVIRONMENT,
Massachusetts Inst. of Tech. Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-11093

FINAL ENVIRONMENTAL STATEMENT, CONSTRUCTION OF ARTIFICIAL REEFS IN THE ATLANTIC OCEAN OFF CAPE HENRY, VIRGINIA.
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 8B.
W76-11094

A PUBLIC AUTHORITY TO MANAGE THE ATLANTIC OUTER CONTINENTAL SHELF,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 6E.
W76-11097

7. RESOURCES DATA

7A. Network Design

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5A.
W76-10588

DESIGN OF NATIONWIDE WATER-QUALITY MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-10643

SOME INTERNATIONAL ACTIVITIES IN ENVIRONMENTAL MONITORING,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.
W76-10644

EARTHWATCH-SENTINEL FOR THE FUTURE,
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 5A.
W76-10645

NETWORK DESIGN CONSIDERATIONS FOR THE GLOBAL ENVIRONMENTAL MONITORING SYSTEM (GEMS) OF THE UNITED NATIONS,
Smithsonian Astrophysical Observatory, Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-10646

A PROPOSED NATIONAL MONITORING SYSTEM FOR ORGANICS IN WATER,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5A.
W76-10668

7B. Data Acquisition

DIPLOMATIC AND LEGAL ASPECTS OF REMOTE SENSING,
Department of State, Washington, D. C.
For primary bibliographic entry see Field 6E.
W76-10584

AN EVALUATION OF AUTOMATIC WASTEWATER COMPOSITORS,
Environmental Protection Agency, Kansas City, Kans. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W76-10652

REMOTE SENSING OF GROUND AND SURFACE WATER CONTAMINATION BY LEACHATE FROM LANDFILL,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W76-10666

ASSESSMENT OF THE BENEFITS OF ENVIRONMENTAL REMOTE SENSING,
Enviro Control, Inc., Rockville, Md.
For primary bibliographic entry see Field 5A.
W76-10670

EVALUATION OF WATER SAMPLES COLLECTED DURING LANDSAT-1 OVERPASSES OF THE LOWER CHESAPEAKE BAY AREA,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 5A.
W76-10672

SOME OBSERVATIONS ON THE JOSS-WALDVOGEL RAINFALL DISDROMETER,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
For primary bibliographic entry see Field 2B.
W76-10928

APPLICATION OF A RESIDENCE TIME MODEL TO DILUTION GAUGING, WITH PARTICULAR REFERENCE TO THE PROBLEM OF CHANGING DISCHARGE,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2E.
W76-10935

AUTOMATED DETERMINATION OF CARBON IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-10936

NEAR SURFACE SAMPLER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-10995

TECHNIQUES FOR ESTIMATING FLOOD DEPTHS FOR OKLAHOMA STREAMS,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 4A.
W76-11075

U.S. GEOLOGICAL SURVEY WATER QUALITY MONITOR, OPERATIONS MANUAL,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 5A.
W76-11080

7C. Evaluation, Processing and Publication

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5A.
W76-10588

MANAGEMENT OF GROUNDWATER QUALITY DATA,
Commonwealth Associates, Inc., Jackson, Mich.
For primary bibliographic entry see Field 5A.
W76-10660

AUTOMATED FORECAST PROCEDURES FOR RIVER QUALITY MANAGEMENT,
For primary bibliographic entry see Field 5A.
W76-10664

A PROPOSED NATIONAL MONITORING SYSTEM FOR ORGANICS IN WATER,
Environmental Research Lab., Athens, Ga.

For primary bibliographic entry see Field 5A.
W76-10668

GROUNDWATER AVAILABILITY IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-10718

PUBLIC GROUNDWATER SUPPLIES IN MCHENRY COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-10719

METEOROLOGICAL ASPECTS OF THE OAHU FLOOD OF 19 APRIL 1974,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2B.
W76-10807

A SIMULATION MODEL OF TRITIUM KINETICS IN A FRESHWATER MARSH,
Ohio Cooperative Wildlife Research Univ, Columbus.
For primary bibliographic entry see Field 5B.
W76-10812

SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS: FINAL REPORT,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W76-10813

WATER RESOURCES DATA FOR WISCONSIN. PART 1. SURFACE WATER RECORDS. PART 2. WATER QUALITY RECORDS.
Geological Survey, Madison, Wis. Water Resources Div.
Data Report, 1975, 347 p. 5 fig, 27 ref, Numerous tab.

Descriptors: *Water quality, *Wisconsin, *Water resources, *Hydrologica data, Streamflow, Reservoir storage, Water chemistry, Water properties, Biological properties, Physical properties, Surface waters, Data collections, Gaging stations, Sampling, On-site data collections, Great Lakes region.

Water resources data for the 1974 water year for Wisconsin are given, including records of streamflow or reservoir storage at gaging stations, partial-record stations, and miscellaneous sites, and records of water quality on the chemical, biological, and physical characteristics of surface water. A glossary of terms related to streamflow, waterquality, and other hydrologic data, as used in this report, are defined. An index of recording stations is included. (Witt-IPC)
W76-10832

SOURCES OF INFORMATION IN WATER RESOURCES, AN ANNOTATED GUIDE TO PRINTED MATERIALS,
California Univ., Berkeley. Water Resources Center Archives.
For primary bibliographic entry see Field 10C.
W76-10881

APPLICATION OF THE STANFORD WATERSHED MODEL TO NIGERIAN WATERSHEDS,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-10923

A COMPARISON OF SEVERAL WATER QUALITY INDEXES,
CACI, Inc., Reston, Va. Information Technology Dept.
For primary bibliographic entry see Field 5A.
W76-10926

THE SPARTA AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
R. Newcome, Jr.
Water-Resources Investigations 76-7 (open-file report), March 1976. 3 sheets, 15 fig, 3 tab, 16 ref.

Descriptors: *Groundwater resources, *Water quality, *Aquifer characteristics, *Water supply, *Mississippi, Water wells, Water utilization, Hydrogeology, Pumping, Water yield, Chemical analysis, Hydrologic data, *Maps, Water levels, Groundwater recharge.
Identifiers: *Sparta aquifer system(Miss).

This 3-sheet atlas on the Sparta aquifer system in Mississippi is the third report in the series. Information on the aquifers was obtained in the cooperative programs of the U. S. Geological Survey with the Mississippi Board of Water Commissioners and other State and Federal agencies. The Sparta Sand, a formation of the Claiborne Group of Eocene age, is a principal source of water supplies in Mississippi. This formation, which usually consists of two or more sand beds separated by clay, is available for water-supply development in more than 40 percent of Mississippi, a larger area than any other aquifer system. In 1975, about 50 mgd were pumped from wells in the Sparta, divided about equally between public supply and self-supplied industry. The public supplies and other major groundwater uses are described, and the distribution of withdrawals, by county, is shown. Water from Sparta wells generally is of good quality but high concentration of iron in the eastern half of the area and high flouride on the southwest margin are frequent. The water is a sodium bicarbonate type and generally has hardness less than 50 mg/litre--less than 10 mg/litre in the southwestern half of the area. (Woodard-USGS)
W76-11067

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
R. S. Stulik, and R. L. Laney.
Water-Resources Investigations 76-35 (open-file report), April 1976. 3 sheets, 3 ref.

Descriptors: *Groundwater resources, *Water yield, Water quality, *Aquifer characteristics, *Hydrologic data, *Maps, Water levels, Pumping, Water level fluctuations, Groundwater recharge, Water wells, Water supply, Irrigation, Chemical analysis, Specific conductivity, Dissolved solids, Fluoride.
Identifiers: *Maricopa County(Ariz), *Lower Hassayampa area(Ariz).

This 3-sheet map report shows groundwater conditions in the lower Hassayampa area, Maricopa County, Ariz. The sedimentary deposits form the main water-bearing unit and consist mainly of weakly consolidated gravel, sand, silt, clay; locally, the deposits are capped by as much as 50 feet of caliche-cemented gravel. The unit range in thickness from a few tens of feet near the mountains to as much as 1,200 feet in the central part of the area. The unit may yield from several hundred to a few thousand gallons per minute of water to wells. The long-term withdrawal of groundwater has resulted in a general decline in water levels in most of the lower Hassayampa area; however, in the southern part of the area a few water-level rises have occurred. Water-level changes in measured wells for 1956-75 ranged from a decline of about 84 feet to a rise of about 2 feet. The water level declined nearly 114 feet in one well for 1953-75. The dissolved-solids concentration ranges from less than 500 to more than 3,000 mg/litre. In the study area the annual average maximum daily air temperature is about 87 deg F, and an optimum concentration of flouride in drinking water is 0.7 mg/litre. The presence of concentrations greater than 1.4 mg/litre is grounds for rejection of the water for public supply. (Woodard-USGS)
W76-11068

WATER-QUALITY INVESTIGATION, EEL RIVER, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-11069

BOG STRATIGRAPHY, RADIOCARBON DATES, AND PINEDALE TO HOLOCENE GLACIAL HISTORY IN THE FRONT RANGE, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2C.
W76-11071

GREATER PITTSBURGH REGIONAL STUDIES, REPORTS AND MAPS, APRIL 1976.
Geological Survey, Reston, Va.
Geological Survey catalog, 1976. 14 p.

Descriptors: *Bibliographies, *Publications, *Hydrologic data, *Land use, *Pennsylvania, Environmental effects, Flood plains, Coal mine wastes, Erosion, Water resources, Streams, Runoff, Water quality, Data collections, Groundwater, Topography, Maps, Natural resources, Appalachian Mountain Region, Regional analysis.
Identifiers: *Pittsburgh(Penn).

Reports and maps concerning hydrology, geology, and land use related to environmental effects, are products of a cooperative program of Greater Pittsburgh Regional Studies by the U.S. Geological Survey, the Pennsylvania Bureau of Topographic & Geologic Survey, the Appalachian Regional Commission, and the Southwestern Pennsylvania Regional Planning Commission, that began in January 1971 and will cease operations in the region in June, 1976. This catalog was prepared in April 1976, at which time a number of reports and maps remained to be completed for distribution. Some of these are included, labelled 'in press'. Others were not sufficiently advanced for inclusion. (Woodard-USGS)
W76-11072

GROUND-WATER LEVELS IN NEW MEXICO, 1974,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2F.
W76-11073

WATER-QUALITY DATA FOR CANALS IN EASTERN BROWARD COUNTY, FLORIDA, 1969-1974,
Geological Survey, Tallahassee, Fla.
B. G. Waller, W. L. Miller, and T. R. Beaven.
Open-file report FL-75009, 1976. 156 p, 2 fig, 8 tab.

Descriptors: *Water quality, *Chemical analysis, *Canals, *Florida, Environmental effects, Urban runoff, Sediments, Agricultural runoff, Estuaries, Saline water intrusion, Water analysis, Monitoring, Basic data collections.
Identifiers: Eastern Broward County(Fla).

Water-analysis data obtained from 1964-74 are presented for the Broward County water-quality-monitoring network which includes 27 stations located along 8 primary canals. The stations include discharge points from the water conservation areas, areas draining agricultural land, urban and residential drainage, and estuarine waters.

Surface-water samples were collected in the center of the canals, 1 to 2 ft below the surface. Bottom sediment samples also were collected. Broward County, on the southeast coast of Florida, contains many rapidly expanding urban areas, most of which are in the eastern part. Because most of the canals in the county are in these urban areas, the canals have become convenient receptacles for storm-water runoff and sewage effluent. The degradation of the water quality in these canals greatly affects their usefulness to the community. Contaminants entering these waters could affect their trophic state and prevent optimal use. (Woodard-USGS)
W76-11081

FLOOD FREQUENCY OF MISSISSIPPI STREAMS,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 4A.
W76-11083

8. ENGINEERING WORKS

8A. Structures

SEABED SCOUR BY CURRENTS NEAR PLATFORMS,
Trondheim Univ. (Norway). Vassdrags-og Havnelaboratoriet.
For primary bibliographic entry see Field 8B.
W76-11087

8B. Hydraulics

FLUID-MECHANICS ASPECTS IN THE DESIGN OF SEWAGE OUTFALLS INTO THE SEA (STROEMUNGSMECHANISCHE ENTWURFSASPEKTE FUER ABWASSEREINLEITUNGEN INS MEER),
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
For primary bibliographic entry see Field 5E.
W76-10678

UNDERLAKE SEWER SPURS RESORT DEVELOPMENT,
Burns and McDonnell, Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-10685

HYDRAULIC JUMP IN CIRCULAR SEWERS,
Greater Chicago Metropolitan Sanitary District, Ill. Sewer Design Section.
For primary bibliographic entry see Field 5D.
W76-10686

THE RELATIONSHIP OF SLOPE AND STREAM CHANNEL FORM IN THE RIVER DART, DEVON,
Exeter Univ. (England), Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-10698

OBLIQUE IMPINGEMENT OF CIRCULAR TURBULENT JETS,
Alberta Research, Edmonton. Div. of Highway and River Engineering.
S. Beltaos.
Journal of Hydraulic Research, Vol. 14, No. 1, p 17-36, 1976. 20 fig, 3 tab, 30 ref.

Descriptors: *Jets, *Boundary layers, *Reynolds number, Laboratory tests, Hydraulics, Fluid mechanics, Flow, Shear stress, Equations, Walls, Turbulence.
Identifiers: *Circular turbulent jets, Wall pressures, Impingement angle, Skin friction, Nozzle Reynolds number.

The oblique impingement of circular turbulent jets on smooth walls has been studied both experimentally and analytically. This type of flow represents a considerable degree of geometrical generality as the flow is three-dimensional in its main portion. An inductive, semi-empirical method has been developed to predict wall pressures in the impingement region. Wall shear stress in the same region has been measured on the symmetry plane and an analytical method has been presented for its prediction. For prediction of flow properties in the wall jet region, a theory has been developed which is based on boundary-layer approximations of the Reynolds equations of motion and upon the similarity ofradial velocity profiles. It was shown that the flow is quasi-axisymmetric, i.e., flow takes place along radial lines with shear stresses between radial planes being very small. The thickness of the wall jet grows linearly on each radial at a universal slope. The local skin friction factor remains constant along radials and is independent of any other parameter of the problem except Nozzle Reynolds number. Further, it is shown that dimensionless maximum velocity is proportional to dimensionless radial distance, the proportionality factor being a function of angle of impingement and angle coordinate in cylindrical system. This function was derived semi-empirically and was shown to be a reasonable description of the experiments. (Lee - ISWS)
W76-10709

FLOW RESISTANCE IN BROAD SHALLOW GRASSED CHANNELS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2E.
W76-10710

TRANSPORTATION OF SOLIDS BY WATER IN PIPELINES,
Mississippi State Univ., Mississippi State. Dept. of Agricultural and Biological Engineering.
J. C. McWhorter, and J. B. Allen.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 766, $3.50 in paper copy, $3.00 in microfiche OWRT A-097-MISS(1). Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1976. 20 p, 7 fig, 2 tab, 37 ref.

Descriptors: *Pipelines, Transportation, *Slurries, Reviews, Laboratory tests, Pipes, Particle size, Hydraulics.
Identifiers: *Solids transport(Pipes), Literature reviews.

The purpose was to review the literature and to prepare a statement on current knowledge of the transport of solids by water in pipelines, and also to make a qualitative laboratory study of the behavior of solids in astream of water within a recirculating pipeline system. The initial phase of the study was a review of current literature. In the laboratory phase, all observations were made in a horizontal test section of 4 in. diameterclear acrylic pipe. Wooden spheres and cubes with a volume of 0.212 in. 3 were observed photographically and visually. Observations were also made of polyethylene pellets approximately 0.13 in. diameter and 0.20 in. long. Average water velocity ranged from 2.7 to 10.9 fps. The report includes summary statements regarding the interaction of the carrier fluid and the particles conveyed by the fluid. The findings of the laboratory study are compatible with conclusions derived from the literature review.
W76-10806

EXPERIMENTAL AND THEORETICAL INVESTIGATIONS IN AN OSCILLATORY TURBULENT BOUNDARY LAYER,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
I. G. Jonsson, and N. A. Carlsen.
Journal of Hydraulic Research, Vol. 14, No. 1, p 45-60, 1976. 13 fig, 5 tab, 9 ref.

Descriptors: *Boundary layers, *Turbulent boundary layers, Hydraulics, Coasts, Fluid mechanics, Shear stress, Laboratory tests, Hydraulic models, Beds, Oceans, Waves(Water).
Identifiers: *Oscillatory flow, *Wave friction factor, Mean specific energy loss, Wave boundary layer thickness.

The oscillatory flow near the sea bed under a wave motion is always rough turbulent in a coastal zone. This type of an oscillatory boundary layer (wave boundary layer) was therefore chosen as a subject for detailed velocity measurements, from which characteristics such as wave friction factor, mean specific energy loss, and boundary layer thickness were determined. The wave friction factor was defined from the maximum bed shear stress. The mean specific energy loss was determined by free stream velocity and wave friction factor. The wave boundary layer thickness was defined by Nikuradse roughness parameter and free stream particle amplitude. (Lee - ISWS)
W76-10916

ON ROLLING-GRAIN RIPPLES,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 2J.
W76-10917

SEEPAGE FLOW THROUGH HOMOGENEOUS SOIL INTO A ROW OF DRAIN PIPES,
Waikato Univ., Hamilton (New Zealand). Dept. f Mathematics.
For primary bibliographic entry see Field 4A.
W76-10919

LONGITUDINAL DISPERSION FOR FLOW OVER ROUGH BEDS,
New Brunswick University, Fredericton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-10921

CHANNEL WIDTH AND THE RIFFLE-POOL SEQUENCE,
Lanchester Polytechnic, Coventry(England).
For primary bibliographic entry see Field 2E.
W76-10924

APPLICATION OF FINITE ELEMENT METHOD TO OPEN CHANNEL FLOW,
Agricultural Univ., Wageningen (Netherlands). Dept. of Hydraulics and Catchment Hydrology.
D. H. Keuning.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY4, Proceedings Paper 12053, p 459-468, April 1976. 5 fig, 1 tab, 10 ref, 2 append.

Descriptors: *Finite element analysis, *Open channel flow, *Tidal streams, *Marshes, *Hydraulics, Continuity equation, Energy equation, Analytical techniques, Numerical analysis, Channels, Unsteady flow, Flow.
Identifiers: *Galerkin's method, Sectional linearization, Periodic flow.

Finite element method in combination with Galerkin's principle was applied to the nonstationary and nonlinear equations for one-dimensional flow in open channels. A straight horizontal channel with a uniform trapezoidal cross section was considered. It connected a constant water level marsh with a river affected by tidal flow. Under these conditions, the channel flow became a periodic function of time. The discharge and the water depth were chosen as dependent variables. Numerical computations were performed for various sets of parameters reflecting the operating conditions. When the lock at the confluence of the channel and the river was closed, a standing wave was generated and the water flowed back to the marsh. The principle of sectional linearization was in-

troduced to avoid extensive calculations. (Singh-ISWS)
W76-10939

DESIGN OF ALTERNATING DIFFUSER PIPES,
Skopje Univ. (Yugoslavia).
A. Nospal, and J-C. Tatinclaux.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY4, p 553-558, April 1976. 4 fig, 5 ref.

Descriptors: *Thermal pollution, *Water temperature, *Laboratory tests, *Effluents, *Flow characteristics, Powerplants, Cooling water, Heat balance, Hydraulics.
Identifiers: *Multiport diffuser, Diffuser load.

Experiments were conducted in a glass-walled flume for investigating a two-dimensional model of a multiport diffuser with alternating horizontal parts. Such a diffuser pipe can often be advantageously used when large amounts of effluents are to be discharged into relatively shallow receiving bodies of water. When condenser cooling water of a power plant is discharged into receiving waters, the increase in water temperature is limited by state and federal standards. The experimental results were used to establish general relationship between the temperature rise, the volume flux ratio, and the diffuser load. A procedure was outlined for an initial design of an alternating diffuser when maximum permissible temperature rise on the water surface, temperature difference between effluent and ambient temperature, and the value of the diffuser load are specified. (Singh-ISWS)
W76-10952

SHORELINE RETAINING WALL,
T. H. Shillingford.
U. S. Patent No. 3,952,520, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1582, April 27, 1976.

Descriptors: *Patents, *Engineering structures, *kall, *Retaining walls, *Coastal structures, Erosion control, Shore protection, Sands, Waves(Water), Beaches, Coasts.

A retaining wall for use in stabilizing shoreline erosion is comprised of a footing and an upright wall portion. The front face of the wall has a number of recesses spaced apart from each other to form a pattern extending the length and height of the wall. Each recess is horizontally oriented and is uniform in cross-section throughout its depth. The lateral dimension of the recess is not less than 18 inches in any direction, and the depth is not greater than the width. The wall is located along the shoreline at a distance from the waterline reached by an average wave. The footing is rested on firm ground. It is preferable to bury the wall initially to cover at least the bottom row of recesses as a safety factor to prevent the footing from being undercut. When the wall is in place, waves travelling up the beach and carrying entrained sand will impinge on the wall. The water will enter the recesses and because they are shallow and blind, the kinetic energy of the water will be dissipated and at the same time air trapped in the recesses will be entrained in the water. As the dead water falls back from the recesses it will drop in front of the wall carrying the entrained air and sand to form a sieve-like bed of sand through which the water will percolate. In this manner a beach is built against the wall. (Sinha-OEIS)
W76-10953

PORTABLE FLOATING WAVE TRIPPER,
J. M. Potter.
U. S. Patent No. 3,952,521, 5 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1582, April 27, 1976.

Descriptors: *Patents, *Engineering structures, *Breakwaters, *Coastal structures, Shore protection, Ocean waves, Waves(Water), Pontoons, Floats.

A floating breakwater or wave tripper supported by pontoons or floats is disclosed. The breakwater is useable for moderating waves and for creating a generally calm surface on the water behind the breakwater. Since the device is carried by floats of pontoons, it is portable and may be moved and positioned as desired. The pontoons or floats which support the breakwater are so shaped that the device cuts through the waves striking it instead of floating over them, and is therefore more effective in reducing the height of incident waves than are prior devices which float on the surface of the wave. Suitable anchors are provided to secure the device in a desired location and a number of wavebreakers may be joined together to form a portable breakwater of generally any desired length. (Sinha-OEIS)
W76-10954

COMBINED DRAIN AND FLOOD GATE,
For primary bibliographic entry see Field 3F.
W76-10968

OIL PORTS ON THE CONTINENTAL SHELF,
Exxon Research and Engineering Co., Florham Park, N. J.
For primary bibliographic entry see Field 5G.
W76-10984

STEADY LAMINAR FLOW IN A STATIONARY TANK WITH A SPINNING BOTTOM,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
C. V. Alonso.
Journal of Applied Mechanics, Transactions of the ASME, Vol. 42, No. 4, p. 771-776, 1975, 10 fig., 10 ref. ASME Paper No. 75-APM-U.

Descriptors: *Rotating flow, *Boundary layer, *Laminar flow, *Mathematical models, *Numerical analysis, *Experimental models, Steady flow, Circulation, Hydrodynamics.
Identifiers: *Navier-Stokes equations, *Finite differences, Newtonian fluids.

The steady incompressible viscous flow induced in a cylindrical tank by the rotation of its bottom was studied both theoretically and experimentally. The complete Navier-Stokes equations are expressed in terms of the tangential velocity, vorticity, and meridional stream function. The transformed equations are solved numerically using and alternating-direction implicit scheme and a nonuniform grid. The general validity of the numerical solution was demonstrated by the agreement between the computed and experimental results. (USDA-ARS)
W76-11062

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON MOHAWK RIVER IN TOWNS OF FRANKFORT AND SCHUYLER, HERKIMER COUNTY, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 4A.
W76-11079

APPLICATION OF SIMPLE DAM BREAK ROUTING MODEL,
Geological Survey, Reston, Va.
R. S. McQuivey, and T. N. Keefer.
In: Fundamental Tools to be Used in Environmental Problems; Proceedings of 16th Congress of International Association for Hydraulic Research, Sao Paulo, Brazil, July 27-August 1, 1975, Volume 2, p 315-324, 1975. 4 fig, 1 tab, 2 ref.

Descriptors: *Dam failure, *Flood routing, *Model studies, *Flood forecasting, *Computer models, Mathematical models, Hydrographs, Regression analysis, Peak discharge, Equations, Dam design.
Identifiers: *Multiple-linearization technique.

A multiple-linearization flow-routing model is used to route a discharge hydrograph resulting from the rupture of a mine-waste pond to downstream locations. The peak flow results are compared to flow measurements made by slope-area indirect measurement techniques. Estimates of peak stage are compared to stages obtained from high-water marks. The comparisons point out the possible limitations of estimating unsteady flow by steady flow techniques and the difficulty of applying a simple model to a complex flow problem. (Woodard-USGS)
W76-11084

SIMPLIFIED ROUTING OF DAM BREAK WAVES,
Geological Survey, Bay St. Louis, Miss., and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-11085

SEABED SCOUR BY CURRENTS NEAR PLATFORMS,
Trondheim Univ. (Norway). Vassdrags-og Havnelaboratoriet.
T. Carstens.
Marine Science Communications, Vol 2, No 1, p 69-93, 1976. 18 fig, 8 ref.

Descriptors: *Continental Shelf, *Offshore platforms, *Drilling, Engineering structures, Hydraulic structures, Resources development, Environmental effects, Scour.
Identifiers: *Outer Continental Shelf, *Gravity platforms(Offshore), *Scour protection, North Sea.

The gravity platforms in the North Sea, sitting directly on granular seabeds, may be undercut by scour and need scour protection. Conventional methods of protection are developed for structures 1 or 2 orders of magnitude smaller and seem unnecessarily conservative when scaled to these larger sizes. The reason is that some of the flow details that exert extra stresses on the bed, are not preserved during scale-up. Some new ideas for scour protection are discussed. These are all built into the structure so as to reduce expensive offshore operations as much as possible. A breakthrough in protection techniques is anticipated before long as a result of the present effort in several countries to come up with satisfactory designs. The existing prediction formulas for scour depth at bridge piers are likely to be misleading when applied to large gravity platforms. With increasing diameter the scour at the cylinder wall becomes less extensive both in relative area and relative depth. Scour will nevertheless occur, and ideas for built-in scour protection are discussed. These ideas have been tested to some extent in small scale hydraulic models, with results ranging from full protection to reduced scour. Full scale performance data are still missing or at best uncertain. Several promising methods are at present in the development phase and need large scale testing before they can be finally evaluated. (Sinha-OEIS)
W76-11087

FINAL ENVIRONMENTAL STATEMENT, CONSTRUCTION OF ARTIFICIAL REEFS IN THE ATLANTIC OCEAN OFF CAPE HENRY, VIRGINIA.
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
U.S. Commerce Department, NOAA, October 2, 1972. 11 p, 5 ref.

Descriptors: *Continental Shelf, Resources development, *Environmental effects, Habitats, Artificial substrates, Water resources, *Virginia, Reefs, Ecosystems, Fish, Shellfish, *Atlantic Ocean.
Identifiers: *Outer Continental Shelf, *Artificial reefs, *Environmental impact, Cape Henry(Va).

Two artificial reefs of approximately 80 and 4000 acres will be constructed in the Atlantic Ocean approximately 15 and 30 miles east of Cape Henry, Virginia. The reefs will be constructed of 166 surplus Navy vessels (36 ft. - 96 ft.). This project will create habitat attractive to sport fishes in an area where such habitat does not occur naturally. Underwater observations will be made by the National Marine Fisheries Service (NMFS) to determine changes in the biota on and surrounding the reefs. The physical alteration of the ocean that will occur is expected to create new habitats for many types and substantial numbers of marine organisms including game fishes. The proposed reefs will occupy bottoms suitable for the operation of conventional commercial trawling gear. Neither site is presently fished commercially because of low productivity and the presence of ship wrecks. Benthic fauna will be covered by the vessels, however, this will not significantly affect population sizes of the species involved. No significant adverse environmental effects are anticipated as a result of this project. (Sinha-OEIS)
W76-11094

8C. Hydraulic Machinery

HOW TO USE AND SELECT A SCREW PUMP,
Lakeside Equipment Corp. Bartlett, Ill.
W. L. Berk.
Water and Sewage Works, Reference number, p R-22, R-24-R-27, April 30, 1976. 4 fig, 1 tab.

Descriptors: *Pumps, *Pumping, *Waste treatment, *Sewage treatment, *Hydraulic equipment, Evaluation, Performance, Efficiencies, Flow, Equipment, Irrigation systems, Treatment facilities, Surface drainage, Hydraulic engineering.

The use of screw pumps for moving large quantities of liquid at a relatively low lift is discussed. Screw pumps are currently being used in the following applications: activated sludge return, raw sewage lift stations, raw and effluent sewage plant lift stations, industrial product and waste handling, storm water pumping, irrigation, land drainage, and the delivery of a constant flow to treatment works with equalization basins. Screw pumps require less total dynamic head, operate at higher efficiency, and require less energy for a given application when compared with centrifugal pumps. Selection criteria and design considerations for screw pump applications are outlined. The mathematics of a hypothetical pump selection are developed in terms of total lift and pump speed, drive selection, screw pump loadings, and deflection. A tabulation of screw pump lift and capacity data is also presented. (Kreager-FIRL)
W76-10681

FIVE PUMPS SALVAGE A QUEBEC SEWER JOB,
N. Hancock.
Engineering and Contract Record, Vol. 89, No. 5, p 34, May, 1976. 1 fig.

Descriptors: *Separated sewers, *Drains, *Pipes, *Storm drains, *Pumps, *Floods, *Melt water, Rain water, Storm runoff, Construction.

Five large pumps were used to bail out when a sudden January mild spell caused serious flooding of a storm sewer being installed in Chateauguay, Quebec. The route followed an S-curve from the town's principal highway where a 1.5 m storm drain and a 67.5 cm sanitary drain are buried. During construction, part of the 1.5 m drain was temporarily removed and the runoff transferred by two electric pumps into the 3 m diameter pipe being installed. These pumps were unable to contain the flooding resulting from the combination of the sudden thaw and heavy rain. Although three more pumps were added, almost 2 days were required to pump at least 8 m of water out of the trench. The crushed stone base for the pipe had to be re-laid after the water was removed. The depth of the trench was 9 m, and its width was 14 m at the top, narrowing to 5 m at the lowest point. The excavation was done in two stages, after which the bottom of the trench was levelled and the pipe installed. A bulldozer was used to scrape earth from underneath telephone cable crossings. These lines slowed progress, although they were clearly marked on the drawings. A crane was used to lower the pipe into the trench. (Snyder-FIRL)
W76-10689

MATERIALS FAILURE IDENTIFICATION MANUAL FOR SEA WATER DESALINATION PLANTS.
Aqua-Chem, Inc., Milwaukee, Wis.
For primary bibliographic entry see Field 3A.
W76-10880

8F. Concrete

VOLUME AND STRENGTH OF A DOLOS,
Brown and Root, Inc., Houston, Tex.
H. C. Desai.
Journal of the Waterways, Harbors, and Coastal Engineering Division, American Society of Civil Engineers. Vol. 102, No. WW1, p 79-88, February 1976. 2 fig, 5 tab, 12 equ, 10 ref.

Descriptors: *Breakwaters, *Concrete mixes, *Harbors, *Facilities, Mechanical engineering, Protection, Stress, Strain, Volume, Strength, Size.
Identifiers: *Concrete(Reinforced), *Dolos.

A precise formula is presented for computing the block volume of dolos and a concrete armor stone for protection of breakwaters and marine structures, with particular emphasis for a heavier dolos. A dolos is first treated as a solid concrete body falling by rotating under its own weight. An energy approach is followed and total external energy due to fall is compared with the total internal ultimate energy capacity of the dolos as a solid concrete body. A dolos is then treated as a solid concrete element of defined shape in a particular position and then hit by another dolos. Theories of failure of engineering mechanics are applied to determine maximum principal stresses and principal strains. These are then compared with concrete rupture stresses and strains. An attempt is made to indicate the usefulness or otherwise of steel fibers as reinforcing admixtures. Three different sizes of a dolos are compared and two mixes of concrete are considered. (Bell-Cornell)
W76-10523

8G. Materials

FINAL REPORT, MATERIAL EVALUATION AND DEVELOPMENT PROGRAM, OSW SAN DIEGO TEST FACILITY,
Burns and Roe Construction Corp., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W76-10552

FIBER-GLASS-REINFORCED POLYESTERS AND FURAN RESINS FOR WATER- AND WASTE-TREATMENT SYSTEMS,
Ashland Chemical Co., Columbus, Ohio. Resins and Plastics Div.
W. A. Szymanski, and R. C. Talbot.
American Water Works Association Journal, Vol. 68, No. 5, p 228-231, May, 1976. 2 fig, 3 tab, 6 ref.

Descriptors: *Linings, *Resins, *Plastics, *Polymers, *Materials, *Waste water treatment, *Corrosion control, Physical properties, Treatment facilities, Equipment, Waste treatment, Bacteria, Algae, Fungi, Mildews.
Identifiers: Fiberglass, Furan resins.

Properties of fiberglass-reinforced polyester and furan resins are reviewed in relation to their use in water- and waste-treatment applications. These materials show good chemical resistance was well as resistance to bacteria, algae, fungi, and mildew. The strength characteristics of furan laminates compare favorably to those of ordinary carbon steel and aluminum. The coefficient of thermal expansion of fiberglass-reinforced plastics is about twice that of steel or concrete and about the same as that of aluminum. A large water treatment plant capable of reclaiming chrome and process water at a rate of 6000 gallons/min is currently using fiberglass-reinforced polyester and furna linings for the inlet flume and trough, the equalization tank, two treatment tanks, two reaction tanks, a drain sump, an acid sump, steel storm retention tanks, clarifiers, and thickeners. (Kreager-FIRL)
W76-10682

COMPARING INFLOW AND INFILTRATION,
Pool (Charles) and Associates, Inc., Ketchikan, Alaska.
For primary bibliographic entry see Field 5D.
W76-10683

CLEVELAND MIXES METHODS IN SEWER CONSTRUCTION.
For primary bibliographic entry see Field 5D.
W76-10684

TOWN MAINTAINS SEWERS DESPITE 'SUGAR SAND',
Bossier City Utilities Dept., La.
For primary bibliographic entry see Field 5D.
W76-10687

SEWERS - RELINING VS REPLACEMENT,
Grand Rapids City Engineer Office, Mich.
R. J. Spry.
Water and Sewage Works, Reference number, p R-66, April 30, 1976.

Descriptors: *Sewers, *Linings, *Polymers, *Maintenance, Plastic pipes, *Maintenance costs, Materials, Sewage treatment, Conduits, Engineering structures, Structures.
Identifiers: Polyethylene, Polyvinyl chloride.

Experience with two sewer relining projects in Grand Rapids, Michigan is reported. One project involved relining 305 ft of a 10-inch sewer with DuPont Aldyl Series D Polyethylene which was installed in 18-foot lengths using a butt weld. The cost for relining was about $54.50/ft as compared with an estimated $85.20/ft which would have been required for reconstruction. The other project involved the relining of 47 ft of an 8-inch sewer with polyvinyl chloride pipe. Relining rather than replacement of this section resulted in a cost savings of more than $3400. The use of the above materials for making house connections did not prove to be successful. Pipe manufacturers are continuing efforts to improve the technique for this purpose. (Kreager-FIRL)
W76-10690

NEW BOILER WATER CHEMICAL TREATMENT REDUCES CORROSION AND SCALE BUILDUP.
For primary bibliographic entry see Field 3E.
W76-10859

MATERIALS FAILURE IDENTIFICATION MANUAL FOR SEA WATER DESALINATION PLANTS.
Aqua-Chem, Inc., Milwaukee, Wis.
For primary bibliographic entry see Field 3A.
W76-10880

PROCESS OF WATER TREATMENT,
Water Technology Service, Inc., Cleveland, Ohio. (Assignee).
For primary bibliographic entry see Field 5F.
W76-10971

8I. Fisheries Engineering

THE USE OF FLOWING BIOLOGICAL SYSTEMS IN AQUACULTURE, SEWAGE TREATMENT, POLLUTION ASSAY AND FOODCHAIN STUDIES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10986

HEAT EXCHANGERS FOR USE IN THE CULTURING OF MARINE ORGANISMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-10990

SOCIAL, POLITICAL, REGULATORY AND MARKETING PROBLEMS OF MARINE WASTE-FOOD RECYCLING SYSTEMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-10991

THE USE OF POWER PLANT WASTE HEAT IN MARINE AQUACULTURE,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W76-10992

INTEGRATED SYSTEMS OF MOLLUSK CULTURE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10996

POLYSPECIES AQUACULTURE SYSTEMS: THE DETRITAL TROPHIC LEVEL,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10997

COMPARISON OF THE FOOD CHAIN DYNAMICS OF THE POLYCHAETE, NEREIS VIRENS CULTURED ON ANIMAL TISSUE AND DETRITUS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10998

RECYCLING GROUND WATER IN WAUSHARA COUNTY, WISCONSIN: RESOURCE MANAGEMENT FOR COLD-WATER FISH HATCHERIES,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 4B.
W76-11082

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

SOURCES OF INFORMATION IN WATER RESOURCES, AN ANNOTATED GUIDE TO PRINTED MATERIALS,
California Univ., Berkeley. Water Resources Center Archives.
For primary bibliographic entry see Field 10C.
W76-10881

10C. Secondary Publication And Distribution

DIRECTORY OF DISASTER-RELATED TECHNOLOGY,
Federal Disaster Assistance Administration, Washington, D. C.
Hud Report No. 401-FDAA, 1975. Prepared for the Federal Disaster Assistance Administration by the Smithsonian Science Information Exchange, Washington, D. C. 817 p, 559 ref.

Descriptors: *Disasters, *Floods, *Safety, *Research and development, *Research priorities, *Technology, *Hazards, Governments, Safety factors, Hurricanes, Water quality, Earthquakes, Tornadoes, *Information exchange, Publications.
Identifiers: Performing organization, Major disasters, Directures.

The Directory is a compendium of studies, investigations and research efforts undertaken since 1970 related to disaster preparedness, assistance, mitigation and hazard reduction of natural disasters in the U. S. Its purpose is to improve the application of disaster related technology by Federal, State and local governments and the private sector through information exchange on the results of research studies. Information is arranged into eight sections with each of the 1,287 projects keyed to a unique reference number which provides quick access to all elements of information. The sections are: Geographic Areas, locations in which technology has application; Functional Categories, information relating to individual assistance, public assistance, disaster mitigation and hazard reduction; Technology Categories, detection, engineering, geology, seismology and transportation engineering; Disaster Types has full text summaries of ongoing and completed projects, classified by subject content. Supporting Organization has a single alphabetical listing of supporting agencies with cross reference numbers to the project in the Disaster Types Section, an address list and an alphabetical listing of supporting organizations arranged within each disaster type; Performing Organization provides reference numbers for projects and lists performing agencies within each disaster type; Investigator/Author and Project Title List complete the directory. An extensive bibliography on natural hazards is included. (Salzman-North Carolina)
W76-10502

LITERATURE REVIEW: MOVEMENT OF SPILLED OIL AT SEA,
Mathematica, Inc. Philadelphia, Pa. Regional and Environmental Studies,
For primary bibliographic entry see Field 5B.
W76-10599

DIRECTORY OF EPA, STATE AND LOCAL ENVIRONMENTAL QUALITY MONITORING AND ASSESSMENT ACTIVITIES.
Smithsonian Institution, Cambridge, Mass. Center for Short-Lived Phenomena.
For primary bibliographic entry see Field 5G.
W76-10623

A SELECTED ANNOTATED BIBLIOGRAPHY ON FISH AND WILDLIFE IMPLICATIONS OF MISSOURI BASIN WATER ALLOCATION,
Colorado Univ., Boulder, Colo. Inst. of Behavioral Science.
For primary bibliographic entry see Field 4C.
W76-10825

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS: FEEDLOT POINT SOURCE CATEGORY,
Environmental Protection Agency, Office of Air and Water Programs. Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10829

DDT IN WATER, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-10877

WATER REUSE, A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-10878

AGRICULTURAL RUNOFF, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-10879

SOURCES OF INFORMATION IN WATER RESOURCES, AN ANNOTATED GUIDE TO PRINTED MATERIALS,
California Univ., Berkeley. Water Resources Center Archives.
G. J. Giefer.
Water Information Center, Inc., Port Washington, N. Y., 1976, 290 p.

Descriptors: Water resources, *Documentation, *Bibliographies, *Publications, *Information exchange, United States, Research and development, Environment, Water quality, Data collections.

This guide cites and annotates over 1,100 titles found useful for reference purposes in the water resources field. The guide attempts to bring together secondary sources, a core of titles familiar to hydrologists, titles from allied fields which cover certain aspects of water, and the pertinent bibliographic aids now appearing in the literature as the environmental sciences. The emphasis has been upon the literature of the United States. While several titles treating each of the States are included, there is no attempt to include all existing reference works on specific areas and States. Textbooks are not included; few journal citations are included. The period covered is, in general, 1960 to date; earlier works are included in several subject areas where the work cited represents a long retrospective search or is otherwise in some way noteworthy. The literature has been arrange in a modified form of the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology. Within the subdivisions of these categories, reference works have been arranged by the following forms: guides and manuals; bibliographies; indeces and abstract journals; encyclopedias; dictionaries; publication lists; handbooks; directories; and data compilations. A combined author, title, subject index is provided.
W76-10881

GROUNDWATER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 02F.
W76-11066

10F. Preparation Of Reviews

GROUNDWATER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 02F.
W76-11066

LIBRARY U. OF I. URBANA-CHAMPAIGN

SUBJECT INDEX

ABSORPTION
Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

Accumulation, Release, and Retention of Petroleum Hydrocarbons by the Oyster, Crassostrea Virginica,
W76-11018 5C

ACTIVATED CARBON
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

ACTIVATED SLUDGE
Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water, Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci),
W76-10515 5A

Foam Formation in Plants for Biological Purification of Effluents from the Manufacture of Kraft Pulp (Penoobrazuvaneto v stantsiite za biologichno prechistvane naotpad' chite vodi ot proizvodstvoto na sulfatnatseluloza),
W76-10833 5D

Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

ACUTE OIL POLLUTION
Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

ADDITIVES
Physical Growth and Behavioral Development of Mice Receiving Chlorine and Fluorine,
W76-10551 5C

ADJACENT LANDOWNERS
Phillips Ranch, Inc. V Banta (Rights in Water Adjacent to Plaintiff's Property Doesn't Give Defendant Easement to Carry Water Over Plaintiff's Property).
W76-10804 6E

ADJUDICATION PROCEDURE
Settlement of Disputes Arising Under the Law of the Sea Convention,
W76-10590 6E

ADMINISTRATION
Water Resources Planning Act,
W76-10776 6E

ADMINISTRATIVE AGENCIES
Interdisciplinary/Interinstitutional Requirements for Water Resource Planning: Processes to Enhance Cooperation,
W76-10609 6B

Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities.
W76-10623 5G

Illinois Laws Relating to Waterways 1973.
W76-10720 6E

Environmental Protection Agency: Grants and Other Federal Assistance, State and Local Assistance.
W76-10765 5G

Deepwater Port Site Evaluation,
W76-10766 5G

Deepwater Ports: Licensing Procedures and Design Construction, Equipment and Operations,
W76-10767 5G

Drainage Districts.
W76-10784 6E

ADMINISTRATIVE REGULATIONS
Deepwater Port Site Evaluation,
W76-10766 5G

Organic Chemicals Manufacturing Point Source Category, Ethylene Oxide, Ethylene Glycol, Methyl Amines and Oxo Chemicals Processes,
W76-10769 5G

ADOPTION OF PRACTICES
Zoning--Flood Control.
W76-10781 6E

ADSORPTION
Advances in Interfacial Phenomena of Particulate/Solution/Gas Systems; Applications to Flotation Research,
W76-10627 5D

Electrochemical Properties of the Oxide-Solution Interface in Relation to Flotation,
W76-10629 5B

Determination of Surface Equilibria and Mass Transfer Rates in a Concurrent Flow Bubble Column,
W76-10632 5D

Behavior of Hydrogen and Hydroxyl Ions at the Oxide-Water Interface,
W76-10633 5B

Characterization of Adsorbed Cobalt at the Oxide-Water Interface,
W76-10634 5D

Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems using Electron Spectroscopy for Chemical Analysis,
W76-10635 5D

Adsorption Mechanism of Sulfides at a Platinum-Solution Interface,
W76-10636 5D

Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

ADVECTION
Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

ADVERSE POSSESSION
Bushy and Vanguard V, Ltd V Seven Lakes Reservoir Co. (Seepage and Percolation from Subsurface Destroying Adverse Possessor's Claims).
W76-10802 6E

AERATED LAGOONS
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards System Design,
W76-10512 5D

Aerobic Waste Treatment,
W76-11035 5D

AERIAL PHOTOGRAPHY
Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

AEROBIC BACTERIA
The Total Aerobic Heterotrophic Bacteria Germ Content of Water from the Series of Shallow Inlets to the South of Darss Found by Investigation Using the Cast Plate and the MPN Methods, (In German),
W76-10897 5A

AEROBIC TREATMENT
Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

Aerobic Waste Treatment,
W76-11035 5D

AEROSOLS
Aerosol Production from Land Application of Wastewater by Agricultural Irrigation Equipment,
W76-10625 5D

Proceedings from a Workshop on Inadvertent Weather Modification.
W76-10901 3B

Atmospheric Effects of Pollutants,
W76-10903 5A

Recent Developments in Chemical Aerosol Analysis,
W76-10910 5A

Introduction to the Atmospheric Aerosol System,
W76-10911 5A

Urban Aerosols and Inadvertent Weather Modification,
W76-10913 4C

AFRICA
Application of the Stanford Watershed Model to Nigerian Watersheds,
W76-10923 2A

AGING
Some Mechanisms of Weathering of Petroleum Hydrocarbons on Marine Waters: Competitive Pathways to Fate and Disposition of Petroleum Pollution,
W76-11010 5B

AGRICULTURAL CHEMICALS
Toxicity of Agricultural Chemicals to Larvivorous Fish in Korean Rice Fields,
W76-11095 5C

AGRICULTURAL RUNOFF
Rounding Up Runoff: Reflections in Waste Handling Systems,
W76-10530 5D

Pollution Potential of Runoff from Livestock Feeding Operations,
W76-10531 5B

EPA'S New Feedlot Disposal Plan,
W76-10532 5D

AGRICULTURAL RUNOFF

Waterway Cleans Feedlot Runoff,
W76-10537 5D

Effect of Cattle Feedyard Runoff on Soil Infiltration Rates,
W76-10538 5B

Effect of Soil-Incorporated Dairy Cattle Manure on Runoff Water Quality and Soil Properties,
W76-10539 5B

Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

Water Quality and Management Characteristics of Feedlot Runoff Holding Ponds,
W76-10545 5D

An Economic Appraisal of Alternative Dairy Waste Management Systems Designed for Pollution Control,
W76-10547 5D

Quality Variation of Feedlot Runoff in Storage,
W76-10549 5B

Samplers for Monitoring Runoff Waters,
W76-10550 5A

Water Pollution Control Act of 1972, Economic Impacts, Irrigated and Non-Irrigated Agriculture.
W76-10564 5G

Agricultural Runoff, A Bibliography, Volume 2.
W76-10879 5B

AGRICULTURE

Water to the Fields: India's Changing Strategy,
W76-10589 3F

The Inadvertent Impacts of Agriculture on Weather and Climate and Agricultural Methods for Amelioration of Climatic Stress,
W76-10902 3B

AIR POLLUTION

A Clean Piece of Paper,
W76-10842 5D

Reasons for Having the IVL-Institute for Water and Air Pollution Control Research. (Varfor ett IVL-institut for vatten- och luftvardsforskning.),
W76-10853 5G

Environmental and Social Factors (in the Paper Industry),
W76-10861 5G

Proceedings from a Workshop on Inadvertent Weather Modification.
W76-10901 3B

Some Characteristics of A Dusty Rain in Yugoslavia,
W76-10906 5A

Dispersion of Pollutants,
W76-10907 5B

Wind-Tunnel Simulation of Atmospheric Flow and Dispersion,
W76-10908 5A

Recent Developments in Chemical Aerosol Analysis,
W76-10910 5A

Introduction to the Atmospheric Aerosol System,
W76-10911 5A

The Legal Requirement for the Assessment of Inadvertent Weather Modification - An Engineering Viewpoint,
W76-10912 3B

Monsoonal Deposition of Sea Salt and Air Pollutants Over Bombay,
W76-10932 5B

Legal Aspects of Odor and Dust from Feedlots,
W76-11054 5G

A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

AIR POLLUTION EFFECTS

Particle Emissions from a Large Kraft Paper Mill and Their Effects on the Microstructure of Warm Clouds,
W76-10904 5A

ALABAMA

Environmental Improvement Authorities Act of 1969 (Formation of Public Corporations to Deal with Pollution),
W76-10777 6E

Bear Creek Development Authority,
W76-10778 6E

ALASKA

Sovereignty of State.
W76-10789 6E

Village Safe Water Act.
W76-10790 6E

ALGAE

Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

A Kinetic Approach to the Effect of Temperature on Algal Growth,
W76-10987 5C

ALGORITHM 2

Solving Discrete-Variable Multiple-Constraint Non Linear Programs: The Decision State Method, (Vol. 3),
W76-10606 6A

ALTERNATIVE COSTS

An Analysis of Dairy Waste Management Alternatives for Southern California Dairymen,
W76-10534 5G

Water Pollution Control Act of 1972, Municipal Options.
W76-10568 5G

ALTERNATIVE PLANNING

An Economic Appraisal of Alternative Dairy Waste Management Systems Designed for Pollution Control,
W76-10547 5D

ALUM

Regina Tertiary Treatment Plant Study and Design, (Part II),
W76-10516 5D

ALUMINUM SULFATE

Studies on Coagulation Treatment of Spent Water from Pulping Process. Part 2. Coagulation Characteristics of Hemicellulose (In Japanese),
W76-10839 5D

AMINES

Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

AMMONIA

Oxidation of Ammonia in Water by Ferrates (VI) and (IV),
W76-10611 5D

Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

Studies on the Toxicity of Ammonia, Nitrate and Their Mixtures to the Common Guppy,
W76-10811 5C

AMMONIA/NITRATE RATIO

Studies on the Toxicity of Ammonia, Nitrate and Their Mixtures to the Common Guppy,
W76-10811 5C

AMMONIUM COMPOUNDS

Fertilizer Manufacturing Point Source Category, Urea Subcategory,
W76-10764 5G

ANADROMOUS FISH

The Third U. N. Law of the Sea Conference: Major Unresolved Fisheries Issues,
W76-10733 6E

ANAEROBIC CONDITIONS

Soil Conservation Service Program in Animal Waste Management,
W76-11046 5G

ANAEROBIC LAGOONS

Disposal of Cattle Feedlot Waste in an Anaerobic Lagoon on the Organic Soils of South Florida--Preliminary Results,
W76-10540 5E

ANALOG MODELS

An Analog Model of the Chipuxet Aquifer, Rhode Island,
W76-10814 2F

ANALYSIS

Some Data on Zooplankton of Reservoirs in the Mary and Chardzhou Regions of the Turkmen SSR, (In Russian),
W76-10520 2H

ANALYTICAL METHODS

International Conference on Environmental Sensing and Assessment, Volumes 1 and 2.
W76-10637 5A

Spark Source Mass Spectrometry: The Optimum Referee Method for Multielement Analysis,
W76-10649 5A

ANALYTICAL TECHNIQUES

Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water,

Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci),
W76-10515 5A

Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

Water Transport Across Cation-Exchange Membrane. I. Experimental Technique. Influence of the Concentration and Temperature on the Water Transport Number,
W76-10620 3A

Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems using Electron Spectroscopy for Chemical Analysis,
W76-10635 5D

Sampling and Analysis of Metals in Air, Water and Waste Products,
W76-10639 5A

Water Contamination Detection,
W76-10648 5A

Trace Metal Analysis by Atomic Emission Using a D.C. Argon Plasma,
W76-10651 5A

Some Considerations on Monitoring of Trace Metals in Estuaries and Oceans,
W76-10653 5A

Recent Developments in Chemical Aerosol Analysis,
W76-10910 5A

Automated Determination of Carbon in Natural Waters,
W76-10936 5A

Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

ANIMAL SHELTERS
Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

ANNELIDS
Comparison of the Food Chain Dynamics of the Polychaete, Nereis Virens Cultured on Animal Tissue and Detritus,
W76-10998 5C

ANTARCTIC
Identification of Nuclei and Concentrations of Chemical Species in Snow Crystals Sampled at the South Pole,
W76-10696 2C

ANTIGUA (WEST INDIES)
A Method for Determining the Irrigation Requirement in Antigua, W. I.,
W76-10981 3F

ANTITRANSPIRANTS
Antitranspirant Sprays Affecting Fruit Size of Early Amber Peaches,
W76-10725 3F

ANZA-TERWILLIGER AREA (CALIF)
Geohydrology of the Anza-Terwilliger Area, Riverside County, California,
W76-11074 4B

APLOCHEILUS LATIPES
Toxicity of Agricultural Chemicals to Larvivorous Fish in Korean Rice Fields,
W76-11095 5C

APPLICATION METHOD
Chemical and Microbiological Changes in Poultry Litter Applied to Soil as Influenced by the Time and Method of Application,
W76-10615 5E

APPLICATION METHODS
Aerosol Production from Land Application of Wastewater by Agricultural Irrigation Equipment,
W76-10625 5D

Waste Application to Soils,
W76-11042 5D

APPLICATION RATES
Excessive Manure Can Affect Potable Water.
W76-10542 5B

Chemical and Microbiological Changes in Poultry Litter Applied to Soil as Influenced by the Time and Method of Application,
W76-10615 5E

Manure and the Nitrate Problem,
W76-10616 5E

Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

APPROPRIATION
South Dakota's System of Water Management and its Relation to Land Use and Economic Development,
W76-10721 4A

Hyrup V Kleppe (Right-of-way for Pipeline to Tap Water from Spring on Public Land).
W76-10797 6E

Provo City V Lambert (Modification of City's Appropriation Certificate).
W76-10803 6E

AQUATIC INSECTS
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

AQUATIC INVERTEBRATES
Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

AQUATIC MICROBIOLOGY
Tropic Status of Selected Northern New Mexico Lakes,
W76-10808 5C

AQUATIC PRODUCTIVITY
Some Considerations of the Chronic Effects of Petroleum in the Marine Environment,
W76-11023 5C

AQUATIC WEEDS
Studies on Evapotranspiration of Some Aquatic Weeds,
W76-10554 2D

AQUICULTURE
The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Foodchain Studies,
W76-10986 5C

Removal of Inorganic Nitrogen in an Integrated Food Chain System,
W76-10988 5C

Heat Exchangers for Use in the Culturing of Marine Organisms,
W76-10990 5G

Social, Political, Regulatory and Marketing Problems of Marine Waste-Food Recycling Systems,
W76-10991 5G

The Use of Power Plant Waste Heat in Marine Aquaculture,
W76-10992 5D

Permissible Levels of Heavy Metals in Secondary Effluent for Use in a Combined Sewage Treatment-Marine Aquaculture System. I. Monitoring During Pilot Operation,
W76-10993 5D

Permissible Levels of Heavy Metals in Secondary Effluent for use in a Combined Sewage Treatment-Marine Aquaculture System. II. Development of Guidelines by Methods, of Additions,
W76-10994 5D

Integrated Systems of Mollusk Culture,
W76-10996 5C

Polyspecies Aquaculture Systems: The Detrital Trophic Level,
W76-10997 5C

Comparison of the Food Chain Dynamics of the Polychaete, Nereis Virens Cultured on Animal Tissue and Detritus,
W76-10998 5C

Virus Survival Patterns in a Tertiary Sewage Treatment-Aquaculture Model System,
W76-10999 5D

Uptake, Translocation and Elimination of Individual Chlorobiophenyls by Oysters,
W76-11000 5C

AQUIFER CHARACTERISTICS
Groundwater,
W76-11066 2F

The Sparta Aquifer System in Mississippi,
W76-11067 7C

Maps Showing Ground-Water Conditions in the Lower Hassayampa Area, Maricopa County, Arizona--1975,
W76-11068 7C

AQUIFERS
Monitoring Groundwater Pollution,
W76-10659 5A

Groundwater Pollution Monitoring Case Studies,
W76-10661 5A

An Analog Model of the Chipuxet Aquifer, Rhode Island,
W76-10814 2F

Subsurface Waters of Erosion Troughs in the Aktyuba Region of the Ural - A Source of Drinking Water Supply,
W76-10943 2F

ARBOREAL INTERCEPTION
A Note on the Contribution of Fog Drip to Streamflow,
W76-10927 2B

ARCTIC
Milankovitch Solar Radiation Variations and Ice Age Ice Sheet Sizes,
W76-10949 2C

ARCTIC OCEAN
Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

ARGON
Trace Metal Analysis by Atomic Emission Using a D.C. Argon Plasma,
W76-10651 5A

ARITHMETIC WATER QUALITY INDEX
A Comparison of Several Water Quality Indexes,
W76-10926 5A

ARIZONA
Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-10585 6B

Text and Commentary for Weather Modification Control Law,
W76-10809 3B

AROMATIC COMPOUNDS
Polycyclic Aromatic Compounds in Nature,
W76-10865 5B

ARSENIC COMPOUNDS
Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

ARTIFICIAL RECHARGE
Optimal Management of the Subsurface Environment: Parameter Identification,
W76-10613 5B

ARTIFICIAL REEFS
Final Environmental Statement, Construction of Artificial Reefs in the Atlantic Ocean Off Cape Henry, Virginia.
W76-11094 8B

ARTIFICIAL SUBSTRATES
Final Environmental Statement, Construction of Artificial Reefs in the Atlantic Ocean Off Cape Henry, Virginia.
W76-11094 8B

ARTIFICIAL WATERCOURSES
Natural Resources, Dept of; Navigable Waters.
W76-10786 6E

ASBESTOS
Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textile, Friction Materials and Sealing Devices Segment of the Asbestos Manufacturing Point Source Category,
W76-10595 5G

ASIA
Water to the Fields: India's Changing Strategy,
W76-10589 3F

Monsoonal Deposition of Sea Salt and Air Pollutants Over Bombay,
W76-10932 5B

ASSESSMENTS
Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities.
W76-10623 5G

ATLANTIC OCEAN
Dumping Sewage Sludge in the Ocean.
W76-10674 5E

Baroclinic Instability in the Denmark Strait Overflow,
W76-10693 2L

Final Environmental Statement, Construction of Artificial Reefs in the Atlantic Ocean Off Cape Henry, Virginia.
W76-11094 8B

ATMOSPHERE
Atmospheric Effects of Pollutants,
W76-10903 5A

Introduction to the Atmospheric Aerosol System,
W76-10911 5A

ATOMIC ABSORPTION SPECTROMETRY
Atomic-Absorption Determination of Vanadium and Molybdenum in Tap Water and Mineral Waters After Anion-Exchange Separation,
W76-10869 5A

ATRAZINE
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

ATTITUDES
Social, Political, Regulatory and Marketing Problems of Marine Waste-Food Recycling Systems,
W76-10991 5G

AUTOMATION
Automated Forecast Procedures for River Quality Management,
W76-10664 5A

AVULSION
Coastal Industrial Water Authority V. York (No Change to Title to Land by Avulsion Even Through Avulsion Artificially Caused).
W76-10796 6E

BACKWASHING APPARATUS
Filtration and Backwashing Apparatus for Use with a Water Filtration System,
W76-10977 5F

BACKWATER
Upstream Flood Lowering in Reservoirs,
W76-10938 4A

BACTERIA
Distribution of Stream Pollution in Lake Water,
W76-10712 5B

Bacterial Growth Rates and Temperature Optima in a Stream with a Fluctuating Thermal Regime.
W76-10886 5C

The Total Aerobic Heterotrophic Bacteria Germ Content of Water from the Series of Shallow Inlets to the South of Darss Found by Investigation Using the Cast Plate and the MPN Methods, (In German),
W76-10897 5A

Bacterioplankton and its Significance in the Bioproductivity of the Reservoirs, (In Russian),
W76-10969 5C

Effect of a Livestock Wintering Operation on a Western Mountain Stream,
W76-11059 5A

BACTERIAL TRACERS
Distribution of Stream Pollution in Lake Water,
W76-10712 5B

BACTERIOLOGY
Survival of Human Pathogens in the Marine Environment,
W76-10890 5C

BACTERIOPLANKTON
Bacterioplankton and its Significance in the Bioproductivity of the Reservoirs, (In Russian),
W76-10969 5C

BALTIC SEA
Abundance and Biomass of Zooplankton during the Synoptic Investigation of the Shallow Inlets to the South of the Zingst Peninsula (South Baltic) During May/June, 1972. (In German),
W76-10817 5C

BARIUM
Barium in Southern California Coastal Waters: A Potential Indicator of Marine Drilling Contamination,
W76-11089 5A

BARK
Land Application of Sewage Sludge. III. Nitrate Accumulation and Wheat Growth Resulting from Addition of Sewage Sludge and Wood Wastes to Soils,
W76-10841 5E

BARNACLES
Biological Fate of Petroleum Hydrocarbons in Aquatic Macroorganisms,
W76-11014 5C

BASELINE STUDIES
Earthwatch-Sentinel for the Future,
W76-10645 5A

Water Supply for the Greater New York Metropolitan Area,
W76-10983 6B

BASIC DATA COLLECTIONS
Ground-Water Levels in New Mexico, 1974,
W76-11073 2F

BASINS
Bushy and Vanguard V, Ltd V Seven Lakes Reservoir Co. (Seepage and Percolation from Subsurface Destroying Adverse Possessor's Claims).
W76-10802 6E

BEACHES
Beach and Shore Restoration; Authority of State Over Federal and Local Beach Restoration Projects.
W76-10794 6E

Sargent Lake Ass'n. V Dane (Rights of Property Owners Association in a Dam, Beach, and Shorefront Area).
W76-10795 6E

BEEF
Economic Considerations Involved in Selecting Types of Confinement and Waste Disposal Systems for Swine and Beef,
W76-11043 5D

BEHAVIOR
Physical Growth and Behavioral Development of Mice Receiving Chlorine and Fluorine,
W76-10551 5C

BENEFITS
Benefits from Water Pollution Abatement, Property Values,
W76-10580 5G

BENTHIC DIATOMS
Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

BENTHIC FAUNA
Polyspecies Aquaculture Systems: The Detrital Trophic Level,
W76-10997 5C

BENTHIC FLORA
Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

BENTHIC ORGANISMS
Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

The Importance of Oil Pollution in the North Sea,
W76-11026 5B

Some Biological Effects Related to the West Falmouth Oil Spill,
W76-11029 5C

BENTHOS
Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

Use of A Trophodynamic Chain of the Benthic Type for the Study of Transfers of Metallic Pollutants, (In French),
W76-10944 5C

BERING STRAIT
Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

BERYLLIUM SULFATE
Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

BI-LEVEL DRAINAGE
Field and Laboratory Evaluation of Bi-Level Drainage Theory,
W76-10934 4A

BIBLIOGRAPHIES
Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

A Selected Annotated Bibliography on Fish and Wildlife Implications of Missouri Basin Water Allocation,
W76-10825 4C

DDT in Water, A Bibliography, Volume 2.
W76-10877 5C

Water Reuse, a Bibliography, Volume 5.
W76-10878 5D

Agricultural Runoff, A Bibliography, Volume 2.
W76-10879 5B

Sources of Information in Water Resources, an Annotated Guide to Printed Materials,
W76-10881 10C

Greater Pittsburgh Regional Studies, Reports and Maps, April 1976.
W76-11072 7C

BIBLIOGRAPHY
Groundwater,
W76-11066 2F

BIOASSAY
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

Marine Molysmology: The Primary Production of Experimental Ecosystems Set up in the Rance River Estuary. Effect of Crude Oil,
W76-10830 5C

Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish,
W76-10896 5C

Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

BIOASSAYS
Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

A Literature Review of the Biological Impact of Oil Spills in Marine Waters,
W76-11027 5C

BIOCHEMICAL OXYGEN DEMAND
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards System Design,
W76-10512 5D

BIOCHEMISTRY
Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

BIODEGRADATION
Long-Term Stability of Waste Lignins in Aquatic Systems. Part 2. Stability in Saline Water,
W76-10838 5B

Biodegrading Poultry Excreta with House Fly Larvae: The Concept and Equipment,
W76-11053 5D

BIOINDICATORS
PCB'S in the Environment,
W76-10739 5C

BIOLOGICAL FILTERS
Biological Filters (Biologicheskie fil'try),
W76-10850 5D

BIOLOGICAL MEMBRANES
Biological Filters (Biologicheskie fil'try),
W76-10850 5D

BIOLOGICAL TREATMENT
Biological Filters (Biologicheskie fil'try),
W76-10850 5D

Detoxification of Bleached Kraft Mill Effluents,
W76-10867 5D

BIOLOGICAL UPTAKE
Accumulation, Release, and Retention of Petroleum Hydrocarbons by the Oyster, Crassostrea Virginica,
W76-11018 5C

BIOMASS
Abundance and Biomass of Zooplankton during the Synoptic Investigation of the Shallow Inlets to the South of the Zingst Peninsula (South Baltic) During May/June, 1972. (In German),
W76-10817 5C

Determination of the Biomass and Detritus Content from Natural Phytoplankton Scoop Samples, (In German),
W76-10864 5A

BIOPOLYMERS
Structure of Water in the Cell: Review of the Literature, (In Russian),
W76-10974 1A

BIRDS
Studies for Wildlife on Energy Areas,
W76-10820 6G

Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

BIRDS OF PREY
Raptor Study of Utah Oil Shale Area,
W76-10822 6G

BLANEY-CRIDDLE METHOD
Predicting Consumptive use with Climatological Data,
W76-10873 2D

BLEACHING WASTES
Long-Term Stability of Waste Lignins in Aquatic Systems. Part 2. Stability in Saline Water,
W76-10838 5B

Foam Separation for Detoxification of Bleached Kraft Mill Effluents,
W76-10855 5D

Effluents from Chlorination and Alkaline Extraction of Pine Sulfate Pulp,
W76-10858 5B

Sequential Chlorination -- Impact on the Environment,
W76-10860 5D

BLOCK RATE COSTS
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

BLOWOUTS
Oil in Sea Ice,
W76-11098 5B

BOATING REGULATIONS
Navigable Waters: Riparian Rights.
W76-10787 6E

BOILER FEED WATER
New Boiler Water Chemical Treatment Reduces Corrosion and Scale Buildup.
W76-10859 3E

BOMBAY (INDIA)
Monsoonal Deposition of Sea Salt and Air Pollutants Over Bombay,
W76-10932 5B

BORON
Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

BOUNDARY DISPUTES
Settlement of Disputes Arising Under the Law of the Sea Convention,
W76-10590 6E

Ocean Boundaries and Petroleum Resources,
W76-10596 6E

The Great Maine Lobster War,
W76-10747 6E

Coastal Industrial Water Authority V. York (No Change to Title to Land by Avulsion Even Through Avulsion Artificially Caused).
W76-10796 6E

BOUNDARY LAYER
Steady Laminar Flow in a Stationary Tank with a Spinning Bottom,
W76-11062 8B

BOUNDARY LAYERS
Oblique Impingement of Circular Turbulent Jets,
W76-10709 8B

Experimental and Theoretical Investigations in an Oscillatory Turbulent Boundary Layer,
W76-10916 8B

BREAKWATERS
Volume and Strength of a Dolos,
W76-10523 8F

Portable Floating Wave Tripper,
W76-10954 8B

BREAM
Ecological Variability of Bream in Lithuanian Waters: 2. Age and Growth Rate, (In Russian),
W76-10519 5C

BRIDGE DESIGN
Floodflow Characteristics at Proposed Bridge Site on Mohawk River in Towns of Frankfort and Schuyler, Herkimer County, New York,
W76-11079 4A

BRINE DISPOSAL
Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

BRINES
Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

BROOK TROUT
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

BUDGETING
H.R. 5952 (Water Resources Planning Act),
W76-10775 6E

BULKHEAD LINE
Navigable Waters: Riparian Rights.
W76-10785 6E

BUNKER FUEL
Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

CALCIUM
An Empirical Na-K-Ca Geothermometer for Natural Waters,
W76-10598 2K

CALCIUM SULFATE
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

CALIFORNIA
Preventing Water Pollution from Turkey Operations,
W76-10535 5G

Farm Animal Manures: An Overview of Their Role in the Agricultural Environment,
W76-10548 5G

Upstream Changes in Fish Populations Following Impoundment of Sagehen Creek, California,
W76-10619 2I

Polychlorinated Biphenyls Off Southern California,
W76-10647 5C

People Ex Rel Younger V Superior Court (Damage Assessment to Public Entity Constitutional Because not Punitive).
W76-10800 6E

San Francisco Civil Service Ass'n, Local 400 V State Ex Rel Regional Water Quality Control Board (Damages Assessment for Pollutants to Public Entity Constitutional).
W76-10801 6E

Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

Urban Aerosols and Inadvertent Weather Modification,
W76-10913 4C

Problems of Public Works Projects in the Present Economic Climate,
W76-10980 6C

Ground Water Quality Monitoring for California's Needs,
W76-11065 5A

Water-Quality Investigation, Eel River, California,
W76-11069 5A

Geohydrology of the Anza-Terwilliger Area, Riverside County, California,
W76-11074 4B

Variation in Concentration of Selected Water-Quality Constituents in the Sacramento River at Bend Bridge, California,
W76-11078 5A

Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

CALORIES
Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

CANADA
Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

Monitoring of Subsurface Waste-Disposal Operations: A Generalized Systems Approach with Examples from Canadian Case Histories,
W76-10662 5D

The Great Maine Lobster War,
W76-10747 6E

Effect of Vegetation on Lateral Migration of Anastomosed Channels of a Glacier Meltwater River,
W76-10940 4C

Distribution of Suspended Oil Particles Following the Grounding of the Tanker Arrow,
W76-11096 5B

CANAL CONSTRUCTION
Environmental Investigation of Eden Isles,
W76-10510 5G

CANALS
Environmental Investigation of Eden Isles,
W76-10510 5G

Water-Quality Data for Canals in Eastern Broward County, Florida, 1969-1974,
W76-11081 7C

CANNERIES
Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

CAPITAL COSTS
Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 1).
W76-10570 5G

Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 2),
W76-10571 5G

CARBOHYDRATES
Studies on Coagulation Treatment of Spent Water from Pulping Process. Part 2. Coagulation Characteristics of Hemicellulose (In Japanese),
W76-10839 5D

CARBON
Automated Determination of Carbon in Natural Waters,
W76-10936 5A

CARBON DIOXIDE
Automated Determination of Carbon in Natural Waters,
W76-10936 5A

CARBON RADIOISOTOPES
Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

CARCINOGENS
Water Programs Secondary Treatment Information,
W76-10770 5D

Domestic Wastewater Disinfection, Secondary Treatment,
W76-10771 5D

Is Our Approach to the Oil Pollution Problem too Crude,
W76-11031 5C

CARIBBEAN
Environmental Monitoring in Latin America and the Caribbean,
W76-10654 5A

CATADROMOUS FISH
The Third U. N. Law of the Sea Conference: Major Unresolved Fisheries Issues,
W76-10733 6E

CATION EXCHANGE
Water Transport Across Cation-Exchange Membrane. I. Experimental Technique. Influence of the Concentration and Temperature on the Water Transport Number,
W76-10620 3A

CATIONIC POLYELECTROLYTES
Coagulation of Textile Industry Effluents with Cationic Polyelectrolytes (Koagulacja sciekow przemyslu wlokienniczego przy uzyciu polielektrolitow kationowych),
W76-10836 5D

CATTLE
Effect of Cattle Feedyard Runoff on Soil Infiltration Rates,
W76-10538 5B

Intact Manure Packs Halt Seepage.
W76-10544 5G

Waste Management Systems for Roofed Beef Confinement Facilities,
W76-11040 5D

Economic Considerations Involved in Selecting Types of Confinement and Waste Disposal Systems for Swine and Beef,
W76-11043 5D

CELLULOSE
Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

Adaptation of Feed Yeast to a Cellulosic Effluent Medium (in Armenian with Russian summary),
W76-10847 5D

CELLULOSE ACETATE
Adaptation of Feed Yeast to a Cellulosic Effluent Medium (in Armenian with Russian summary),
W76-10847 5D

CELLULOSE ATTISHOLZ AG. (SWITZERLAND)
Environmental Protection Installations of Cellulose Attisholz AG. (Umweltschutzanlagen der Cellulose Attisholz AG.).
W76-10849 5D

CENSUS
A Preliminary Design for a National Environmental Census,
W76-10642 5A

CENTRAL U. S.
Coal Mining, Development and Processing -- The Associated Water Problems,
W76-10727 6E

The State and Regional Situation,
W76-11034 5D

Swine Systems for Iowa and North Central States,
W76-11041 5D

A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

CENTRAL VALLEY (CALIF)
Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume I),
W76-10572 5G

Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume II),
W76-10573 5G

CHAMPAIGN COUNTY (ILL)
Groundwater Availability in Champaign County,
W76-10718 4B

CHANGING DISCHARGES
Application of a Residence Time Model to Dilution Gauging, with Particular Reference to the Problem of Changing Discharge,
W76-10935 2E

CHANNEL CATFISH
Water Quality in a Recirculating Raceway System for Fish Culture,
W76-10546 5G

CHANNEL GEOMETRY
The Relationship of Slope and Stream Channel Form in the River Dart, Devon,
W76-10698 2E

CHANNEL MORPHOLOGY
The Relationship of Slope and Stream Channel Form in the River Dart, Devon,
W76-10698 2E

CHANNEL SLOPE
The Relationship of Slope and Stream Channel Form in the River Dart, Devon,
W76-10698 2E

CHANNEL STABILITY
Effect of Vegetation on Lateral Migration of Anastomosed Channels of a Glacier Meltwater River,
W76-10940 4C

CHANNEL WIDTH
Channel Width and the Riffle-Pool Sequence,
W76-10924 2E

CHANNELIZATION
Multiobjective Planning and Environmental Evaluation of Water Resource Systems,
W76-10610 6G

CHANNELS
Dredged Material Disposal--Effects and Alternatives,
W76-10724 5E

Channel Width and the Riffle-Pool Sequence,
W76-10924 2E

Effect of Vegetation on Lateral Migration of Anastomosed Channels of a Glacier Meltwater River,
W76-10940 4C

Tide-Induced Mass Transport; A Flushing Mechanism for Shallow Lagoons,
W76-10947 2L

CHARA
Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

CHARACEAE
Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

CHEMCONTROL
Natural Resources, Dept of; Nuisances: Water.
W76-10783 6E

CHEMICAL ANALYSIS
Recent Developments in Chemical Aerosol Analysis,
W76-10910 5A

Water Quality Characteristics of the Illinois River at Peoria,
W76-10922 5A

Water-Quality Investigation, Eel River, California,
W76-11069 5A

Variation in Concentration of Selected Water-Quality Constituents in the Sacramento River at Bend Bridge, California,
W76-11078 5A

Water-Quality Data for Canals in Eastern Broward County, Florida, 1969-1974,
W76-11081 7C

CHEMICAL DEGRADATION
A Strategy for Aquatic Pollutants Fate and Transport Determination,
W76-10665 5B

Decision Mapping - Tool for Underground Waste Management,
W76-11063 5B

CHEMICAL INDUSTRY
An Integrated Power Process Model of Water Use and Wastewater Treatment in Chlorine Caustic Production,
W76-10621 5D

Organic Chemicals Manufacturing Point Source Category, Ethylene Oxide, Ethylene Glycol, Methyl Amines and Oxo Chemicals Processes,
W76-10769 5G

CHEMICAL OXYGEN DEMAND
Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water,

Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci),
W76-10515 5A

CHEMICAL PROPERTIES
Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

Chemical and Microbiological Changes in Poultry Litter Applied to Soil as Influenced by the Time and Method of Application,
W76-10615 5E

Interfacial Chemistry of Particulate Flotation,
W76-10628 5B

A Comparison of Several Water Quality Indexes,
W76-10926 5A

Some Water Quality Aspects in a Nascent Impoundment in Central Illinois,
W76-10950 5B

CHEMICAL REACTIONS
Electrochemical Production of Free Radicals for Wastewater Treatment,
W76-10876 5D

CHEMICAL WASTES
PCB'S in the Environment,
W76-10739 5C

Ink Formulating Point Source Category, Pretreatment Standards for Existing Sources,
W76-10774 5G

An Investigation of Effluent Control Standards and Practices (Atomic Energy Production),
W76-10828 5G

CHEMISTRY
Identification of Nuclei and Concentrations of Chemical Species in Snow Crystals Sampled at the South Pole,
W76-10696 2C

CHEMISTRY OF PRECIPITATION
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

CHESAPEAKE BAY
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

Evaluation of Water Samples Collected During LANDSAT-1 Overpasses of the Lower Chesapeake Bay Area,
W76-10672 5A

Metabolism of Mercury Compounds in Microorganisms,
W76-10894 5C

CHICAGO (ILL)
Possible Urban Effects on Maximum Daily Rainfall at Paris, St. Louis and Chicago,
W76-10929 4C

CHIPUXET AQUIFER (RI)
An Analog Model of the Chipuxet Aquifer, Rhode Island,
W76-10814 2F

CHLORDANE
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

CHLORINATED HYDROCARBON PESTICIDES
Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

CHLORINATED HYDROCARBONS
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

CHLORINATION
Domestic Wastewater Disinfection, Secondary Treatment,
W76-10771 5D

Sequential Chlorination -- Impact on the Environment,
W76-10860 5D

Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish,
W76-10896 5C

Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

CHLORINE
Physical Growth and Behavioral Development of Mice Receiving Chlorine and Fluorine,
W76-10551 5C

Water Programs Secondary Treatment Information,
W76-10770 5D

CHLOROPHYLL
Evaluation of Water Samples Collected During LANDSAT-1 Overpasses of the Lower Chesapeake Bay Area,
W76-10672 5A

CHRONIC TOXICITY
Some Considerations of the Chronic Effects of Petroleum in the Marine Environment,
W76-11023 5C

CIRCULAR TURBULENT JETS
Oblique Impingement of Circular Turbulent Jets,
W76-10709 8B

CIRCULATION
Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

CITIES
Water Pollution Control Act of 1972, Municipal Options.
W76-10568 5G

Natural Resources, Dept of; Nuisances: Water.
W76-10783 6E

Possible Urban Effects on Maximum Daily Rainfall at Paris, St. Louis and Chicago,
W76-10929 4C

CLAMS
Uptake and Depuration of Specific Hydrocarbons from Oil by the Bivalves Rangia Cuneata and Crassostrea Virginica,
W76-11024 5C

CLASSIFICATION
Water Quality and the Water and Soil Conservation Act 1967,
W76-10737 5G

Timber Products Processing Point Source Category, Proposed Pretreatment Standards for Existing Sources,
W76-10760 5G

Ground Water Quality Monitoring for California's Needs,
W76-11065 5A

CLIMATIC DATA
Predicting Consumptive use with Climatological Data,
W76-10873 2D

CLOUD PHYSICS
Proceedings from a Workshop on Inadvertent Weather Modification.
W76-10901 3B

CLOUD SEEDING
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

CLOUDS
Particle Emissions from a Large Kraft Paper Mill and Their Effects on the Microstructure of Warm Clouds,
W76-10904 5A

Inadvertent Effects in Weather Modification,
W76-10909 3B

COAGULATION
Coagulation of Textile Industry Effluents with Cationic Polyelectrolytes (Koagulacja sciekow przemyslu wlokienniczego przy uzyciu polielektrolitow kationowych),
W76-10836 5D

Studies on Coagulation Treatment of Spent Water from Pulping Process. Part 2. Coagulation Characteristics of Hemicellulose (In Japanese),
W76-10839 5D

COALESCENCE
Use of Log-Normal Distributions for Numerical Calculations of Condensation and Collection,
W76-10694 2B

COALS
Coal Mining, Development and Processing -- The Associated Water Problems,
W76-10727 6E

COAST GUARD REGULATIONS
Burning Waters,
W76-10740 5G

Deepwater Port Site Evaluation,
W76-10766 5G

COASTAL STRUCTURES
Deepwater Port Site Evaluation,
W76-10766 5G

Deepwater Ports: Licensing Procedures and Design Construction, Equipment and Operations,
W76-10767 5G

Shoreline Retaining Wall,
W76-10953 8H

Portable Floating Wave Tripper,
W76-10954 8B

COASTAL WATERS
Materials Transportation Bureau: Transpiration of Natural and Other Gas by Pipeline,
W76-10756 5G

Legal Interpretation of Term 'Wetlands'.
W76-10792 6E

COASTAL ZONE MANAGEMENT
Legal Interpretation of Term 'Wetlands'.
W76-10792 6E

COASTAL ZONE MANAGEMENT ACT
The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf,
W76-10734 5G

National Oceanic and Atmospheric Administration: Coastal Zone Management Program, Administration Grants, Allocation of Section 306 Funds to States,
W76-10754 6E

Coastal Zone Management Program Development Grants, Outer Continental Shelf,
W76-10755 6E

COASTS
Polychlorinated Biphenyls Off Southern California,
W76-10647 5C

National Oceanic and Atmospheric Administration: Coastal Zone Management Program, Administration Grants, Allocation of Section 306 Funds to States,
W76-10754 6E

Tide-Induced Mass Transport; A Flushing Mechanism for Shallow Lagoons,
W76-10947 2L

COBALT
Characterization of Adsorbed Cobalt at the Oxide-Water Interface,
W76-10634 5D

COLIFORMS
Frequency Distributions for Coliform Bacteria in Water,
W76-10650 5A

COLORADO
Hyrup V Kleppe (Right-of-way for Pipeline to Tap Water from Spring on Public Land).
W76-10797 6E

Bushy and Vanguard V, Ltd V Seven Lakes Reservoir Co. (Seepage and Percolation from Subsurface Destroying Adverse Possessor's Claims).
W76-10802 6E

Bog Stratigraphy, Radiocarbon Dates, and Pinedale to Holocene Glacial History in the Front Range, Colorado,
W76-11071 2C

COLORADO RIVER BASIN
Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 1).
W76-10570 5G

Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 2),
W76-10571 5G

WSSI Final Report for the Colorado River Basin Pilot Project,
W76-10818 3B

COLUMBIA RIVER
Water Quality Analysis, Columbia River.
W76-10579 5G

An Investigation of Effluent Control Standards and Practices (Atomic Energy Production),
W76-10828 5G

COMBINED SEWERS
Water Pollution Through Rain Overflows from Mixed Sewers (Gewasserverschmutzung Durch Regenuberlaufe Aus Mischkanalisationen),
W76-10688 5B

COMMERCIAL FISHING
Prices and Property Rights in the Fisheries,
W76-10586 6C

Enabling Legislation: Possibilities for the Commercial Fishing Industry,
W76-10593 6E

Department Opposes Unilateral Extension of U. S. Fisheries Jurisdiction,
W76-10744 6E

COMPENSATION
People Ex Rel Younger V Superior Court (Damage Assessment to Public Entity Constitutional Because not Punitive).
W76-10800 6E

COMPETITIVE PRICES
Prices and Property Rights in the Fisheries,
W76-10586 6C

COMPREHENSIVE PLANNING
Environmental Protection Agency: Policies and Procedures for State Continuing Planning Process,
W76-10762 5G

Comprehensive Water Supply Study for New York State,
W76-10982 6B

COMPUTER MODELS
Simulation of Thermally-Influenced Hydrodynamic Flows: Final Report,
W76-10813 2H

An Analog Model of the Chipuxet Aquifer, Rhode Island,
W76-10814 2F

Soil Water Modeling I: A Generalized Simulator of Steady, Two-Dimensional Flow,
W76-10933 2G

Modeling Solute Transport in Ground Water,
W76-11076 5B

Application of Simple Dam Break Routing Model,
W76-11084 8B

COMPUTER PROGRAMS
Implementation of a Large Scale Water Quality Data Management System,
W76-10588 5A

Management of Groundwater Quality Data,
W76-10660 5A

CONCEPTUAL MODELS (METEOROLOGY)
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

CONCRETE MIXES
Volume and Strength of a Dolos,
W76-10523 8F

CONCRETE (REINFORCED)
Volume and Strength of a Dolos,
W76-10523 8F

CONDENSATION
Use of Log-Normal Distributions for Numerical Calculations of Condensation and Collection,
W76-10694 2B

CONDITIONAL ENTROPY
Entropy Principle Applied to the Rainfall-Runoff Process,
W76-10918 2A

CONFERENCES
International Conference on Environmental Sensing and Assessment, Volumes 1 and 2.
W76-10637 5A

CONFINEMENT PENS
Animal Waste Management Conference.
W76-11032 5D

The State and Regional Situation,
W76-11034 5D

Waste Management Systems for Roofed Beef Confinement Facilities,
W76-11040 5D

CONFINEMENT WINTERING OPERATIONS
Effect of a Livestock Wintering Operation on a Western Mountain Stream,
W76-11059 5A

CONGRESSIONAL HEARINGS
H.R. 5952 (Water Resources Planning Act),
W76-10775 6E

Water Resources Planning Act,
W76-10776 6E

CONNECTICUT RIVER
Environmental Impact Assessment, Water Quality Analysis, Connecticut River.
W76-10577 5G

Report on Pollution of Interstate Waters of the Connecticut River.
W76-10626 5A

CONOCHILUS-UNICORNIS
Zooplankton of Lakes of the Bol'Shezemel-Skaya Tundra, (In Russian),
W76-11056 5C

CONSTRUCTION
Deepwater Ports: Licensing Procedures and Design Construction, Equipment and Operations,
W76-10767 5G

CONSUMPTIVE USE
Predicting Consumptive use with Climatological Data,
W76-10873 2D

CONTINENTAL SHELF
Ocean Boundaries and Petroleum Resources,
W76-10596 6E

Marine Technology Society Eighth Annual Conference Preprints,
W76-10600 5G

The Law of the Sea at the Caracas Session: A Brief Evaluation,
W76-10732 6E

The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf,
W76-10734 5G

U. S. Position on Law of the Sea Reviewed,
W76-10743 6E

The Oceans: Wild West Scramble for Control,
W76-10745 6E

National Oceanic and Atmospheric Administration: Coastal Zone Management Program, Ad-

ministration Grants, Allocation of Section 306 Funds to States,
W76-10754 6E

Coastal Zone Management Program Development Grants, Outer Continental Shelf,
W76-10755 6E

Outer Continental Shelf Resource Development Safety: A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products.
W76-11001 5G

Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

Seabed Scour by Currents Near Platforms,
W76-11087 8B

Sharing the Offshore Oil Bonanza.
W76-11088 6C

Barium in Southern California Coastal Waters: A Potential Indicator of Marine Drilling Contamination,
W76-11089 5A

Offshore Oil: Technology - And Emotion,
W76-11090 5G

A Thorough Look At Current Offshore Petroleum Operations.
W76-11091 6C

Oil Spills and Offshore Petroleum,
W76-11092 5G

Offshore Oil Spills and the Marine Environment,
W76-11093 5G

Final Environmental Statement, Construction of Artificial Reefs in the Atlantic Ocean Off Cape Henry, Virginia.
W76-11094 8B

Distribution of Suspended Oil Particles Following the Grounding of the Tanker Arrow,
W76-11096 5B

A Public Authority to Manage the Atlantic Outer Continental Shelf,
W76-11097 6E

Oil in Sea Ice,
W76-11098 5B

Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

CONTROL

Design Considerations in Feedlot Runoff Control,
W76-11039 5D

Performance of Feedlot Runoff Control Facilities in Kansas,
W76-11058 5D

COOLING WATER

Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish,
W76-10896 5C

The Use of Power Plant Waste Heat in Marine Aquaculture,
W76-10992 5D

COOPERATIVES

Enabling Legislation: Possibilities for the Commercial Fishing Industry,
W76-10593 6E

COPEPODS

The Anomalous Influence of Salinity on Temperature Tolerances of Summer and Winter Population of the Copepod Eurytemora Affinis,
W76-10884 5C

Zooplankton of Lakes of the Bol'Shezemel-Skaya Tundra, (In Russian),
W76-11056 5C

COPPER

Ion and Precipitate Flotation of Metal Ions from Solution,
W76-10630 5D

CORROSION

Materials Failure Identification Manual for Sea Water Desalination Plants.
W76-10880 3A

CORROSION CONTROL

Final Report, Material Evaluation and Development Program, OSW San Diego Test Facility,
W76-10552 3A

Fiber-Glass-Reinforced Polyesters and Furan Resins for Water- and Waste-Treatment Systems,
W76-10682 8G

New Boiler Water Chemical Treatment Reduces Corrosion and Scale Buildup.
W76-10859 3E

Materials Failure Identification Manual for Sea Water Desalination Plants.
W76-10880 3A

COST ALLOCATION

Dams of Pork,
W76-10738 6B

COST ANALYSIS

Dams of Pork,
W76-10738 6B

COST-BENEFIT ANALYSIS

Economic Framework for Groundwater Quality Monitoring,
W76-10657 5G

Dams of Pork,
W76-10738 6B

COST-BENEFIT RATIO

Dams of Pork,
W76-10738 6B

COST-BENEFIT THEORY

Dams of Pork,
W76-10738 6B

COST SHARING

Rounding Up Runoff: Reflections in Waste Handling Systems,
W76-10530 5D

COSTS

Water Supply and Sewage Facilities Plan Update - 1970 (1974 Supplement),
W76-10508 5G

Water Pollution Abatement Technology: Capabilities and Costs, Iron and Steel Industry,
W76-10558 5D

A Preliminary Design for a National Environmental Census,
W76-10642 5A

Oil Pollution Prevention,
W76-10772 5G

The Cost of Complying with Federal Water Pollution Law.
W76-10872 5G

EPA's Role in the Animal Waste Problem: Panel Discussion,
W76-11045 5G

The Impact on Dairy Farm Organization of Alternative Manure Disposal Systems. A Method of Assessing the Cost of Environmental Regulation,
W76-11061 5D

CRABS

Red Crab (Geryon Quinquedens) and Snow Crab (Chionoecetes Opilio) Resistance to Infection by the Lobster Pathogen Aerococcus Viridans (Var.) Homari,
W76-10882 5C

Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

CROP PRODUCTION

Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

Yield and Removal of Nutrients by Oat Plants Depending on Fertilizer Rates and Soil Moisture Content, (In Belorussian),
W76-10962 3F

CROP RESPONSE

Manure and the Nitrate Problem,
W76-10616 5E

CRYSTALS

Supersaturation and Time Dependence of Ice Nucleation from the Vapor on Single Crystal Substrates,
W76-10695 3B

The Growth Rates and Densities of Ice Crystals Between -3C and -21C,
W76-10697 2B

Method of Making Snow,
W76-10958 3B

CUCUMBER PICKLING INDUSTRY

Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

CURCUMIN METHOD

Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

CURVES

Upstream Flood Lowering in Reservoirs,
W76-10938 4A

CYANIDES

Electrochemical Cell for Decreasing the Cyanide and Heavy Metal Content of an Aqueous Solution,
W76-10972 5D

CYTOLOGICAL STUDIES
Structure of Water in the Cell: Review of the Literature, (In Russian),
W76-10974 1A

DAIRY INDUSTRY
An Analysis of Dairy Waste Management Alternatives for Southern California Dairymen,
W76-10534 5G

Excessive Manure Can Affect Potable Water.
W76-10542 5B

An Economic Appraisal of Alternative Dairy Waste Management Systems Designed for Pollution Control,
W76-10547 5D

Farm Animal Waste Management: What our Milk Market Requires,
W76-11050 5D

The Impact on Dairy Farm Organization of Alternative Manure Disposal Systems. A Method of Assessing the Cost of Environmental Regulation,
W76-11061 5D

DAM FAILURE
Application of Simple Dam Break Routing Model,
W76-11084 8B

Simplified Routing of Dam Break Waves,
W76-11085 4A

DAMS
Dams of Pork,
W76-10738 6B

Sargent Lake Ass'n. V Dane (Rights of Property Owners Association in a Dam, Beach, and Shorefront Area).
W76-10795 6E

Harry S. Truman Dam and Reservoir, Osage River, Missouri. Appendix E, F, G, (Environmental Impact Statement.
W76-10827 4A

DAPHNIA
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

DATA COLLECTIONS
Management of Groundwater Quality Data,
W76-10660 5A

WSSI Final Report for the Colorado River Basin Pilot Project,
W76-10818 3B

Pelagic Tar in the North Pacific Ocean,
W76-11009 5A

DATA PROCESSING
WSSI Final Report for the Colorado River Basin Pilot Project,
W76-10818 3B

DATA STORAGE AND RETRIEVAL
Implementation of a Large Scale Water Quality Data Management System,
W76-10588 5A

Management of Groundwater Quality Data,
W76-10660 5A

DDT
Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

DDT in Water, A Bibliography, Volume 2.
W76-10877 5C

DEBRIS AVALANCHES
The Ability of Debris, Heavily Freighted with Coarse Clastic Materials, To Flow on Gentle Slopes,
W76-10711 2J

DEBRIS FLOW
The Ability of Debris, Heavily Freighted with Coarse Clastic Materials, To Flow on Gentle Slopes,
W76-10711 2J

DECISION MAKING
Strategies for Natural Resource Decision-Making: Comments on the Staff Report,
W76-10503 6E

Water Pollution Control Act of 1972, Municipal Options.
W76-10568 5G

A Multi-Objective Framework for Environmental Management Using Goal Programming,
W76-10582 6A

New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

Decision Mapping - Tool for Underground Waste Management,
W76-11063 5B

DECISION STATE METHOD
Solving Discrete-Variable Multiple-Constraint Non Linear Programs: The Decision State Method, (Vol. 3),
W76-10606 6A

DEEP WATER
Oil Ports on the Continental Shelf,
W76-10984 5G

DEEP WATER PORTS
Oil Ports on the Continental Shelf,
W76-10984 5G

DEEP-WELL DISPOSAL
Decision Mapping - Tool for Underground Waste Management,
W76-11063 5B

DEEP WELLS
Decision Mapping - Tool for Underground Waste Management,
W76-11063 5B

DEFINITIONS (LEGAL)
Legal Interpretation of Term 'Wetlands'.
W76-10792 6E

DEGRADATION
Accumulation, Release, and Retention of Petroleum Hydrocarbons by the Oyster, Crassostrea Virginica,
W76-11018 5C

DEMERSAL FISH
Prices and Property Rights in the Fisheries,
W76-10586 6C

DEMOGRAPHY
The Economic Impact of Recreational Land-Use in an Island Environment: A Case Study of Jekyll Island, Georgia,
W76-10581 6B

DENMARK STRAIT
Baroclinic Instability in the Denmark Strait Overflow,
W76-10693 2L

DENSITY CURRENTS
Density Current Surges I--Their Role in the Initial Dispersion of A Surface Field,
W76-10707 5B

Density Current Surges II--The Movement of Surges in a Turbulent Environment and Their Role in Surface Field Dispersion,
W76-10708 5B

DEPOSITION (SEDIMENTS)
Deposition in Upper Patuxent Estuary, Maryland, 1968-1969,
W76-10925 4C

DEPTH
Techniques for Estimating Flood Depths for Oklahoma Streams,
W76-11075 4A

DEPURATION
Uptake and Depuration of Specific Hydrocarbons from Oil by the Bivalves Rangia Cuneata and Crassostrea Virginica,
W76-11024 5C

DESALINATION
Geothermal Energy Recovery Process,
W76-10967 3A

DESALINATION APPARATUS
Final Report, Horizontal Spray Film (HTEX) and Vertical Tube (VTEX) Evaporator, OSW San Diego Test Facility.
W76-10553 3A

Materials Failure Identification Manual for Sea Water Desalination Plants.
W76-10880 3A

DESALINATION PLANTS
Final Report, Material Evaluation and Development Program, OSW San Diego Test Facility,
W76-10552 3A

Final Report, Horizontal Spray Film (HTEX) and Vertical Tube (VTEX) Evaporator, OSW San Diego Test Facility.
W76-10553 3A

Materials Failure Identification Manual for Sea Water Desalination Plants.
W76-10880 3A

DESIGN
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards System Design,
W76-10512 5D

Rounding Up Runoff: Reflections in Waste Handling Systems,
W76-10530 5D

Samplers for Monitoring Runoff Waters,
W76-10550 5A

Design Considerations in Feedlot Runoff Control,
W76-11039 5D

Large Commercial Feedlots - How Wastes are Handled in the West,
W76-11048 5D

Pollution Abatement Systems for Farm Animal Wastes in Southeast Michigan,
W76-11057 5D

DESIGN CRITERIA
Disposal Lagoon.
W76-10618 5D

DETERGENTS
Soap and Detergent Manufacturing Category Pretreatment Standards for New Sources,
W76-10759 5G

DETERIORATION
Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

DETRITUS
Determination of the Biomass and Detritus Content from Natural Phytoplankton Scoop Samples, (In German),
W76-10864 5A

Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

Comparison of the Food Chain Dynamics of the Polychaete, Nereis Virens Cultured on Animal Tissue and Detritus,
W76-10998 5C

DIANTHRIMIDE METHOD
Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

DIATOMS
Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

DIETS
Comparison of the Food Chain Dynamics of the Polychaete, Nereis Virens Cultured on Animal Tissue and Detritus,
W76-10998 5C

DIFFUSION
Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

DILUTION GAGING
Application of a Residence Time Model to Dilution Gauging, with Particular Reference to the Problem of Changing Discharge,
W76-10935 2E

DIQUAT
A Rapid Method for the Simultaneous Determination of Paraquat and Diquat in Pond and River Waters by Pyrolysis and Gas Chromatography,
W76-10870 5A

DISASTERS
Directory of Disaster-Related Technology,
W76-10502 10C

DISCHARGE MEASUREMENT
Application of a Residence Time Model to Dilution Gauging, with Particular Reference to the Problem of Changing Discharge,
W76-10935 2E

DISCHARGE (WATER)
Fertilizer Manufacturing Point Source Category, Effluent Limitations and Guidelines for Existing Sources and Standards for New Sources for the Phosphate Subcategory,
W76-10768 5G

DISCRETE VARIABLE OPTIMIZATION
Solving Discrete-Variable Multiple-Constraint Non Linear Programs: The Decision State Method, (Vol. 3),
W76-10606 6A

DISCRIMINATORY PRICING
Do Regulated Freight Rates Discourage Recycling,
W76-10676 5G

DISEASE RESISTANCE
Red Crab (Geryon Quinquedens) and Snow Crab (Chionoecetes Opilio) Resistance to Infection by the Lobster Pathogen Aerococcus Viridans (Var.) Homari,
W76-10882 5C

DISINFECTION
Water Programs Secondary Treatment Information,
W76-10770 5D

Domestic Wastewater Disinfection, Secondary Treatment,
W76-10771 5D

DISPERSION
Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

Density Current Surges I--Their Role in the Initial Dispersion of A Surface Field,
W76-10707 5B

Density Current Surges II--The Movement of Surges in a Turbulent Environment and Their Role in Surface Field Dispersion,
W76-10708 5B

Dispersion of Pollutants,
W76-10907 5B

Wind-Tunnel Simulation of Atmospheric Flow and Dispersion,
W76-10908 5A

Pulsed Dispersion of Trace Chemical Concentrations in a Saturated Sorbing Porous Medium,
W76-10915 5B

Longitudinal Dispersion for Flow Over Rough Beds,
W76-10921 5B

Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

DISSOLVED OXYGEN
Marked Diminution of Dissolved Oxygen in the Hypolimnion of Lake Biwa in August, 1973, (In Japanese),
W76-10976 5C

DISTRIBUTION PATTERNS
Distribution of Stream Pollution in Lake Water,
W76-10712 5B

Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

Pulsed Dispersion of Trace Chemical Concentrations in a Saturated Sorbing Porous Medium,
W76-10915 5B

A Model for Water and Phosphorus Distribution on the Island of Goeteborg, (In Swedish),
W76-10963 5B

DISTRIBUTION SYSTEMS
Irrigation Systems Automation,
W76-10955 3F

Alignment Control Apparatus for Center Pivot Irrigation Equipment,
W76-10957 3F

Trickle Irrigator,
W76-10970 3F

DOCUMENTATION
Sources of Information in Water Resources, an Annotated Guide to Printed Materials,
W76-10881 10C

DOLOS
Volume and Strength of a Dolos,
W76-10523 8F

DOMESTIC WASTES
Domestic Wastewater Disinfection, Secondary Treatment,
W76-10771 5D

Permissible Levels of Heavy Metals in Secondary Effluent for Use in a Combined Sewage Treatment-Marine Aquaculture System. I. Monitoring During Pilot Operation,
W76-10993 5D

DRAIN GAP
Seepage Flow Through Homogeneous Soil into a Row of Drain Pipes,
W76-10919 4A

DRAINAGE
A Note on the Contribution of Fog Drip to Streamflow,
W76-10927 2B

DRAINAGE AREA
Selection of Typical Small Drainage Basins for Investigating and Computing Spring Runoff from Large River Basins,
W76-10705 4A

DRAINAGE DISTRICTS
Natural Resources, Dept of; Navigable Waters.
W76-10786 6E

DRAINAGE SYSTEMS
Field and Laboratory Evaluation of Bi-Level Drainage Theory,
W76-10934 4A

DRAINS
Five Pumps Salvage a Quebec Sewer Job,
W76-10689 8C

Seepage Flow Through Homogeneous Soil into a Row of Drain Pipes,
W76-10919 4A

DREDGING
Dredged Material Disposal--Effects and Alternatives,
W76-10724 5E

Navigable Waters: Riparian Rights.
W76-10785 6E

DRILLING
Seabed Scour by Currents Near Platforms,
W76-11087 8B

DRINKING WATER LEGISLATION
Safe Drinking Water Act - Implications for Ground Water Quality Protection,
W76-11064 5F

DROWNING
Adams V Montana Power Co. (Definition of Navigable Waters for Admiralty Jurisdiction).
W76-10798 6E

DRYING SCANNING CURVE
Capillary Hysteresis and the Relationship Between Drying and Wetting Curves,
W76-10914 2G

DUST
Legal Aspects of Odor and Dust from Feedlots,
W76-11054 5G

DUSTS
Some Characteristics of A Dusty Rain in Yugoslavia,
W76-10906 5A

DUSTY RAIN
Some Characteristics of A Dusty Rain in Yugoslavia,
W76-10906 5A

DYE DISPERSION
Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

DYES
Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

DYNAMIC PROGRAMMING
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

Solving Discrete-Variable Multiple-Constraint Non Linear Programs: The Decision State Method, (Vol. 3),
W76-10606 6A

EARLY IMPOUNDMENT
Some Water Quality Aspects in a Nascent Impoundment in Central Illinois,
W76-10950 5B

ECOLOGICAL IMPACT
Environmental Investigation of Eden Isles,
W76-10510 5G

ECOLOGY
Raptor Study of Utah Oil Shale Area,
W76-10822 6G

ECONOMIC FEASIBILITY
The Economics of Developing the Resources of the World's Oceans,
W76-10587 6B

Problems of Public Works Projects in the Present Economic Climate,
W76-10980 6C

ECONOMIC IMPACT
Water Pollution Control Act of 1972, Economic Impacts, Metal Finishing Industry,
W76-10556 5G

Water Pollution Control Act of 1972, Economic Impacts, Iron and Steel Industry,
W76-10557 5G

Water Pollution Control Act of 1972, Economic Impacts, Pulp and Paper Industry,
W76-10559 5G

Water Pollution Control Act of 1972, Economic Impacts, Petroleum Refining Industry,
W76-10560 5G

Water Pollution Control Act of 1972, Economic Impacts, Leather Tanning Industry.
W76-10561 5G

Water Pollution Control Act of 1972, Economic Impacts, Fertilizer Industry.
W76-10562 5G

Water Pollution Control Act of 1972, Economic Impacts, Plant Closures.
W76-10563 5G

Water Pollution Control Act of 1972, Economic Impacts, Irrigated and Non-Irrigated Agriculture.
W76-10564 5G

Water Pollution Control Act of 1972, Economic Impacts, Non-Ferrous Metals Industry,
W76-10565 5G

Water Pollution Control Act of 1972, Economic Impacts, Textile Industry.
W76-10566 5G

The Economic Impact of Recreational Land-Use in an Island Environment: A Case Study of Jekyll Island, Georgia,
W76-10581 6B

Prospect for Sea-Bed Resources in a Recession,
W76-10979 6E

ECONOMIC ZONES
The Law of the Sea at the Caracas Session: A Brief Evaluation,
W76-10732 6E

ECONOMICS
An Economic Appraisal of Alternative Dairy Waste Management Systems Designed for Pollution Control,
W76-10547 5D

Economic Considerations Involved in Selecting Types of Confinement and Waste Disposal Systems for Swine and Beef,
W76-11043 5D

ECOSYSTEMS
Anatomy of an Oil Spill,
W76-10597 5B

Flow of Toxic Metals in the Environment,
W76-10638 5B

Rookery Bay: Ecological Constraints on Coastal Development,
W76-10741 6G

Lawyers and Ecomanagement,
W76-10753 6E

EDEN ISLES (LA)
Environmental Investigation of Eden Isles,
W76-10510 5G

EEL RIVER (CALIF)
Water-Quality Investigation, Eel River, California,
W76-11069 5A

EFFICIENCIES
Sorption Capabilities of Soils for Phosphate Removal,
W76-10673 5D

EFFLUENT
Development Document for Effluent Limitations Guidelines and New Source Performance Standards: Feedlot Point Source Category,
W76-10829 5G

EFFLUENT LIMITATIONS
An Investigation of Effluent Control Standards and Practices (Atomic Energy Production),
W76-10828 5G

EFFLUENTS
Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Animal Feed, Breakfast Cereal, and Wheat Starch Segments of the Grain Mills Point Source Category,
W76-10594 5G

Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textile, Friction Materials and Sealing Devices Segment of the Asbestos Manufacturing Point Source Category,
W76-10595 5G

Timber Products Processing Point Source Category, Proposed Pretreatment Standards for Existing Sources,
W76-10760 5G

Ei Du Pont De Nemours and Company V Train (Federal Water Pollution Prevention and Control Act Quality Standards of Water and Effluent Discharged into that Water).
W76-10799 6E

Design of Alternating Diffuser Pipes,
W76-10952 8B

Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

ELECTRIC POWERPLANT
Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

ELECTRIC POWERPLANTS
Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish,
W76-10896 5C

ELECTRO-OSMOSIS
Water Transport Across Cation-Exchange Membrane. I. Experimental Technique. Influence of the Concentration and Temperature on the Water Transport Number,
W76-10620 3A

ELECTROCHEMISTRY
Electrochemical Properties of the Oxide-Solution Interface in Relation to Flotation,
W76-10629 5B

Adsorption Mechanism of Sulfides at a Platinum-Solution Interface,
W76-10636 5D

ELECTRODES
Adsorption Mechanism of Sulfides at a Platinum-Solution Interface,
W76-10636 5D

ELECTRODIALYSIS
Use of Electrodialysis in the Water Recycling System of Viscose Production (Primenenie elektrodializa v sisteme vodooborota viskoznogo proizodstva),
W76-10848 5D

ELECTROFLOTATION
Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

ELECTROLYSIS
Production Studies on the Electrolytic Method of Recovering Zinc from Effluent Sediments (Proizvodstvennye issledovaniya elektroliticheskogo sposoba regeneratsii tsinka iz osadkov stochnykh vod),
W76-10846 5D

Electrochemical Production of Free Radicals for Wastewater Treatment,
W76-10876 5D

EMBANKMENTS
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

EMULSIFIERS
Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

ENCROACHMENT
Partial Depletion of Saline Groundwater by Seepage,
W76-10920 2L

ENERGY
Studies for Wildlife on Energy Areas,
W76-10820 6G

Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

ENERGY DISSIPATION
A Normal Mode Method for Predicting Storm Surges on a Lake,
W76-10715 2H

ENGINEERING STRUCTURES
Shoreline Retaining Wall,
W76-10953 8B

Portable Floating Wave Tripper,
W76-10954 8B

ENTERIC BACTERIA
Survival of Human Pathogens in the Marine Environment,
W76-10890 5C

ENTEROMORPHA
Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

ENTROPY
Entropy Principle Applied to the Rainfall-Runoff Process,
W76-10918 2A

ENVIRONMENT
A Multi-Objective Framework for Environmental Management Using Goal Programming,
W76-10582 6A

Polycyclic Aromatic Compounds in Nature,
W76-10865 5B

ENVIRONMENTAL CONTROL
Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

Assessment of Polyvinyl Chloride as a Packaging Material for Distilled Spirits, (Enivronmental Impact Assessment),
W76-10722 6G

New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

Environmental Regulation of the Annual Reproductive Season of Strongylocentrotus Purpuratus (Stimpson),
W76-10888 5C

Swine Systems for Iowa and North Central States,
W76-11041 5D

ENVIRONMENTAL EFFECTS
Water Quality Analysis, Iowa-Cedar River Basin.
W76-10576 5G

Environmental Impact Assessment, Water Quality Analysis, Connecticut River.
W76-10577 5G

Water Quality Analysis, Santee River Basin.
W76-10578 5G

Water Quality Analysis, Columbia River.
W76-10579 5G

Ocean Boundaries and Petroleum Resources,
W76-10596 6E

Anatomy of an Oil Spill,
W76-10597 5B

Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

Marine Technology Society Eighth Annual Conference Preprints,
W76-10600 5G

An Environmental Analysis of a Simulated Sea-Floor Mining Operation,
W76-10601 5G

The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

Safety and Pollution Control - Offshore Petroleum Producing Facilities,
W76-10603 5G

Earthwatch-Sentinel for the Future,
W76-10645 5A

Assessment of Polyvinyl Chloride as a Packaging Material for Distilled Spirits, (Enivronmental Impact Assessment),
W76-10722 6G

The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf,
W76-10734 5G

Preparation of State Water Quality Management Plans.
W76-10763 5G

Oil Pollution Prevention,
W76-10772 5G

A Selected Annotated Bibliography on Fish and Wildlife Implications of Missouri Basin Water Allocation,
W76-10825 4C

Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

Behavioural Thermoregulation and Activity Patterns in the Green Sunfish, Lepomis Cyanellus,
W76-10883 5C

The Anomalous Influence of Salinity on Temperature Tolerances of Summer and Winter Population of the Copepod Eurytemora Affinis,
W76-10884 5C

Temperatures Selected and Avoided by Fish at Various Acclimation Temperatures,
W76-10885 5C

Bacterial Growth Rates and Temperature Optima in a Stream with a Fluctuating Thermal Regime.
W76-10886 5C

Environmental Regulation of the Annual Reproductive Season of Strongylocentrotus Purpuratus (Stimpson),
W76-10888 5C

The Respiratory Strategies of two Species of Freshwater Gastropods (Ancylus Fluviatilis Mull and Planorbis Contortus Linn) in Relation to Temperature, Oxygen Concentration, Body Size and Season,
W76-10889 5C

Trace Element Interactions in the Estuarine Zone of the Anasco River, Puerto Rico,
W76-10892 5C

A Comparison of Several Water Quality Indexes,
W76-10926 5A

Outer Continental Shelf Resource Development Safety: A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products.
W76-11001 5G

Technical Capabilities in Offshore Completion and Workover Operations to Maximize Safety,
W76-11002 5G

Technical Capabilities in Offshore Pipeline Operations to Maximize Safety,
W76-11003 5G

Technical Capabilities of Offshore Exploration Operations to Maximize Safety amd Environmental Protection,
W76-11004 5G

Regulation and Supervision of Outer Continental Shelf Operations on the Pacific Coast,
W76-11005 5G

Gulf Coast Lease Management Inspection Program,
W76-11006 5G

Some Biological Effects Related to the West Falmouth Oil Spill,
W76-11029 5C

Barium in Southern California Coastal Waters: A Potential Indicator of Marine Drilling Contamination,
W76-11089 5A

Offshore Oil: Technology - And Emotion,
W76-11090 5G

A Thorough Look At Current Offshore Petroleum Operations.
W76-11091 6C

Oil Spills and Offshore Petroleum,
W76-11092 5G

Offshore Oil Spills and the Marine Environment,
W76-11093 5G

Final Environmental Statement, Construction of Artificial Reefs in the Atlantic Ocean Off Cape Henry, Virginia.
W76-11094 8B

A Public Authority to Manage the Atlantic Outer Continental Shelf,
W76-11097 6E

Oil in Sea Ice,
W76-11098 5B

The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

ENVIRONMENTAL IMPACT
Environmental Investigation of Eden Isles,
W76-10510 5G

The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

Final Environmental Statement, Construction of Artificial Reefs in the Atlantic Ocean Off Cape Henry, Virginia.
W76-11094 8B

ENVIRONMENTAL IMPACT ASSESSMENT
Environmental Impact Assessment, Water Quality Analysis, Connecticut River.
W76-10577 5G

ENVIRONMENTAL IMPACT STATEMENT
New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

ENVIRONMENTAL IMPACT STATEMENTS
The Legal Requirement for the Assessment of Inadvertent Weather Modification - An Engineering Viewpoint,
W76-10912 3B

ENVIRONMENTAL SANITATION
Marine Sanitation Device Standard,
W76-10758 5D

EQUATIONS
Hydraulic Jump in Circular Sewers,
W76-10686 5D

EQUITABLE APPORTIONMENT
Equitable Apportionment of Interstate Ground Waters,
W76-10728 4B

EROSION
Estimated Erosion Rates on Mount Rainier, Washington,
W76-10951 2J

EROSION CONTROL
Water Pollution Control Act of 1972, Economic Impacts, Irrigated and Non-Irrigated Agriculture.
W76-10564 5G

State Water Control Board--Authority to Investigate all Problems Concerned with the Quality of Water,
W76-10779 6E

EROSION RATES
Estimated Erosion Rates on Mount Rainier, Washington,
W76-10951 2J

EROSION TROUGHS
Subsurface Waters of Erosion Troughs in the Aktyuba Region of the Ural - A Source of Drinking Water Supply,
W76-10943 2F

ESTIMATED COSTS
Water Pollution Abatement Technology: Capabilities and Costs, Metal Finishing Industry,
W76-10555 5D

Water Pollution Control Act of 1972, Economic Impacts, Pulp and Paper Industry,
W76-10559 5G

Water Pollution Control Act of 1972, Economic Impacts, Petroleum Refining Industry,
W76-10560 5G

Water Pollution Control Act of 1972, Economic Impacts, Textile Industry.
W76-10566 5G

ESTIMATING
Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-10585 6B

ESTUARIES
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

Deposition in Upper Patuxent Estuary, Maryland, 1968-1969,
W76-10925 4C

A Two-Dimensional Numerical Model of Estuarine Circulation: The Effects of Altering Depth and River Discharge,
W76-10948 2L

'Ware the Wadden Sea,
W76-10985 6G

ESTUARINE ENVIRONMENT
Rookery Bay: Ecological Constraints on Coastal Development,
W76-10741 6G

ESTUARINE POLLUTION
Biological Effects of Chronic Oil Pollution on Coastal Ecosystems,
W76-11019 5C

ESTUARY
Some Considerations on Monitoring of Trace Metals in Estuaries and Oceans,
W76-10653 5A

EUROPE
Some Characteristics of A Dusty Rain in Yugoslavia,
W76-10906 5A

Channel Width and the Riffle-Pool Sequence,
W76-10924 2E

'Ware the Wadden Sea,
W76-10985 6G

EURYHALINE FISH
A Fin Rot Disease of Marine and Euryhaline Fishes in the New York Bight,
W76-10524 5C

EURYTEMORA AFFINIS
The Anomalous Influence of Salinity on Temperature Tolerances of Summer and Winter Population of the Copepod Eurytemora Affinis,
W76-10884 5C

EUTROPHICATION
Tropic Status of Selected Northern New Mexico Lakes,
W76-10808 5C

Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

EVALUATION
Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-10585 6B

EVAPORATION
The Evaporation and Sedimentation in Man-Made Arade Lake, Southern Portugal,
W76-10703 2D

Predicting Consumptive use with Climatological Data,
W76-10873 2D

The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

Chemical Composition: A Control on the Physical and Chemical Processes Acting on Petroleum in the Marine Environment,
W76-11013 5B

EVAPORATORS
Final Report, Horizontal Spray Film (HTEX) and Vertical Tube (VTEX) Evaporator, OSW San Diego Test Facility.
W76-10553 3A

EVAPOTRANSPIRATION
Studies on Evapotranspiration of Some Aquatic Weeds,
W76-10554 2D

Predicting Consumptive use with Climatological Data,
W76-10873 2D

EXCAVATION
Cleveland Mixes Methods in Sewer Construction.
W76-10684 5D

EXPERIMENTAL MODELS
Steady Laminar Flow in a Stationary Tank with a Spinning Bottom,
W76-11062 8B

EXPLOITATION
A New International Law for the Deep Seabed Regime,
W76-10726 6E

FACILITIES
Volume and Strength of a Dolos,
W76-10523 8F

FAILURE (MECHANICS)
Materials Failure Identification Manual for Sea Water Desalination Plants.
W76-10880 3A

FAILURES
Materials Failure Identification Manual for Sea Water Desalination Plants.
W76-10880 3A

FARM PRICES
The Effect of Changing Input andProduct Prices on the Demand for Irrigation Water in Texas,
W76-10810 3F

FARM WASTES
Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

Pollution Potential of Runoff from Livestock Feeding Operations,
W76-10531 5B

Preventing Water Pollution from Turkey Operations,
W76-10535 5G

Effect of Soil-Incorporated Dairy Cattle Manure on Runoff Water Quality and Soil Properties,
W76-10539 5B

An Economic Appraisal of Alternative Dairy Waste Management Systems Designed for Pollution Control,
W76-10547 5D

Farm Animal Manures: An Overview of Their Role in the Agricultural Environment,
W76-10548 5G

Water Pollution Control Act of 1972, Economic Impacts, Irrigated and Non-Irrigated Agriculture.
W76-10564 5G

Water Pollution Abatement Technology: Capabilities and Costs, Control of Water Pollution from Selected Nonpoint Sources.
W76-10567 5D

Development Document for Effluent Limitations Guidelines and New Source Performance Standards: Feedlot Point Source Category,
W76-10829 5G

Agricultural Runoff, A Bibliography, Volume 2.
W76-10879 5B

Animal Waste Management Conference.
W76-11032 5D

Animal Waste Management--Comments on the National Situation,
W76-11033 5D

The State and Regional Situation,
W76-11034 5D

Aerobic Waste Treatment,
W76-11035 5D

System Components to Separate Solids and Liquids,
W76-11036 5D

Swine Manure Collection and Removal Systems,
W76-11037 5D

Nature and Behavior of Manure,
W76-11038 5B

Design Considerations in Feedlot Runoff Control,
W76-11039 5D

Waste Management Systems for Roofed Beef Confinement Facilities,
W76-11040 5D

Swine Systems for Iowa and North Central States,
W76-11041 5D

Waste Application to Soils,
W76-11042 5D

Economic Considerations Involved in Selecting Types of Confinement and Waste Disposal Systems for Swine and Beef,
W76-11043 5D

Legal Aspects of Livestock Production and Waste Management,
W76-11044 5D

EPA's Role in the Animal Waste Problem: Panel Discussion,
W76-11045 5G

Soil Conservation Service Program in Animal Waste Management,
W76-11046 5G

Beef Cattle Feedlots: Impact on Underlying Soil,
W76-11047 5B

Large Commercial Feedlots - How Wastes are Handled in the West,
W76-11048 5D

Farm Animal Waste Management: What our Milk Market Requires,
W76-11050 5D

How to Plan and Manage a Lagoon,
W76-11052 5D

Biodegrading Poultry Excreta with House Fly Larvae: The Concept and Equipment,
W76-11053 5D

Legal Aspects of Odor and Dust from Feedlots,
W76-11054 5G

Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

Pollution Abatement Systems for Farm Animal Wastes in Southeast Michigan,
W76-11057 5D

Performance of Feedlot Runoff Control Facilities in Kansas,
W76-11058 5D

A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

FEASIBILITY
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

The Use of Power Plant Waste Heat in Marine Aquaculture,
W76-10992 5D

FEASIBILITY STUDIES
A Feasibility Study of the Control of Pollution from Industrial Waste Waters Discharged into the Lagoon of Venice,
W76-10679 5D

The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Foodchain Studies,
W76-10986 5C

FEDERAL GOVERNMENT
EPA's Role in the Animal Waste Problem: Panel Discussion,
W76-11045 5G

FEDERAL JURISDICTION
Energy Crisis, Supertankers and Ecology,
W76-10735 5G

Department Opposes Unilateral Extension of U. S. Fisheries Jurisdiction,
W76-10744 6E

Adams V Montana Power Co. (Definition of Navigable Waters for Admiralty Jurisdiction).
W76-10798 6E

FEDERAL PROJECT POLICY
New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

Environmental Protection Agency: Grants and Other Federal Assistance, State and Local Assistance.
W76-10765 5G

FEDERAL-STATE WATER RIGHTS CONFLICTS
The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf,
W76-10734 5G

Beach and Shore Restoration; Authority of State Over Federal and Local Beach Restoration Projects.
W76-10794 6E

FEDERAL WATER POLLUTION CONTROL ACT
An Integrated International and Domestic Approach to Civil Liability for Vessel-Source Oil Pollution,
W76-10730 5G

New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

Marine Sanitation Device Standard,
W76-10758 5D

Soap and Detergent Manufacturing Category Pretreatment Standards for New Sources,
W76-10759 5G

Timber Products Processing Point Source Category,
W76-10761 5G

Preparation of State Water Quality Management Plans.
W76-10763 5G

Fertilizer Manufacturing Point Source Category, Urea Subcategory,
W76-10764 5G

Oil Pollution Prevention,
W76-10772 5G

Pollution--Assembly Bill 128--To Create a System of State Discharge Permits Congruent with National Pollutant Discharge Elimination System,
W76-10780 6E

Ei Du Pont De Nemours and Company V Train (Federal Water Pollution Prevention and Control Act Quality Standards of Water and Effluent Discharged into that Water).
W76-10799 6E

The Cost of Complying with Federal Water Pollution Law.
W76-10872 5G

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972

Water Pollution Abatement Technology: Capabilities and Costs, Metal Finishing Industry,
W76-10555 5D

Water Pollution Control Act of 1972, Economic Impacts, Metal Finishing Industry,
W76-10556 5G

Water Pollution Control Act of 1972, Economic Impacts, Iron and Steel Industry,
W76-10557 5G

Water Pollution Abatement Technology: Capabilities and Costs, Iron and Steel Industry,
W76-10558 5D

Water Pollution Control Act of 1972, Economic Impacts, Pulp and Paper Industry,
W76-10559 5G

Water Pollution Control Act of 1972, Economic Impacts, Petroleum Refining Industry,
W76-10560 5G

Water Pollution Control Act of 1972, Economic Impacts, Leather Tanning Industry.
W76-10561 5G

Water Pollution Control Act of 1972, Economic Impacts, Fertilizer Industry.
W76-10562 5G

Water Pollution Control Act of 1972, Economic Impacts, Plant Closures.
W76-10563 5G

Water Pollution Control Act of 1972, Economic Impacts, Irrigated and Non-Irrigated Agriculture.
W76-10564 5G

Water Pollution Control Act of 1972, Economic Impacts, Non-Ferrous Metals Industry,
W76-10565 5G

Water Pollution Control Act of 1972, Economic Impacts, Textile Industry.
W76-10566 5G

Water Pollution Control Act of 1972, Municipal Options.
W76-10568 5G

Water Pollution Control Act of 1972, Social Impacts, Eight Case Studies.
W76-10569 5G

Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 1).
W76-10570 5G

Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 2),
W76-10571 5G

Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume I),
W76-10572 5G

Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume II),
W76-10573 5G

The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement, Volume I,
W76-10574 5G

The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement Volume II,
W76-10575 5G

Water Quality Analysis, Iowa-Cedar River Basin.
W76-10576 5G

Environmental Impact Assessment, Water Quality Analysis, Connecticut River.
W76-10577 5G

Water Quality Analysis, Santee River Basin,
W76-10578 5G

Water Quality Analysis, Columbia River.
W76-10579 5G

FEED LOTS

Rounding Up Runoff: Reflections in Waste Handling Systems,
W76-10530 5D

Pollution Potential of Runoff from Livestock Feeding Operations,
W76-10531 5B

EPA'S New Feedlot Disposal Plan,
W76-10532 5D

Control of Pollution from Animal Feedlots,
W76-10533 5G

EPA Proposes New Feedlot Regulations.
W76-10536 5G

Waterway Cleans Feedlot Runoff,
W76-10537 5D

Effect of Cattle Feedyard Runoff on Soil Infiltration Rates,
W76-10538 5B

Disposal of Cattle Feedlot Waste in an Anaerobic Lagoon on the Organic Soils of South Florida--Preliminary Results,
W76-10540 5E

Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

Intact Manure Packs Halt Seepage.
W76-10544 5G

Water Quality and Management Characteristics of Feedlot Runoff Holding Ponds,
W76-10545 5D

Quality Variation of Feedlot Runoff in Storage,
W76-10549 5B

Development Document for Effluent Limitations Guidelines and New Source Performance Standards: Feedlot Point Source Category,
W76-10829 5G

Agricultural Runoff, A Bibliography, Volume 2.
W76-10879 5B

Animal Waste Management Conference.
W76-11032 5D

The State and Regional Situation,
W76-11034 5D

Nature and Behavior of Manure,
W76-11038 5B

Design Considerations in Feedlot Runoff Control,
W76-11039 5D

Beef Cattle Feedlots: Impact on Underlying Soil,
W76-11047 5B

Large Commercial Feedlots - How Wastes are Handled in the West,
W76-11048 5D

Legal Aspects of Odor and Dust from Feedlots,
W76-11054 5G

Performance of Feedlot Runoff Control Facilities in Kansas,
W76-11058 5D

FERMENTATION

Frequency Distributions for Coliform Bacteria in Water,
W76-10650 5A

FERRATES (VI)

Oxidation of Ammonia in Water by Ferrates (VI) and (IV),
W76-10611 5D

FERROMANGANESE DEPOSITS

The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

FERTILIZER INDUSTRY

Water Pollution Control Act of 1972, Economic Impacts, Fertilizer Industry.
W76-10562 5G

FERTILIZERS

Water Pollution Control Act of 1972, Economic Impacts, Fertilizer Industry.
W76-10562 5G

Fertilizer Manufacturing Point Source Category, Effluent Limitations and Guidelines for Existing Sources and Standards for New Sources for the Phosphate Subcategory,
W76-10768 5G

Pollution Control through Utilization of Spent Sulfite Liquors from the Pulp Industry as Organic Nitrogen Fertilizer (Ein Beitrag zur umweltfreundlichen Technik durch Verwertung der Sulfitablaugen der Zellstoffindustrie als organischer Stickstoffduenger),
W76-10851 5D

Yield and Removal of Nutrients by Oat Plants Depending on Fertilizer Rates and Soil Moisture Content, (In Belorussian),
W76-10962 3F

FIBERLOG
The Fiberlog, a New Monitor for Fibrous Effluents,
W76-10843 5A

FIBERS (PLANT)
The Fiberlog, a New Monitor for Fibrous Effluents,
W76-10843 5A

FILTERS
Biological Filters (Biologicheskie fil'try),
W76-10850 5D

Filter Apparatus,
W76-10975 5D

FILTRATION
Filter Apparatus,
W76-10975 5D

Filtration and Backwashing Apparatus for Use with a Water Filtration System,
W76-10977 5F

FIN ROT DISEASE (FISH)
A Fin Rot Disease of Marine and Euryhaline Fishes in the New York Bight,
W76-10524 5C

FINITE DIFFERENCES
Steady Laminar Flow in a Stationary Tank with a Spinning Bottom,
W76-11062 8B

FINITE ELEMENT ANALYSIS
Application of Finite Element Method to Open Channel Flow,
W76-10939 8B

FINLAND
The Use of Waste Fibers as Absorption Material in Grass Silage,
W76-10863 5E

FISH
Studies for Wildlife on Energy Areas,
W76-10820 6G

Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

Studies on the Least Chub (Iotichthys Phlegethontiscope) in Geothermal Activities Area of Snake and Tule Valleys, Utah,
W76-10824 6G

A Selected Annotated Bibliography on Fish and Wildlife Implications of Missouri Basin Water Allocation,
W76-10825 4C

Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

FISH CONSERVATION
The Third U. N. Law of the Sea Conference: Major Unresolved Fisheries Issues,
W76-10733 6E

FISH DISEASES
A Fin Rot Disease of Marine and Euryhaline Fishes in the New York Bight,
W76-10524 5C

FISH FARMING
Water Quality in a Recirculating Raceway System for Fish Culture,
W76-10546 5G

FISH FOOD ORGANISMS
Production Response of the Bluegill Sunfish, Lepomis Macrochirus Rafinesque, to Added Attachment Surface for Fish-Food Organisms,
W76-10522 2I

FISH GENETICS
Ecological Variability of Bream in Lithuanian Waters: 2. Age and Growth Rate, (In Russian),
W76-10519 5C

Some Characteristics of Spleen Growth in the Lake Minnow, (In Russian),
W76-10521 2I

FISH HATCHERIES
Recycling Ground Water in Waushara County, Wisconsin: Resource Management for Cold-Water Fish Hatcheries,
W76-11082 4B

FISH PHYSIOLOGY
Some Characteristics of Spleen Growth in the Lake Minnow, (In Russian),
W76-10521 2I

FISH POPULATION
Ecological Variability of Bream in Lithuanian Waters: 2. Age and Growth Rate, (In Russian),
W76-10519 5C

FISH POPULATIONS
Some Characteristics of Spleen Growth in the Lake Minnow, (In Russian),
W76-10521 2I

Upstream Changes in Fish Populations Following Impoundment of Sagehen Creek, California,
W76-10619 2I

An Analysis of the Main Scientific Papers Dealing with Long Term Low Level Effects of Oil Pollution,
W76-11022 5C

FISH TOXINS
Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

FISHERIES
Prices and Property Rights in the Fisheries,
W76-10586 6C

Department Opposes Unilateral Extension of U. S. Fisheries Jurisdiction,
W76-10744 6E

Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

FISSURES (GEOLOGIC)
Role of Precipitation in the Chemistry of Subsurface Waters in the Western Part of the Turgay Trough,
W76-10942 2F

FLASH DISTILLATION
Final Report, Material Evaluation and Development Program, OSW San Diego Test Facility,
W76-10552 3A

FLASH FLOODS
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

FLOOD CONTROL
Harry S. Truman Dam and Reservoir, Osage River, Missouri. Appendix E, F, G, (Environmental Impact Statement.
W76-10827 4A

FLOOD CONTROL ACT OF 1944
Coal Mining, Development and Processing -- The Associated Water Problems,
W76-10727 6E

FLOOD DAMAGE
Hydrologic Effects of Storms of June 24-28, 1974 in Lee and Collier Counties, Florida,
W76-11077 4A

FLOOD DISASTER PROTECTION ACT
Identification of Special Hazard Areas List of Communities with Special Hazard Areas,
W76-10773 6F

FLOOD FLOW
Floodflow Characteristics at Proposed Bridge Site on Mohawk River in Towns of Frankfort and Schuyler, Herkimer County, New York,
W76-11079 4A

FLOOD FORECASTING
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

Techniques for Estimating Flood Depths for Oklahoma Streams,
W76-11075 4A

Flood Frequency of Mississippi Streams,
W76-11083 4A

Application of Simple Dam Break Routing Model,
W76-11084 8B

FLOOD FREQUENCY
Hydrologic Effects of Storms of June 24-28, 1974 in Lee and Collier Counties, Florida,
W76-11077 4A

Flood Frequency of Mississippi Streams,
W76-11083 4A

FLOOD IRRIGATION
Irrigation Systems Automation,
W76-10955 3F

Combined Drain and Flood Gate,
W76-10968 3F

FLOOD PLAIN INSURANCE
Identification of Special Hazard Areas List of Communities with Special Hazard Areas,
W76-10773 6F

FLOOD PLAIN ZONING
Identification of Special Hazard Areas List of Communities with Special Hazard Areas,
W76-10773 6F

Zoning--Flood Control.
W76-10781 6E

FLOOD PLAINS
Identification of Special Hazard Areas List of Communities with Special Hazard Areas,
W76-10773 6F

FLOOD RECURRENCE INTERVAL
Techniques for Estimating Flood Depths for Oklahoma Streams,
W76-11075 4A

Flood Frequency of Mississippi Streams,
W76-11083 4A

FLOOD ROUTING
A Discrete Linear Cascade Model for Hydrology,
W76-10946 2E

Application of Simple Dam Break Routing Model,
W76-11084 8B

Simplified Routing of Dam Break Waves,
W76-11085 4A

FLOODS
Directory of Disaster-Related Technology,
W76-10502 10C

Five Pumps Salvage a Quebec Sewer Job,
W76-10689 8C

Hydrologic Effects of Storms of June 24-28, 1974 in Lee and Collier Counties, Florida,
W76-11077 4A

FLORIDA
Disposal of Cattle Feedlot Waste in an Anaerobic Lagoon on the Organic Soils of South Florida--Preliminary Results,
W76-10540 5E

Enabling Legislation: Possibilities for the Commercial Fishing Industry,
W76-10593 6E

Rookery Bay: Ecological Constraints on Coastal Development,
W76-10741 6G

A Sound Water Plan for South Florida Implementation of the 1972 Water Resources Act,
W76-10742 6E

Peach Irrigation in Florida,
W76-10749 3F

Water Management Districts--Water Resources--Authority to Consider and Protect Against Degradation of Water Quality Through Permitting Processes.
W76-10791 6E

Legal Interpretation of Term 'Wetlands'.
W76-10792 6E

Variances and Temporary Permits for Operation of Non-Conforming Sewage Disposal Facilities.
W76-10793 6E

Beach and Shore Restoration; Authority of State Over Federal and Local Beach Restoration Projects.
W76-10794 6E

The Impact of Highway Construction on a North Florida Watershed,
W76-10945 5B

Tide-Induced Mass Transport; A Flushing Mechanism for Shallow Lagoons,
W76-10947 2L

Construction and Testing of Two Waste-Injection Monitor Wells in Northwest Florida,
W76-11070 5B

Hydrologic Effects of Storms of June 24-28, 1974 in Lee and Collier Counties, Florida,
W76-11077 4A

Water-Quality Data for Canals in Eastern Broward County, Florida, 1969-1974,
W76-11081 7C

FLORIDA WATER RESOURCES ACT (1972)
A Sound Water Plan for South Florida Implementation of the 1972 Water Resources Act,
W76-10742 6E

FLOTATION
Advances in Interfacial Phenomena of Particulate/Solution/Gas Systems; Applications to Flotation Research,
W76-10627 5D

Interfacial Chemistry of Particulate Flotation,
W76-10628 5B

Electrochemical Properties of the Oxide-Solution Interface in Relation to Flotation,
W76-10629 5B

Ion and Precipitate Flotation of Metal Ions from Solution,
W76-10630 5D

Precipitate Flotation of Calcium Sulfite from Dilute Aqueous Solution with an Anionic Surfactant,
W76-10631 5D

Behavior of Hydrogen and Hydroxyl Ions at the Oxide-Water Interface,
W76-10633 5B

Characterization of Adsorbed Cobalt at the Oxide-Water Interface,
W76-10634 5D

Removal of Surface-Active and Other Substances Causing the Formation of Stable Foam During Purification of Effluents from the Manufacture of Unbleached Kraft Pulp (Opiti za otstranyavane na pov'rkhnostno-aktivnite i drugi veshchestva, obuslavyashchi obrazuvaneto na ustojchiva pyana pri prechistvaneto na otpad'chni vodi ot proizvodstvoto na neizbelena sulfatna tseluloza),
W76-10834 5D

Trends and Experience in the Primary Treatment of Papermaking Effluents (Indirizzi ed esperienze nel trattamento primario delle acque di scarico delle cartiere),
W76-10852 5D

FLOW
Application of a Residence Time Model to Dilution Gauging, with Particular Reference to the Problem of Changing Discharge,
W76-10935 2E

A Two-Dimensional Numerical Model of Estuarine Circulation: The Effects of Altering Depth and River Discharge,
W76-10948 2L

FLOW CHARACTERISTICS
Design of Alternating Diffuser Pipes,
W76-10952 8B

Floodflow Characteristics at Proposed Bridge Site on Mohawk River in Towns of Frankfort and Schuyler, Herkimer County, New York,
W76-11079 4A

FLOW FRICTION
Flow Resistance in Broad Shallow Grassed Channels,
W76-10710 2E

FLOW MEASUREMENT
Application of a Residence Time Model to Dilution Gauging, with Particular Reference to the Problem of Changing Discharge,
W76-10935 2E

FLOW RESISTANCE
Flow Resistance in Broad Shallow Grassed Channels,
W76-10710 2E

FLUID MECHANICS
Fluid-Mechanics Aspects in the Design of Sewage Outfalls into the Sea (Stroemungsmechanische Entwurfsaspekte fuer Abwassereinleitungen ins Meer),
W76-10678 5E

FLUORESCENT DYE
Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

FLUORINE
Physical Growth and Behavioral Development of Mice Receiving Chlorine and Fluorine,
W76-10551 5C

FLUOROMETRIC TECHNIQUES
Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

FLUVIAL GEOMORPHOLOGY
Effect of Vegetation on Lateral Migration of Anastomosed Channels of a Glacier Meltwater River,
W76-10940 4C

FLY ASH
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

FOAM FRACTIONATION
Determination of Surface Equilibria and Mass Transfer Rates in a Concurrent Flow Bubble Column,
W76-10632 5D

FOAM SEPARATION
Foam Separation for Detoxification of Bleached Kraft Mill Effluents,
W76-10855 5D

FOAMING
Foam Formation in Plants for Biological Purification of Effluents from the Manufacture of Kraft Pulp (Penoobrazuvaneto v stantsiite za biologichno prechistvane naotpad' chite vodi ot proizvodstvoto na sulfatnatseluloza),
W76-10833 5D

FOG
Inadvertent Effects in Weather Modification,
W76-10909 3B

A Note on the Contribution of Fog Drip to Streamflow,
W76-10927 2B

FOG DRIP
A Note on the Contribution of Fog Drip to Streamflow,
W76-10927 2B

FOOD CHAINS
Use of A Trophodynamic Chain of the Benthic Type for the Study of Transfers of Metallic Pollutants, (In French),
W76-10944 5C

The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Foodchain Studies,
W76-10986 5C

Removal of Inorganic Nitrogen in an Integrated Food Chain System,
W76-10988 5C

Polyspecies Aquaculture Systems: The Detrital Trophic Level,
W76-10997 5C

FOOD PROCESSING INDUSTRY
Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

How to Meet Water Cleanup Deadlines,
W76-10862 5D

FOODS
Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

FORECASTING
Automated Forecast Procedures for River Quality Management,
W76-10664 5A

A Normal Mode Method for Predicting Storm Surges on a Lake,
W76-10715 2H

Predicting Consumptive use with Climatological Data,
W76-10873 2D

FOREIGN COUNTRIES
Diplomatic and Legal Aspects of Remote Sensing,
W76-10584 6E

Water Quality and the Water and Soil Conservation Act 1967,
W76-10737 5G

FOSSIL FUELS
Outer Continental Shelf Resource Development Safety: A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products.
W76-11001 5G

Technical Capabilities in Offshore Completion and Workover Operations to Maximize Safety,
W76-11002 5G

Technical Capabilities in Offshore Pipeline Operations to Maximize Safety,
W76-11003 5G

Technical Capabilities of Offshore Exploration Operations to Maximize Safety amd Environmental Protection,
W76-11004 5G

Regulation and Supervision of Outer Continental Shelf Operations on the Pacific Coast,
W76-11005 5G

Gulf Coast Lease Management Inspection Program,
W76-11006 5G

Sharing the Offshore Oil Bonanza.
W76-11088 6C

Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

FRASER RIVER (CANADA)
Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

FRESHWATER FISH
Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

FRESHWATER MARSHES
A Simulation Model of Tritium Kinetics in a Freshwater Marsh,
W76-10812 5B

FRONT RANGE AREA (COLO)
Bog Stratigraphy, Radiocarbon Dates, and Pinedale to Holocene Glacial History in the Front Range, Colorado,
W76-11071 2C

FROTH FLOTATION
Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems using Electron Spectroscopy for Chemical Analysis,
W76-10635 5D

FROZEN SOILS
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

FUTURE PLANNING (PROJECTED)
Water Supply for the Greater New York Metropolitan Area,
W76-10983 6B

FWPCA AMENDMENTS OF 1972
PCB'S in the Environment,
W76-10739 5C

Burning Waters,
W76-10740 5G

New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

Marine Sanitation Device Standard,
W76-10758 5D

Soap and Detergent Manufacturing Category Pretreatment Standards for New Sources,
W76-10759 5G

Timber Products Processing Point Source Category, Proposed Pretreatment Standards for Existing Sources,
W76-10760 5G

Timber Products Processing Point Source Category,
W76-10761 5G

Preparation of State Water Quality Management Plans.
W76-10763 5G

Fertilizer Manufacturing Point Source Category, Urea Subcategory,
W76-10764 5G

Environmental Protection Agency: Grants and Other Federal Assistance, State and Local Assistance.
W76-10765 5G

Fertilizer Manufacturing Point Source Category, Effluent Limitations and Guidelines for Existing Sources and Standards for New Sources for the Phosphate Subcategory,
W76-10768 5G

Ink Formulating Point Source Category, Pretreatment Standards for Existing Sources,
W76-10774 5G

Pollution--Assembly Bill 128--To Create a System of State Discharge Permits Congruent with National Pollutant Discharge Elimination System,
W76-10780 6E

GALERKIN'S METHOD
Application of Finite Element Method to Open Channel Flow,
W76-10939 8B

GALVESTON BAY (TEX)
Annual Cycle of Sportfishing Activity at a Warmwater Discharge into Galveston Bay, Texas,
W76-10541 5G

GAMASOL
Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

GAS CHROMATOGRAPHY
Water Contamination Detection,
W76-10648 5A

A Proposed National Monitoring System for Organics in Water,
W76-10668 5A

Capabilities and Limitations in Identifying and Measuring Aquatic Pollutants,
W76-10669 5A

A Rapid Method for the Simultaneous Determination of Paraquat and Diquat in Pond and River Waters by Pyrolysis and Gas Chromatography,
W76-10870 5A

GASTROPODS
The Respiratory Strategies of two Species of Freshwater Gastropods (Ancylus Fluviatilis Mull and Planorbis Contortus Linn) in Relation to Temperature, Oxygen Concentration, Body Size and Season,
W76-10889 5C

GEOLOGIC FORMATIONS
Bog Stratigraphy, Radiocarbon Dates, and Pinedale to Holocene Glacial History in the Front Range, Colorado,
W76-11071 2C

GEOLOGIC TIME
Bog Stratigraphy, Radiocarbon Dates, and Pinedale to Holocene Glacial History in the Front Range, Colorado,
W76-11071 2C

GEOMORPHOLOGY
Investigation of the Hydrologic Characteristics of Talus,
W76-10706 2F

Channel Width and the Riffle-Pool Sequence,
W76-10924 2E

Effect of Vegetation on Lateral Migration of Anastomosed Channels of a Glacier Meltwater River,
W76-10940 4C

GEORGIA
The Economic Impact of Recreational Land-Use in an Island Environment: A Case Study of Jekyll Island, Georgia,
W76-10581 6B

GEOTHERMAL AREA
Studies for Wildlife on Energy Areas,
W76-10820 6G

GEOTHERMAL STUDIES
An Empirical Na-K-Ca Geothermometer for Natural Waters,
W76-10598 2K

Studies on the Least Chub (Iotichthys Phlegethontiscope) in Geothermal Activities Area of Snake and Tule Valleys, Utah,
W76-10824 6G

Geothermal Energy Recovery Process,
W76-10967 3A

GEOTHERMOMETERS
An Empirical Na-K-Ca Geothermometer for Natural Waters,
W76-10598 2K

GERMINATION
Germination of Weed Seeds Depending on Soil Moisture and Density, (In Russian),
W76-10965 3F

GIANT KELP
Position Paper on the Effects of Acute Oil Spills,
W76-11028 5C

GLACIOLOGY
Bog Stratigraphy, Radiocarbon Dates, and Pinedale to Holocene Glacial History in the Front Range, Colorado,
W76-11071 2C

GLEN LAKE (NH)
Report on Glen Lake, Hillsborough County, New Hampshire.
W76-10527 5C

GOAL PROGRAMMING
A Multi-Objective Framework for Environmental Management Using Goal Programming,
W76-10582 6A

GOVERNMENTAL INTERRELATIONS
Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities.
W76-10623 5G

Environmental Protection Agency: Policies and Procedures for State Continuing Planning Process,
W76-10762 5G

Drainage Districts.
W76-10784 6E

Beach and Shore Restoration; Authority of State Over Federal and Local Beach Restoration Projects.
W76-10794 6E

GRAIN MILLING INDUSTRY
Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Animal Feed, Breakfast Cereal, and Wheat Starch Segments of the Grain Mills Point Source Category,
W76-10594 5G

GRAINS (CROPS)
Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Animal Feed, Breakfast Cereal, and Wheat Starch Segments of the Grain Mills Point Source Category,
W76-10594 5G

GRANTS
Environmental Protection Agency: Grants and Other Federal Assistance, State and Local Assistance.
W76-10765 5G

Water Resources Planning Act,
W76-10776 6E

GRAPHICAL ANALYSIS
Hydraulic Jump in Circular Sewers,
W76-10686 5D

GRAPHICAL METHODS
Hydraulic Jump in Circular Sewers,
W76-10686 5D

GRASSED WATERWAYS
Flow Resistance in Broad Shallow Grassed Channels,
W76-10710 2E

GRAVITY PLATFORMS (OFFSHORE)
Seabed Scour by Currents Near Platforms,
W76-11087 8B

GREAT LAKES
A Normal Mode Method for Predicting Storm Surges on a Lake,
W76-10715 2H

GREAT MAINE LOBSTER WAR
The Great Maine Lobster War,
W76-10747 6E

GREAT SALT LAKE
Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

GROUNDWATER
Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

Optimal Management of the Subsurface Environment: Parameter Identification,
W76-10613 5B

Flow of Toxic Metals in the Environment,
W76-10638 5B

Legal Requirements for Monitoring Groundwater Quality,
W76-10656 5G

Economic Framework for Groundwater Quality Monitoring,
W76-10657 5G

Development of a Methodology for Monitoring Groundwater Quality,
W76-10658 5A

Monitoring Groundwater Pollution,
W76-10659 5A

Management of Groundwater Quality Data,
W76-10660 5A

Groundwater Pollution Monitoring Case Studies,
W76-10661 5A

Land Disposal of Wastes: Potential for Groundwater Pollution,
W76-10667 5E

Equitable Apportionment of Interstate Ground Waters,
W76-10728 4B

Indian Water Rights: Some Emerging Frontiers,
W76-10729 6E

An Analog Model of the Chipuxet Aquifer, Rhode Island,
W76-10814 2F

Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma,
W76-10874 4B

Beef Cattle Feedlots: Impact on Underlying Soil,
W76-11047 5B

Construction and Testing of Two Waste-Injection Monitor Wells in Northwest Florida,
W76-11070 5B

Ground-Water Levels in New Mexico, 1974,
W76-11073 2F

Modeling Solute Transport in Ground Water,
W76-11076 5B

GROUNDWATER AVAILABILITY
Groundwater Availability in Champaign County,
W76-10718 4B

GROUNDWATER BASINS
Role of Precipitation in the Chemistry of Subsurface Waters in the Western Part of the Turgay Trough,
W76-10942 2F

GROUNDWATER DEVELOPMENT
Bear Creek Development Authority,
W76-10778 6E

GROUNDWATER MOVEMENT
Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

GROUNDWATER POLLUTION
Excessive Manure Can Affect Potable Water.
W76-10542 5B

GROUNDWATER RECHARGE
Conformity of Groundwater Recharge Rate by Tritium Method and Mathematical Modelling,
W76-10700 2F

Recycling Ground Water in Waushara County, Wisconsin: Resource Management for Cold-Water Fish Hatcheries,
W76-11082 4B

GROUNDWATER RESOURCES
Public Groundwater Supplies in McHenry County,
W76-10719 4B

Equitable Apportionment of Interstate Ground Waters,
W76-10728 4B

Indian Water Rights: Some Emerging Frontiers,
W76-10729 6E

A Proposal for Adoption of A Legal Doctrine of Groundstream Water Interrelationship in Texas,
W76-10731 4B

Groundwater,
W76-11066 2F

The Sparta Aquifer System in Mississippi,
W76-11067 7C

Maps Showing Ground-Water Conditions in the Lower Hassayampa Area, Maricopa County, Arizona--1975,
W76-11068 7C

Geohydrology of the Anza-Terwilliger Area, Riverside County, California,
W76-11074 4B

GROWTH RATES
Physical Growth and Behavioral Development of Mice Receiving Chlorine and Fluorine,
W76-10551 5C

The Growth Rates and Densities of Ice Crystals Between -3C and -21C,
W76-10697 2B

Bacterial Growth Rates and Temperature Optima in a Stream with a Fluctuating Thermal Regime.
W76-10886 5C

Life History and Ecology of Megarcys Signata (Plecoptera: Perlodidae), Mill Creek, Wasatch Mountains, Utah,
W76-10887 2I

A Kinetic Approach to the Effect of Temperature on Algal Growth,
W76-10987 5C

Relative Growth of Different Species of Marine Algae in Wastewater-Seawater Mixtures,
W76-10989 5C

GULF OF MEXICO
Some Considerations of the Chronic Effects of Petroleum in the Marine Environment,
W76-11023 5C

HARBORS
Volume and Strength of a Dolos,
W76-10523 8F

Oil Ports on the Continental Shelf,
W76-10984 5G

HARDNESS (WATER)
Process of Water Treatment,
W76-10971 5F

HARKINS' INDEX
A Comparison of Several Water Quality Indexes,
W76-10926 5A

HAWAII
Disposal Lagoon.
W76-10618 5D

Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

HAZARDOUS SUBSTANCES
Water Management Districts--Water Resources--Authority to Consider and Protect Against Degradation of Water Quality Through Permitting Processes.
W76-10791 6E

HAZARDS
Directory of Disaster-Related Technology,
W76-10502 10C

HEAT EXCHANGERS
Heat Exchangers for Use in the Culturing of Marine Organisms,
W76-10990 5G

HEAT TRANSPORT
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

HEATED SEWAGE
Feasibility Study of a Nuclear Power-Sewage Treatment System for the Conservation and Reclamation of Water Resources,
W76-10614 5D

HEATED WATER
Feasibility Study of a Nuclear Power-Sewage Treatment System for the Conservation and Reclamation of Water Resources,
W76-10614 5D

HEAVY METALS
Metabolism of Mercury Compounds in Microorganisms,
W76-10894 5C

Electrochemical Cell for Decreasing the Cyanide and Heavy Metal Content of an Aqueous Solution,
W76-10972 5D

Permissible Levels of Heavy Metals in Secondary Effluent for Use in a Combined Sewage Treatment-Marine Aquaculture System. I. Monitoring During Pilot Operation,
W76-10993 5D

Permissible Levels of Heavy Metals in Secondary Effluent for use in a Combined Sewage Treatment-Marine Aquaculture System. II. Development of Guidelines by Methods, of Additions,
W76-10994 5D

HEMICELLULOSE
Studies on Coagulation Treatment of Spent Water from Pulping Process. Part 2. Coagulation Characteristics of Hemicellulose (In Japanese),
W76-10839 5D

HERBICIDES
A Rapid Method for the Simultaneous Determination of Paraquat and Diquat in Pond and River Waters by Pyrolysis and Gas Chromatography,
W76-10870 5A

HETEROTROPHIC BACTERIA
The Total Aerobic Heterotrophic Bacteria Germ Content of Water from the Series of Shallow Inlets to the South of Darss Found by Investigation Using the Cast Plate and the MPN Methods, (In German),
W76-10897 5A

HIGH PLAINS (TEX.-OKLA.) COST ADJUSTMENTS
Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma,
W76-10874 4B

HIGHWAY CONSTRUCTION
The Impact of Highway Construction on a North Florida Watershed,
W76-10945 5B

HIGHWAYS
The Impact of Highway Construction on a North Florida Watershed,
W76-10945 5B

HOGS
Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

Swine Manure Collection and Removal Systems,
W76-11037 5D

Swine Systems for Iowa and North Central States,
W76-11041 5D

Economic Considerations Involved in Selecting Types of Confinement and Waste Disposal Systems for Swine and Beef,
W76-11043 5D

Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

HOLDING PONDS
Water Quality and Management Characteristics of Feedlot Runoff Holding Ponds,
W76-10545 5D

Quality Variation of Feedlot Runoff in Storage,
W76-10549 5B

Seepage Loss from Holding Ponds,
W76-11051 5B

HORIZONTAL INTERCEPTION
A Note on the Contribution of Fog Drip to Streamflow,
W76-10927 2B

HORIZONTAL SPRAY FILMS
Final Report, Horizontal Spray Film (HTEX) and Vertical Tube (VTEX) Evaporator, OSW San Diego Test Facility.
W76-10553 3A

HORIZONTAL TUBE EVAPORATORS
Final Report, Horizontal Spray Film (HTEX) and Vertical Tube (VTEX) Evaporator, OSW San Diego Test Facility.
W76-10553 3A

HOUSE FLY LARVAE
Biodegrading Poultry Excreta with House Fly Larvae: The Concept and Equipment,
W76-11053 5D

HUMAN DISEASES
Survival of Human Pathogens in the Marine Environment,
W76-10890 5C

HUMAN RESOURCES
Lawyers and Ecomanagement,
W76-10753 6E

HYDRAULIC EQUIPMENT
How to Use and Select a Screw Pump,
W76-10681 8C

HYDRAULIC JUMP
Hydraulic Jump in Circular Sewers,
W76-10686 5D

HYDRAULIC MODELS
A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

Simulation of Thermally-Influenced Hydrodynamic Flows: Final Report,
W76-10813 2H

Simplified Routing of Dam Break Waves,
W76-11085 4A

HYDRAULICS
Application of Finite Element Method to Open Channel Flow,
W76-10939 8B

HYDROCARBON ACCUMULATION
Accumulation, Release, and Retention of Petroleum Hydrocarbons by the Oyster, Crassostrea Virginica,
W76-11018 5C

HYDROELECTRIC PLANTS
To Amend the Wild and Scenic Rivers Act (Part 5).
W76-10752 6E

HYDROELECTRIC POWER
Harry S. Truman Dam and Reservoir, Osage River, Missouri. Appendix E, F, G, (Environmental Impact Statement.
W76-10827 4A

HYDROGEN SULFIDE
Adsorption Mechanism of Sulfides at a Platinum-Solution Interface,
W76-10636 5D

HYDROGEOLOGY
Partial Depletion of Saline Groundwater by Seepage,
W76-10920 2L

Groundwater,
W76-11066 2F

Geohydrology of the Anza-Terwilliger Area, Riverside County, California,
W76-11074 4B

HYDROGRAPH ANALYSIS
Comparing Inflow and Infiltration,
W76-10683 5D

HYDROLOGIC DATA
Maps Showing Ground-Water Conditions in the Lower Hassayampa Area, Maricopa County, Arizona--1975,
W76-11068 7C

Greater Pittsburgh Regional Studies, Reports and Maps, April 1976.
W76-11072 7C

Hydrologic Effects of Storms of June 24-28, 1974 in Lee and Collier Counties, Florida,
W76-11077 4A

HYDROLOGIC SYSTEMS
Linear and Nonlinear Approaches for Short-Term Runoff Estimations in Time-Invariant Open Hydrologic Systems,
W76-10699 2E

HYDROLOGICA DATA
Water Resources Data for Wisconsin. Part 1. Surface Water Records. Part 2. Water Quality Records.
W76-10832 7C

HYDROLOGY
Investigation of the Hydrologic Characteristics of Talus,
W76-10706 2F

Entropy Principle Applied to the Rainfall-Runoff Process,
W76-10918 2A

HYDROPONICS
Heat Exchangers for Use in the Culturing of Marine Organisms,
W76-10990 5G

HYPOLIMNION
Marked Diminution of Dissolved Oxygen in the Hypolimnion of Lake Biwa in August, 1973, (In Japanese),
W76-10976 5C

HYSTERESIS
Capillary Hysteresis and the Relationship Between Drying and Wetting Curves,
W76-10914 2G

ICE
The Growth Rates and Densities of Ice Crystals Between -3C and -21C,
W76-10697 2B

Milankovitch Solar Radiation Variations and Ice Age Ice Sheet Sizes,
W76-10949 2C

ICE AGE
Milankovitch Solar Radiation Variations and Ice Age Ice Sheet Sizes,
W76-10949 2C

ICE CRYSTAL FORMATION
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

ICE CRYSTAL GROWTH
The Growth Rates and Densities of Ice Crystals Between -3C and -21C,
W76-10697 2B

ICE CRYSTAL NUCLEATION
Supersaturation and Time Dependence of Ice Nucleation from the Vapor on Single Crystal Substrates,
W76-10695 3B

ICE FLOES
A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

ICE JAMS
A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

ICE SHEETS
Milankovitch Solar Radiation Variations and Ice Age Ice Sheet Sizes,
W76-10949 2C

ILLINOIS
Water Quality and Management Characteristics of Feedlot Runoff Holding Ponds,
W76-10545 5D

Groundwater Availability in Champaign County,
W76-10718 4B

Public Groundwater Supplies in McHenry County,
W76-10719 4B

Illinois Laws Relating to Waterways 1973.
W76-10720 6E

Tough Illinois Effluent Standards are met by Celotex Boxboard Mill,
W76-10856 5G

Water Quality Characteristics of the Illinois River at Peoria,
W76-10922 5A

Some Water Quality Aspects in a Nascent Impoundment in Central Illinois,
W76-10950 5B

ILLINOIS RIVER
Water Quality Characteristics of the Illinois River at Peoria,
W76-10922 5A

IMPOUNDMENTS
Some Water Quality Aspects in a Nascent Impoundment in Central Illinois,
W76-10950 5B

INADVERTENT WEATHER MODIFICATION
Proceedings from a Workshop on Inadvertent Weather Modification.
W76-10901 3B

Urban-Industrial Effects on Clouds and Precipitation,
W76-10905 4C

Inadvertent Effects in Weather Modification,
W76-10909 3B

Urban Aerosols and Inadvertent Weather Modification,
W76-10913 4C

INCINERATION
Pesticide Incineration,
W76-10675 5E

Unique Process for Sulfite Spent Liquor Keeps Older Mill Viable,
W76-10871 5D

INDIA
Water to the Fields: India's Changing Strategy,
W76-10589 3F

INDIA (GUJARAT)
Conformity of Groundwater Recharge Rate by Tritium Method and Mathematical Modelling,
W76-10700 2F

INDIAN RESERVATIONS
Indian Water Rights: Some Emerging Frontiers,
W76-10729 6E

INDONESIA
Environmental Quality Surveillance in Indonesia,
W76-10655 5A

INDUSTRIAL EFFLUENTS
Fertilizer Manufacturing Point Source Category, Effluent Limitations and Guidelines for Existing Sources and Standards for New Sources for the Phosphate Subcategory,
W76-10768 5G

INDUSTRIAL PLANT CLOSURES
Water Pollution Control Act of 1972, Economic Impacts, Plant Closures.
W76-10563 5G

INDUSTRIAL PLANTS
Water Pollution Control Act of 1972, Economic Impacts, Plant Closures.
W76-10563 5G

INDUSTRIAL PRODUCTION
An Integrated Power Process Model of Water Use and Wastewater Treatment in Chlorine Caustic Production,
W76-10621 5D

INDUSTRIAL WASTES
Water Pollution Abatement Technology: Capabilities and Costs, Iron and Steel Industry,
W76-10558 5D

Precipitate Flotation of Calcium Sulfite from Dilute Aqueous Solution with an Anionic Surfactant,
W76-10631 5D

Environmental Quality Surveillance in Indonesia,
W76-10655 5A

A Feasibility Study of the Control of Pollution from Industrial Waste Waters Discharged into the Lagoon of Venice,
W76-10679 5D

Soap and Detergent Manufacturing Category Pretreatment Standards for New Sources,
W76-10759 5G

Timber Products Processing Point Source Category, Proposed Pretreatment Standards for Existing Sources,
W76-10760 5G

Timber Products Processing Point Source Category,
W76-10761 5G

Organic Chemicals Manufacturing Point Source Category, Ethylene Oxide, Ethylene Glycol, Methyl Amines and Oxo Chemicals Processes,
W76-10769 5G

Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

An Investigation of Effluent Control Standards and Practices (Atomic Energy Production),
W76-10828 5G

Foam Formation in Plants for Biological Purification of Effluents from the Manufacture of Kraft Pulp (Penoobrazuvaneto v stantsiite za biologichno prechistvane naotpad' chite vodi ot proizvodstvoto na sulfatnatseluloza),
W76-10833 5D

Dispersion of Pollutants,
W76-10907 5B

Metal Recovery from Waste Treatment Sludges,
W76-10960 5D

Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

Purification of Waste Water Containing Organic and Inorganic Impurities,
W76-10966 5D

Electrochemical Cell for Decreasing the Cyanide and Heavy Metal Content of an Aqueous Solution,
W76-10972 5D

Polynuclear Aromatic Hydrocarbon Pollution of the Marine Environment,
W76-11030 5B

INDUSTRIES
Water Pollution Control Act of 1972, Economic Impacts, Plant Closures.
W76-10563 5G

Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Animal Feed, Breakfast Cereal, and Wheat Starch Segments of the Grain Mills Point Source Category,
W76-10594 5G

Urban-Industrial Effects on Clouds and Precipitation,
W76-10905 4C

INFILTRATION
Comparing Inflow and Infiltration,
W76-10683 5D

The Influence of Slope and Rain Intensity on Runoff and Infiltration.
W76-10702 2A

INFILTRATION RATES
Effect of Cattle Feedyard Runoff on Soil Infiltration Rates,
W76-10538 5B

INFLOW
Comparing Inflow and Infiltration,
W76-10683 5D

INFORMATION EXCHANGE
Directory of Disaster-Related Technology,
W76-10502 10C

Sources of Information in Water Resources, an Annotated Guide to Printed Materials,
W76-10881 10C

INFRARED RADIATION
Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

INHIBITION
Marine Molysmology: The Primary Production of Experimental Ecosystems Set up in the Rance River Estuary. Effect of Crude Oil,
W76-10830 5C

INHIBITORS
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

INJECTION WELLS
Monitoring of Subsurface Waste-Disposal Operations: A Generalized Systems Approach with Examples from Canadian Case Histories,
W76-10662 5D

Construction and Testing of Two Waste-Injection Monitor Wells in Northwest Florida,
W76-11070 5B

INSTITUTIONAL CONSTRAINTS
Identification of Special Hazard Areas List of Communities with Special Hazard Areas,
W76-10773 6F

INSTITUTIONS
The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement, Volume I,
W76-10574 5G

The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement Volume II,
W76-10575 5G

Water to the Fields: India's Changing Strategy,
W76-10589 3F

Interdisciplinary/Interinstitutional Requirements for Water Resource Planning: Processes to Enhance Cooperation,
W76-10609 6B

Environmental Improvement Authorities Act of 1969 (Formation of Public Corporations to Deal with Pollution),
W76-10777 6E

INSTRUMENTATION
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

The Fiberlog, a New Monitor for Fibrous Effluents,
W76-10843 5A

Some Observations on the Joss-Waldvogel Rainfall Disdrometer,
W76-10928 2B

Automated Determination of Carbon in Natural Waters,
W76-10936 5A

U.S. Geological Survey Water Quality Monitor, Operations Manual,
W76-11080 5A

INTERCEPTOR SEWERS
Cleveland Mixes Methods in Sewer Construction.
W76-10684 5D

Underlake Sewer Spurs Resort Development,
W76-10685 5D

INTERFACES
Advances in Interfacial Phenomena of Particulate/Solution/Gas Systems; Applications to Flotation Research,
W76-10627 5D

Characterization of Adsorbed Cobalt at the Oxide-Water Interface,
W76-10634 5D

Adsorption Mechanism of Sulfides at a Platinum-Solution Interface,
W76-10636 5D

Density Current Surges I--Their Role in the Initial Dispersion of A Surface Field,
W76-10707 5B

INTERGOVERNMENTAL RELATIONS
Zoning--Flood Control.
W76-10781 6E

INTERINDUSTRY ANALYSIS
Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma,
W76-10874 4B

INTERNATIONAL COMMISSIONS
Some International Activities in Environmental Monitoring,
W76-10644 5A

The Third U. N. Law of the Sea Conference: Major Unresolved Fisheries Issues,
W76-10733 6E

INTERNATIONAL LAW
An Integrated International and Domestic Approach to Civil Liability for Vessel-Source Oil Pollution,
W76-10730 5G

The Law of the Sea at the Caracas Session: A Brief Evaluation,
W76-10732 6E

Energy Crisis, Supertankers and Ecology,
W76-10735 5G

The Oceans: Wild West Scramble for Control,
W76-10745 6E

The New Treaty on Vessel Pollution,
W76-10748 6E

INTERNATIONAL RELATIONS
Diplomatic and Legal Aspects of Remote Sensing,
W76-10584 6E

INTERSTATE COMPACTS
Coal Mining, Development and Processing -- The Associated Water Problems,
W76-10727 6E

INTERSTATE RIVES
North Dakota Water Quality Standards for the Surface Waters of North Dakota.
W76-10788 6E

INTFACES
Density Current Surges II--The Movement of Surges in a Turbulent Environment and Their Role in Surface Field Dispersion,
W76-10708 5B

INVERTEBRATES
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

INVISCID FLOW
Density Current Surges I--Their Role in the Initial Dispersion of A Surface Field,
W76-10707 5B

IODINE
Techniques De Determination Radide Des Effets De Synergie Radionucleides - Polluants, (Techniques for Rapid Determination of Effects of Synergy Between Radionuclides and Pollutants),
W76-10891 5A

ION-SPECIFIC ELECTRODE
Effect of a Livestock Wintering Operation on a Western Mountain Stream,
W76-11059 5A

IONS
Ion and Precipitate Flotation of Metal Ions from Solution,
W76-10630 5D

Behavior of Hydrogen and Hydroxyl Ions at the Oxide-Water Interface,
W76-10633 5B

IOWA
Water Quality Analysis, Iowa-Cedar River Basin.
W76-10576 5G

Swine Systems for Iowa and North Central States,
W76-11041 5D

IOWA-CEDAR RIVER BASIN
Water Quality Analysis, Iowa-Cedar River Basin.
W76-10576 5G

IRON
Ion and Precipitate Flotation of Metal Ions from Solution,
W76-10630 5D

IRON AND STEEL INDUSTRY
Water Pollution Control Act of 1972, Economic Impacts, Iron and Steel Industry,
W76-10557 5G

Water Pollution Abatement Technology: Capabilities and Costs, Iron and Steel Industry,
W76-10558 5D

IRRIGATION
Peach Irrigation in Florida,
W76-10749 3F

Irrigation Systems Automation,
W76-10955 3F

Brake Means for an Air-Powered Sprinkler System,
W76-10956 3F

Alignment Control Apparatus for Center Pivot Irrigation Equipment,
W76-10957 3F

Automatic Water Sprinkler for Irregular Areas,
W76-10959 3F

Combined Drain and Flood Gate,
W76-10968 3F

Trickle Irrigator,
W76-10970 3F

Reaction Arm for Rotary Sprinkler,
W76-10978 3F

IRRIGATION EFFICIENCY
Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

Irrigation Systems Automation,
W76-10955 3F

Brake Means for an Air-Powered Sprinkler System,
W76-10956 3F

Automatic Water Sprinkler for Irregular Areas,
W76-10959 3F

Trickle Irrigator,
W76-10970 3F

IRRIGATION PRACTICES
Brake Means for an Air-Powered Sprinkler System,
W76-10956 3F

Automatic Water Sprinkler for Irregular Areas,
W76-10959 3F

Trickle Irrigator,
W76-10970 3F

IRRIGATION PROGRAMS
Water to the Fields: India's Changing Strategy,
W76-10589 3F

IRRIGATION SYSTEMS
Irrigation Systems Automation,
W76-10955 3F

Alignment Control Apparatus for Center Pivot Irrigation Equipment,
W76-10957 3F

Combined Drain and Flood Gate,
W76-10968 3F

IRRIGATION WATER
The Effect of Changing Input andProduct Prices on the Demand for Irrigation Water in Texas,
W76-10810 3F

A Method for Determining the Irrigation Requirement in Antigua, W. I.,
W76-10981 3F

ISLANDS
The Economic Impact of Recreational Land-Use in an Island Environment: A Case Study of Jekyll Island, Georgia,
W76-10581 6B

JACKASS PENGUIN
Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

JAMAICA
Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

JAPAN
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

JAPAN (LAKE BIWA)
Marked Diminution of Dissolved Oxygen in the Hypolimnion of Lake Biwa in August, 1973, (In Japanese),
W76-10976 5C

JAPAN (SAI-GAWA RIVER)
A Biological Study on the Pollution of the Sai-Gawa River and its Tributaries, Ishikawa Prefecture, (In Japanese),
W76-10973 5B

JAPAN SEA
Numerical Simulation of Japan Sea Effect Snowfall,
W76-10930 2C

JEKYLL ISLAND (GA)
The Economic Impact of Recreational Land-Use in an Island Environment: A Case Study of Jekyll Island, Georgia,
W76-10581 6B

JETS
Oblique Impingement of Circular Turbulent Jets,
W76-10709 8B

JUDICIAL DECISIONS
A Proposal for Adoption of A Legal Doctrine of Groundstream Water Interrelationship in Texas,
W76-10731 4B

Adams V Montana Power Co. (Definition of Navigable Waters for Admiralty Jurisdiction).
W76-10798 6E

JURISDICTION
Legal Requirements for Monitoring Groundwater Quality,
W76-10656 5G

Natural Resources, Dept of; Nuisances: Water.
W76-10783 6E

Ei Du Pont De Nemours and Company V Train (Federal Water Pollution Prevention and Con-

trol Act Quality Standards of Water and Effluent Discharged into that Water).
W76-10799 6E

KALL
Shoreline Retaining Wall,
W76-10953 8B

KANSAS
Performance of Feedlot Runoff Control Facilities in Kansas,
W76-11058 5D

KELPS
Position Paper on the Effects of Acute Oil Spills,
W76-11028 5C

KINETICS
A Strategy for Aquatic Pollutants Fate and Transport Determination,
W76-10665 5B

Electrochemical Production of Free Radicals for Wastewater Treatment,
W76-10876 5D

KOREA
Toxicity of Agricultural Chemicals to Larvivorous Fish in Korean Rice Fields,
W76-11095 5C

KRAFT MILLS
Effluents from Chlorination and Alkaline Extraction of Pine Sulfate Pulp,
W76-10858 5B

LABORATORY ANALYSIS
Ground Water Quality Monitoring for California's Needs,
W76-11065 5A

LABORATORY TECHNIQUES
Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

LABORATORY TESTS
Field and Laboratory Evaluation of Bi-Level Drainage Theory,
W76-10934 4A

Design of Alternating Diffuser Pipes,
W76-10952 8B

Heat Exchangers for Use in the Culturing of Marine Organisms,
W76-10990 5G

LAGOON OF VENICE (ITALY)
A Feasibility Study of the Control of Pollution from Industrial Waste Waters Discharged into the Lagoon of Venice,
W76-10679 5D

LAGOONS
Disposal Lagoon.
W76-10618 5D

A Feasibility Study of the Control of Pollution from Industrial Waste Waters Discharged into the Lagoon of Venice,
W76-10679 5D

Tide-Induced Mass Transport; A Flushing Mechanism for Shallow Lagoons,
W76-10947 2L

Soil Conservation Service Program in Animal Waste Management,
W76-11046 5G

Seepage Loss from Holding Ponds,
W76-11051 5B

How to Plan and Manage a Lagoon,
W76-11052 5D

Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

LAKE LUGANO (ITALY)
On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

LAKE MAGGIORE (ITALY)
On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

LAKE MEAD (NEV)
Distribution of Stream Pollution in Lake Water,
W76-10712 5B

LAKE MORPHOLOGY
On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

LAKE ONTARIO
A Normal Mode Method for Predicting Storm Surges on a Lake,
W76-10715 2H

LAKE PONTCHARTRAIN (LA)
Environmental Investigation of Eden Isles,
W76-10510 5G

LAKE WINNIPESAUKEE (NH)
Report on Lake Winnepesaukee, Carroll and Belknap Counties, New Hampshire.
W76-10529 5C

LAKES
Some Characteristics of Spleen Growth in the Lake Minnow, (In Russian),
W76-10521 2I

Report of Kelly's Falls Pond, Hillsborough County, New Hampshire,
W76-10525 5C

Report on Powder Mill Pond, Hillsborough County, New Hampshire.
W76-10526 5C

Report on Glen Lake, Hillsborough County, New Hampshire.
W76-10527 5C

Report on Sebasticook Lake, Penobscot County, Maine.
W76-10528 5C

Report on Lake Winnepesaukee, Carroll and Belknap Counties, New Hampshire.
W76-10529 5C

The Evaporation and Sedimentation in Man-Made Arade Lake, Southern Portugal,
W76-10703 2D

Tropic Status of Selected Northern New Mexico Lakes,
W76-10808 5C

Simulation of Thermally-Influenced Hydrodynamic Flows: Final Report,
W76-10813 2H

LAMINAR FLOW
Steady Laminar Flow in a Stationary Tank with a Spinning Bottom,
W76-11062 8B

LANCASTER SOUND
Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

LAND APPLICATION
Effect of Soil-Incorporated Dairy Cattle Manure on Runoff Water Quality and Soil Properties,
W76-10539 5B

Excessive Manure Can Affect Potable Water.
W76-10542 5B

Chemical and Microbiological Changes in Poultry Litter Applied to Soil as Influenced by the Time and Method of Application,
W76-10615 5E

LAND DEVELOPMENT
Water to the Fields: India's Changing Strategy,
W76-10589 3F

Matching Resources and People,
W76-10723 6B

LAND DISPOSAL
Manure and the Nitrate Problem,
W76-10616 5E

LAND MANAGEMENT
State Water Control Board--Authority to Investigate all Problems Concerned with the Quality of Water,
W76-10779 6E

LAND TENURE
Sargent Lake Ass'n. V Dane (Rights of Property Owners Association in a Dam, Beach, and Shorefront Area).
W76-10795 6E

LAND USE
Economic Effects of Agricultural Land-Use Management on Soil Erosion and Farm Income in the Obion-Forked Deer River Basin,
W76-10612 4A

South Dakota's System of Water Management and its Relation to Land Use and Economic Development,
W76-10721 4A

Matching Resources and People,
W76-10723 6B

Greater Pittsburgh Regional Studies, Reports and Maps, April 1976.
W76-11072 7C

LANDFILLS
Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

Land Disposal of Wastes: Potential for Groundwater Pollution,
W76-10667 5E

LARGE RIVER BASINS
Selection of Typical Small Drainage Basins for Investigating and Computing Spring Runoff from Large River Basins,
W76-10705 4A

LARVIVOROUS FISH
Toxicity of Agricultural Chemicals to Larvivorous Fish in Korean Rice Fields,
W76-11095 5C

LAS VEGAS VALLEY (NEV)
Quality of Water Considerations in Arid Area Water Management,
W76-10608 5B

LATIN AMERICA
Environmental Monitoring in Latin America and the Caribbean,
W76-10654 5A

LAW ENFORCEMENT
The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement, Volume I,
W76-10574 5G

The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement Volume II,
W76-10575 5G

LAW OF THE SEA
Settlement of Disputes Arising Under the Law of the Sea Convention,
W76-10590 6E

Ocean Boundaries and Petroleum Resources,
W76-10596 6E

A New International Law for the Deep Seabed Regime,
W76-10726 6E

The Law of the Sea at the Caracas Session: A Brief Evaluation,
W76-10732 6E

U. S. Position on Law of the Sea Reviewed,
W76-10743 6E

Department Opposes Unilateral Extension of U. S. Fisheries Jurisdiction,
W76-10744 6E

The Oceans: Wild West Scramble for Control,
W76-10745 6E

LEACHATE
Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

LEAD
Inadvertent Effects in Weather Modification,
W76-10909 3B

LEAD CHLORIDE
Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

LEARNING ABILITY
Physical Growth and Behavioral Development of Mice Receiving Chlorine and Fluorine,
W76-10551 5C

LEAST CHUB
Studies on the Least Chub (Iotichthys Phlegethontiscope) in Geothermal Activities Area of Snake and Tule Valleys, Utah,
W76-10824 6G

LEATHER TANNING INDUSTRY
Water Pollution Control Act of 1972, Economic Impacts, Leather Tanning Industry.
W76-10561 5G

LEGAL ASPECTS
EPA Proposes New Feedlot Regulations.
W76-10536 5G

Diplomatic and Legal Aspects of Remote Sensing,
W76-10584 6E

International Conference on Environmental Sensing and Assessment, Volumes 1 and 2.
W76-10637 5A

Legal Requirements for Monitoring Groundwater Quality,
W76-10656 5G

Equitable Apportionment of Interstate Ground Waters,
W76-10728 4B

Lawyers and Ecomanagement,
W76-10753 6E

Water Pollution--Civil Remedies.
W76-10782 6E

The Legal Requirement for the Assessment of Inadvertent Weather Modification - An Engineering Viewpoint,
W76-10912 3B

Legal Aspects of Livestock Production and Waste Management,
W76-11044 5D

Legal Aspects of Odor and Dust from Feedlots,
W76-11054 5G

LEGAL REVIEW
Equitable Apportionment of Interstate Ground Waters,
W76-10728 4B

LEGISLATION
Enabling Legislation: Possibilities for the Commercial Fishing Industry,
W76-10593 6E

Legal Requirements for Monitoring Groundwater Quality,
W76-10656 5G

Illinois Laws Relating to Waterways 1973.
W76-10720 6E

Department Opposes Unilateral Extension of U. S. Fisheries Jurisdiction,
W76-10744 6E

Bear Creek Development Authority,
W76-10778 6E

Sovereignty of State.
W76-10789 6E

Text and Commentary for Weather Modification Control Law,
W76-10809 3B

Safe Drinking Water Act - Implications for Ground Water Quality Protection,
W76-11064 5F

Ground Water Quality Monitoring for California's Needs,
W76-11065 5A

LEHIGH VALLEY (PA)
Water Supply and Sewage Facilities Plan Update - 1970 (1974 Supplement),
W76-10508 5G

LETHAL LIMIT
PCB'S in the Environment,
W76-10739 5C

LEWISVILLE RESERVOIR
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

LIABILITY
An Integrated International and Domestic Approach to Civil Liability for Vessel-Source Oil Pollution,
W76-10730 5G

LICENSES
New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

LICENSING
To Amend the Wild and Scenic Rivers Act (Part 2).
W76-10750 6E

LIELUPE RIVER (LATVIA)
Lignosulfonates and Natural Water-Soluble Lignin in the Lielupe River (Lignosul'fonaty i prirodnyi vodorastvorimyi lignin v vode r. Lielupe),
W76-10835 5B

LIFE HISTORY STUDIES
Life History and Ecology of Megarcys Signata (Plecoptera: Perlodidae), Mill Creek, Wasatch Mountains, Utah,
W76-10887 2I

LIGHT
Some Mechanisms of Weathering of Petroleum Hydrocarbons on Marine Waters: Competitive Pathways to Fate and Disposition of Petroleum Pollution,
W76-11010 5B

Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

LIGNINS
Removal of Surface-Active and Other Substances Causing the Formation of Stable Foam During Purification of Effluents from the Manufacture of Unbleached Kraft Pulp (Opiti za otstranyavane na pov'rkhnostno-aktivnite i drugi veshchestva, obuslavyashchi obrazuvaneto na ustojchiva pyana pri prechistvaneto na otpad'chni vodi ot proizvodstvoto na neizbelena sulfatna tseluloza),
W76-10834 5D

Lignosulfonates and Natural Water-Soluble Lignin in the Lielupe River (Lignosul'fonaty i prirodnyi vodorastvorimyi lignin v vode r. Lielupe),
W76-10835 5B

Long-Term Stability of Waste Lignins in Aquatic Systems. Part 2. Stability in Saline Water,
W76-10838 5B

Biodegradation of Components of Pulp Waste Effluents by Bacteria. (3). Degradation of Lignin Preparation from Waste Liquor of Oxygen-Alkali Pulping (In Japanese),
W76-10840 5D

Purification of Lignosulfonates by Dynamic Membrane Ultrafiltration,
W76-10868 5D

LIGNOSULFONATES
Purification of Lignosulfonates by Dynamic Membrane Ultrafiltration,
W76-10868 5D

LIME
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

LIMNOLOGY
Tropic Status of Selected Northern New Mexico Lakes,
W76-10808 5C

LINDANE
Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

LINEAR CASCADE MODEL
A Discrete Linear Cascade Model for Hydrology,
W76-10946 2E

LINEAR MODELS
The Impact on Dairy Farm Organization of Alternative Manure Disposal Systems. A Method of Assessing the Cost of Environmental Regulation,
W76-11061 5D

LINEAR PROGRAMMING
Linear and Nonlinear Approaches for Short-Term Runoff Estimations in Time-Invariant Open Hydrologic Systems,
W76-10699 2E

The Effect of Changing Input andProduct Prices on the Demand for Irrigation Water in Texas,
W76-10810 3F

Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma,
W76-10874 4B

LININGS
Fiber-Glass-Reinforced Polyesters and Furan Resins for Water- and Waste-Treatment Systems,
W76-10682 8G

Sewers - Relining VS Replacement,
W76-10690 8G

LIPID CONTENT
Accumulation, Release, and Retention of Petroleum Hydrocarbons by the Oyster, Crassostrea Virginica,
W76-11018 5C

LIQUID SCINTILLATION
Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

LIQUID WASTES
System Components to Separate Solids and Liquids,
W76-11036 5D

LITERATURE
Structure of Water in the Cell: Review of the Literature, (In Russian),
W76-10974 1A

LITHUANIA
Ecological Variability of Bream in Lithuanian Waters: 2. Age and Growth Rate, (In Russian),
W76-10519 5C

LITTER
Chemical and Microbiological Changes in Poultry Litter Applied to Soil as Influenced by the Time and Method of Application,
W76-10615 5E

LIVESTOCK
Development Document for Effluent Limitations Guidelines and New Source Performance Standards: Feedlot Point Source Category,
W76-10829 5G

Animal Waste Management Conference.
W76-11032 5D

Animal Waste Management--Comments on the National Situation,
W76-11033 5D

The State and Regional Situation,
W76-11034 5D

Legal Aspects of Livestock Production and Waste Management,
W76-11044 5D

LOBSTERS
The Great Maine Lobster War,
W76-10747 6E

LOCAL GOVERNMENTS
State Water Control Board--Authority to Investigate all Problems Concerned with the Quality of Water,
W76-10779 6E

Zoning--Flood Control.
W76-10781 6E

LOESS
Loess Distribution by Variable Winds,
W76-10941 2J

LOESS DISTRIBUTION
Loess Distribution by Variable Winds,
W76-10941 2J

LOS ANGELES (CALIF)
Urban Aerosols and Inadvertent Weather Modification,
W76-10913 4C

LOUISIANA
Environmental Investigation of Eden Isles,
W76-10510 5G

Some Considerations of the Chronic Effects of Petroleum in the Marine Environment,
W76-11023 5C

LOW ENERGY
Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

LOWER HASSAYAMPA AREA (ARIZ)
Maps Showing Ground-Water Conditions in the Lower Hassayampa Area, Maricopa County, Arizona--1975,
W76-11068 7C

LYSIMETERS
Plant Measurements as Indicators of Crop Water Deficit,
W76-10622 3F

Predicting Consumptive use with Climatological Data,
W76-10873 2D

Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

MACHIAS SEAL ISLAND
The Great Maine Lobster War,
W76-10747 6E

MAINE
Report on Sebasticook Lake, Penobscot County, Maine.
W76-10528 5C

The Great Maine Lobster War,
W76-10747 6E

MAINTENANCE
Town Maintains Sewers Despite 'Sugar Sand',
W76-10687 5D

Sewers - Relining VS Replacement,
W76-10690 8G

MAINTENANCE COSTS
Sewers - Relining VS Replacement,
W76-10690 8G

MAJOR OIL SPILLS
A Literature Review of the Biological Impact of Oil Spills in Marine Waters,
W76-11027 5C

MALATHION
Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

MAN-MADE LAKES
The Evaporation and Sedimentation in Man-Made Arade Lake, Southern Portugal,
W76-10703 2D

MANAGEMENT
Interboard Plan for the Greater Finger Lakes - Oswego River Basin,
W76-10506 4A

A Multi-Objective Framework for Environmental Management Using Goal Programming,
W76-10582 6A

Implementation of a Large Scale Water Quality Data Management System,
W76-10588 5A

National Ocean Policy: Priorities for the Future,
W76-10591 6E

'Ware the Wadden Sea,
W76-10985 6G

Oil in the Marine Environment,
W76-11025 5B

Animal Waste Management Conference.
W76-11032 5D

Animal Waste Management--Comments on the National Situation,
W76-11033 5D

The State and Regional Situation,
W76-11034 5D

Waste Management Systems for Roofed Beef Confinement Facilities,
W76-11040 5D

Swine Systems for Iowa and North Central States,
W76-11041 5D

Legal Aspects of Livestock Production and Waste Management,
W76-11044 5D

Farm Animal Waste Management: What our Milk Market Requires,
W76-11050 5D

How to Plan and Manage a Lagoon,
W76-11052 5D

A Public Authority to Manage the Atlantic Outer Continental Shelf,
W76-11097 6E

MANGROVE SWAMPS
Rookery Bay: Ecological Constraints on Coastal Development,
W76-10741 6G

MANNING'S ROUGHNESS
Flow Resistance in Broad Shallow Grassed Channels,
W76-10710 2E

MANURE PACKS
Intact Manure Packs Halt Seepage.
W76-10544 5G

MAPS
The Sparta Aquifer System in Mississippi,
W76-11067 7C

Maps Showing Ground-Water Conditions in the Lower Hassayampa Area, Maricopa County, Arizona--1975,
W76-11068 7C

MARICOPA COUNTY (ARIZ)
Maps Showing Ground-Water Conditions in the Lower Hassayampa Area, Maricopa County, Arizona--1975,
W76-11068 7C

MARINE ALGAE
Relative Growth of Different Species of Marine Algae in Wastewater-Seawater Mixtures,
W76-10989 5C

MARINE BIOTA
Oil in the Marine Environment,
W76-11025 5B

MARINE ENVIRONMENT
Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume II.
W76-11007 5C

Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

Chemical Composition: A Control on the Physical and Chemical Processes Acting on Petroleum in the Marine Environment,
W76-11013 5B

Biological Fate of Petroleum Hydrocarbons in Aquatic Macroorganisms,
W76-11014 5C

Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

Biological Effects of Chronic Oil Pollution on Coastal Ecosystems,
W76-11019 5C

Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

Oil in the Marine Environment,
W76-11025 5B

The Importance of Oil Pollution in the North Sea,
W76-11026 5B

A Literature Review of the Biological Impact of Oil Spills in Marine Waters,
W76-11027 5C

Polynuclear Aromatic Hydrocarbon Pollution of the Marine Environment,
W76-11030 5B

Is Our Approach to the Oil Pollution Problem too Crude,
W76-11031 5C

MARINE FISH
An Analysis of the Main Scientific Papers Dealing with Long Term Low Level Effects of Oil Pollution,
W76-11022 5C

MARINE FISHERIES
The Third U. N. Law of the Sea Conference: Major Unresolved Fisheries Issues,
W76-10733 6E

MARINE FUNGI
Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

MARINE MICROORGANISMS
Metabolism of Mercury Compounds in Microorganisms,
W76-10894 5C

Heat Exchangers for Use in the Culturing of Marine Organisms,
W76-10990 5G

MARINE ORGANISMS
Biological Fate of Petroleum Hydrocarbons in Aquatic Macroorganisms,
W76-11014 5C

The Importance of Oil Pollution in the North Sea,
W76-11026 5B

MARINE TOILETS
Marine Sanitation Device Standard,
W76-10758 5D

MARKET VALUE
Prospect for Sea-Bed Resources in a Recession,
W76-10979 6E

MARKETING
Enabling Legislation: Possibilities for the Commercial Fishing Industry,
W76-10593 6E

Social, Political, Regulatory and Marketing Problems of Marine Waste-Food Recycling Systems,
W76-10991 5G

MARSHES
A Simulation Model of Tritium Kinetics in a Freshwater Marsh,
W76-10812 5B

Application of Finite Element Method to Open Channel Flow,
W76-10939 8B

MARYLAND
Deposition in Upper Patuxent Estuary, Maryland, 1968-1969,
W76-10925 4C

MASS SPECTROMETRY
Spark Source Mass Spectrometry: The Optimum Referee Method for Multielement Analysis,
W76-10649 5A

A Proposed National Monitoring System for Organics in Water,
W76-10668 5A

Capabilities and Limitations in Identifying and Measuring Aquatic Pollutants,
W76-10669 5A

MASS TRANSFER
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

MASSACHUSETTS
Environmental Impact Assessment, Water Quality Analysis, Connecticut River.
W76-10577 5G

Anatomy of an Oil Spill,
W76-10597 5B

MATERIALS
Fiber-Glass-Reinforced Polyesters and Furan Resins for Water- and Waste-Treatment Systems,
W76-10682 8G

MATERIALS FAILURE
Materials Failure Identification Manual for Sea Water Desalination Plants.
W76-10880 3A

MATERIALS TESTING
Final Report, Material Evaluation and Development Program, OSW San Diego Test Facility,
W76-10552 3A

Assessment of Polyvinyl Chloride as a Packaging Material for Distilled Spirits, (Enivronmental Impact Assessment),
W76-10722 6G

MATHEMATICAL MODELS
Optimal Management of the Subsurface Environment: Parameter Identification,
W76-10613 5B

Conformity of Groundwater Recharge Rate by Tritium Method and Mathematical Modelling,
W76-10700 2F

Capillary Hysteresis and the Relationship Between Drying and Wetting Curves,
W76-10914 2G

Pulsed Dispersion of Trace Chemical Concentrations in a Saturated Sorbing Porous Medium,
W76-10915 5B

Steady Laminar Flow in a Stationary Tank with a Spinning Bottom,
W76-11062 8B

Decision Mapping - Tool for Underground Waste Management,
W76-11063 5B

MATHEMATICAL STUDIES
Horizontal Random Temperature Structure of the Ocean,
W76-10691 2L

MATHEMATICAL STUDIES

Water Quality Characteristics of the Illinois River at Peoria,
W76-10922 5A

MCHENRY COUNTY (ILL)
Public Groundwater Supplies in McHenry County,
W76-10719 4B

MEASUREMENT
Final Report, Material Evaluation and Development Program, OSW San Diego Test Facility,
W76-10552 3A

Capabilities and Limitations in Identifying and Measuring Aquatic Pollutants,
W76-10669 5A

MEDITERRANEAN
The Evaporation and Sedimentation in Man-Made Arade Lake, Southern Portugal,
W76-10703 2D

MEGARCYS SIGNATA
Life History and Ecology of Megarcys Signata (Plecoptera: Perlodidae), Mill Creek, Wasatch Mountains, Utah,
W76-10887 2I

MEGINNISS ARM TRIBUTARY (FLA)
The Impact of Highway Construction on a North Florida Watershed,
W76-10945 5B

MELT WATER
Five Pumps Salvage a Quebec Sewer Job,
W76-10689 8C

MERCURY
Metabolism of Mercury Compounds in Microorganisms,
W76-10894 5C

MESOZOIC ERA
Subsurface Waters of Erosion Troughs in the Aktyuba Region of the Ural - A Source of Drinking Water Supply,
W76-10943 2F

METABOLISM
Metabolism of Mercury Compounds in Microorganisms,
W76-10894 5C

Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

Uptake and Depuration of Specific Hydrocarbons from Oil by the Bivalves Rangia Cuneata and Crassostrea Virginica,
W76-11024 5C

METAL FINISHING INDUSTRY
Water Pollution Abatement Technology: Capabilities and Costs, Metal Finishing Industry,
W76-10555 5D

Water Pollution Control Act of 1972, Economic Impacts, Metal Finishing Industry,
W76-10556 5G

METAL RECOVERY
Metal Recovery from Waste Treatment Sludges,
W76-10960 5D

METALLIC POLLUTION
Use of A Trophodynamic Chain of the Benthic Type for the Study of Transfers of Metallic Pollutants, (In French),
W76-10944 5C

METALS
Determination of Surface Equilibria and Mass Transfer Rates in a Concurrent Flow Bubble Column,
W76-10632 5D

Flow of Toxic Metals in the Environment,
W76-10638 5B

Sampling and Analysis of Metals in Air, Water and Waste Products,
W76-10639 5A

Trace Metal Analysis by Atomic Emission Using a D.C. Argon Plasma,
W76-10651 5A

Some Considerations on Monitoring of Trace Metals in Estuaries and Oceans,
W76-10653 5A

METEORO LOGICAL DATA
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

METHODOLOGY
Development of a Methodology for Monitoring Groundwater Quality,
W76-10658 5A

A Method for Determining the Irrigation Requirement in Antigua, W. I.,
W76-10981 3F

METHOXYCHLOR
Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

MICHIGAN
Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

To Amend the Wild and Scenic Rivers Act (Part 5).
W76-10752 6E

Pollution Abatement Systems for Farm Animal Wastes in Southeast Michigan,
W76-11057 5D

MICROBIAL DEGRADATION
Biodegradation of Components of Pulp Waste Effluents by Bacteria. (3). Degradation of Lignin Preparation from Waste Liquor of Oxygen-Alkali Pulping (In Japanese),
W76-10840 5D

Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

MICROBIOLOGY
Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

MICROORGANISMS
Chemical and Microbiological Changes in Poultry Litter Applied to Soil as Influenced by the Time and Method of Application,
W76-10615 5E

MILK
Farm Animal Waste Management: What our Milk Market Requires,
W76-11050 5D

MINING
An Environmental Analysis of a Simulated Sea-Floor Mining Operation,
W76-10601 5G

The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

Prospect for Sea-Bed Resources in a Recession,
W76-10979 6E

MINNESOTA
Town Gives Primary and Secondary Treatment to Blandin's Effluent,
W76-10857 5D

MINNOWS
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

Some Characteristics of Spleen Growth in the Lake Minnow, (In Russian),
W76-10521 2I

MIREX
Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

MISSISSIPPI
The Sparta Aquifer System in Mississippi,
W76-11067 7C

Flood Frequency of Mississippi Streams,
W76-11083 4A

MISSOURI
Harry S. Truman Dam and Reservoir, Osage River, Missouri. Appendix E, F, G, (Environmental Impact Statement.
W76-10827 4A

MISSOURI RIVER
A Selected Annotated Bibliography on Fish and Wildlife Implications of Missouri Basin Water Allocation,
W76-10825 4C

Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

MODE OF ACTION
Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

MODEL SCALING
Wind-Tunnel Simulation of Atmospheric Flow and Dispersion,
W76-10908 5A

MODEL STUDIES
An Integrated Power Process Model of Water Use and Wastewater Treatment in Chlorine Caustic Production
W76-10621 5D

Environmental Monitoring in Latin America and the Caribbean,
W76-10654 5A

Automated Forecast Procedures for River Quality Management,
W76-10664 5A

A Strategy for Aquatic Pollutants Fate and Transport Determination,
W76-10665 5B

Baroclinic Instability in the Denmark Strait Overflow,
W76-10693 2L

Use of Log-Normal Distributions for Numerical Calculations of Condensation and Collection,
W76-10694 2B

Distribution of Stream Pollution in Lake Water,
W76-10712 5B

A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

A Simulation Model of Tritium Kinetics in a Freshwater Marsh,
W76-10812 5B

An Analog Model of the Chipuxet Aquifer, Rhode Island,
W76-10814 2F

Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

Wind-Tunnel Simulation of Atmospheric Flow and Dispersion,
W76-10908 5A

Entropy Principle Applied to the Rainfall-Runoff Process,
W76-10918 2A

Partial Depletion of Saline Groundwater by Seepage,
W76-10920 2L

Application of the Stanford Watershed Model to Nigerian Watersheds,
W76-10923 2A

Numerical Simulation of Japan Sea Effect Snowfall,
W76-10930 2C

An Example of the Modification of Ocean Currents by Bottom Topography,
W76-10931 2L

Soil Water Modeling I: A Generalized Simulator of Steady, Two-Dimensional Flow,
W76-10933 2G

A Discrete Linear Cascade Model for Hydrology,
W76-10946 2E

A Two-Dimensional Numerical Model of Estuarine Circulation: The Effects of Altering Depth and River Discharge,
W76-10948 2L

Milankovitch Solar Radiation Variations and Ice Age Ice Sheet Sizes,
W76-10949 2C

A Model for Water and Phosphorus Distribution on the Island of Goeteborg, (In Swedish),
W76-10963 5B

A Kinetic Approach to the Effect of Temperature on Algal Growth,
W76-10987 5C

Towards a Model of the Effects of Oil on Marine Organisms,
W76-11021 5C

Performance of Feedlot Runoff Control Facilities in Kansas,
W76-11058 5D

Modeling Solute Transport in Ground Water,
W76-11076 5B

Application of Simple Dam Break Routing Model,
W76-11084 8B

MODES OF ACTION

Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

MOHAWK RIVER (NY)

Floodflow Characteristics at Proposed Bridge Site on Mohawk River in Towns of Frankfort and Schuyler, Herkimer County, New York,
W76-11079 4A

MOLECULAR STRUCTURE

Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

Structure of Water in the Cell: Review of the Literature, (In Russian),
W76-10974 1A

MOLECULAR WEIGHT

Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

MOLLUSKS

Integrated Systems of Mollusk Culture,
W76-10996 5C

Polyspecies Aquaculture Systems: The Detrital Trophic Level,
W76-10997 5C

MOLYBDENUM

Atomic-Absorption Determination of Vanadium and Molybdenum in Tap Water and Mineral Waters After Anion-Exchange Separation,
W76-10869 5A

MOMENTUM EQUATION

Density Current Surges II--The Movement of Surges in a Turbulent Environment and Their Role in Surface Field Dispersion,
W76-10708 5B

MONITORING

Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities.
W76-10623 5G

International Conference on Environmental Sensing and Assessment, Volumes 1 and 2.
W76-10637 5A

Monitoring: The Trigger for Action,
W76-10640 5A

Environmental Levels of PCB'S,
W76-10641 5A

A Preliminary Design for a National Environmental Census,
W76-10642 5A

Design of Nationwide Water-Quality Monitoring Networks,
W76-10643 5A

Some International Activities in Environmental Monitoring,
W76-10644 5A

Earthwatch-Sentinel for the Future,
W76-10645 5A

Network Design Considerations for the Global Environmental Monitoring System (GEMS) of the United Nations,
W76-10646 5A

An Evaluation of Automatic Wastewater Compositors,
W76-10652 5A

Environmental Monitoring in Latin America and the Caribbean,
W76-10654 5A

Environmental Quality Surveillance in Indonesia,
W76-10655 5A

Legal Requirements for Monitoring Groundwater Quality,
W76-10656 5G

Economic Framework for Groundwater Quality Monitoring,
W76-10657 5G

Development of a Methodology for Monitoring Groundwater Quality,
W76-10658 5A

Monitoring Groundwater Pollution,
W76-10659 5A

Groundwater Pollution Monitoring Case Studies,
W76-10661 5A

Monitoring of Subsurface Waste-Disposal Operations: A Generalized Systems Approach with Examples from Canadian Case Histories,
W76-10662 5D

Land Disposal of Wastes: Potential for Groundwater Pollution,
W76-10667 5E

Assessment of the Benefits of Environmental Remote Sensing,
W76-10670 5A

Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

The Fiberlog, a New Monitor for Fibrous Effluents,
W76-10843 5A

Pelagic Tar in the North Pacific Ocean,
W76-11009 5A

Ground Water Quality Monitoring for California's Needs,
W76-11065 5A

Construction and Testing of Two Waste-Injection Monitor Wells in Northwest Florida,
W76-11070 5B

U.S. Geological Survey Water Quality Monitor, Operations Manual,
W76-11080 5A

MONOMICTIC LAKES

On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

MORTALITY
Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

MORTALITY ESTIMATES
Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

MOUNT RAINIER (WASH)
Estimated Erosion Rates on Mount Rainier, Washington,
W76-10951 2J

MULTI-OBJECTIVE PLANNING
A Multi-Objective Framework for Environmental Management Using Goal Programming,
W76-10582 6A

Multiobjective Planning and Environmental Evaluation of Water Resource Systems,
W76-10610 6G

MULTIPLE-LINEARIZATION TECHNIQUE
Application of Simple Dam Break Routing Model,
W76-11084 8B

Simplified Routing of Dam Break Waves,
W76-11085 4A

MULTIPLE RESERVOIR SYSTEM
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

MULTIPLICATIVE INDEX
A Comparison of Several Water Quality Indexes,
W76-10926 5A

MULTIPORT DIFFUSER
Design of Alternating Diffuser Pipes,
W76-10952 8B

MUNICIPAL WASTES
Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

Town Maintains Sewers Despite 'Sugar Sand',
W76-10687 5D

San Francisco Civil Service Ass'n, Local 400 V State Ex Rel Regional Water Quality Control Board (Damages Assessment for Pollutants to Public Entity Constitutional).
W76-10801 6E

MUNICIPAL WATER
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

NASCENT IMPOUNDMENTS
Some Water Quality Aspects in a Nascent Impoundment in Central Illinois,
W76-10950 5B

NATIONAL PARKS
To Amend the Wild and Scenic Rivers Act (Part 4).
W76-10751 6E

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

Pollution--Assembly Bill 128--To Create a System of State Discharge Permits Congruent with National Pollutant Discharge Elimination System,
W76-10780 6E

NATIONAL WILD AND SCENIC RIVER SYSTEM
To Amend the Wild and Scenic Rivers Act (Part 5).
W76-10752 6E

NATURAL GAS
Materials Transportation Bureau: Transpiration of Natural and Other Gas by Pipeline,
W76-10756 5G

NATURAL OIL SEEPS
An Analysis of the Main Scientific Papers Dealing with Long Term Low Level Effects of Oil Pollution,
W76-11022 5C

NATURAL RESOURCES
Strategies for Natural Resource Decision-Making: Comments on the Staff Report,
W76-10503 6E

National Ocean Policy: Priorities for the Future,
W76-10591 6E

NATURAL STREAMS
A Transformations of Sulfate Turpentine in Natural Waters (Protsessy prevrashcheniya sul'fatnogo skipidara v prirodnykh vodakh),
W76-10845 5B

NAVIER-STOKES EQUATIONS
Steady Laminar Flow in a Stationary Tank with a Spinning Bottom,
W76-11062 8B

NAVIGABLE RIVERS
Navigable Waters: Riparian Rights.
W76-10787 6E

Coastal Industrial Water Authority V. York (No Change to Title to Land by Avulsion Even Through Avulsion Artificially Caused).
W76-10796 6E

NAVIGABLE WATERS
Dredged Material Disposal--Effects and Alternatives,
W76-10724 5E

Navigable Waters: Riparian Rights.
W76-10785 6E

Natural Resources, Dept of; Navigable Waters.
W76-10786 6E

Adams V Montana Power Co. (Definition of Navigable Waters for Admiralty Jurisdiction).
W76-10798 6E

NAVIGATION
Adams V Montana Power Co. (Definition of Navigable Waters for Admiralty Jurisdiction).
W76-10798 6E

NEBRASKA
Waterway Cleans Feedlot Runoff,
W76-10537 5D

Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

Large Commercial Feedlots - How Wastes are Handled in the West,
W76-11048 5D

NEGLIGENCE
Phillips Ranch, Inc. V Banta (Rights in Water Adjacent to Plaintiff's Property Doesn't Give Defendant Easement to Carry Water Over Plaintiff's Property).
W76-10804 6E

NETHERLANDS
Partial Depletion of Saline Groundwater by Seepage,
W76-10920 2L

NETWORK DESIGN
Design of Nationwide Water-Quality Monitoring Networks,
W76-10643 5A

NETWORKS
Network Design Considerations for the Global Environmental Monitoring System (GEMS) of the United Nations,
W76-10646 5A

NEUTRON PROBE
Predicting Consumptive use with Climatological Data,
W76-10873 2D

NEVADA
Quality of Water Considerations in Arid Area Water Management,
W76-10608 5B

Distribution of Stream Pollution in Lake Water,
W76-10712 5B

NEW HAMPSHIRE
Report of Kelly's Falls Pond, Hillsborough County, New Hampshire,
W76-10525 5C

Report on Powder Mill Pond, Hillsborough County, New Hampshire.
W76-10526 5C

Report on Glen Lake, Hillsborough County, New Hampshire.
W76-10527 5C

Report on Lake Winnepesaukee, Carroll and Belknap Counties, New Hampshire.
W76-10529 5C

The Great Maine Lobster War,
W76-10747 6E

Sargent Lake Ass'n. V Dane (Rights of Property Owners Association in a Dam, Beach, and Shorefront Area).
W76-10795 6E

NEW MEXICO
Tropic Status of Selected Northern New Mexico Lakes,
W76-10808 5C

Ground-Water Levels in New Mexico, 1974,
W76-11073 2F

NEW YORK
Interboard Plan for the Greater Finger Lakes - Oswego River Basin,
W76-10506 4A

Multiobjective Planning and Environmental Evaluation of Water Resource Systems,
W76-10610 6G

Here Come De Sludge,
W76-10746 6E

Comprehensive Water Supply Study for New York State,
W76-10982 6B

Water Supply for the Greater New York Metropolitan Area,
W76-10983 6B

Floodflow Characteristics at Proposed Bridge Site on Mohawk River in Towns of Frankfort and Schuyler, Herkimer County, New York,
W76-11079 4A

NEW YORK BIGHT
A Fin Rot Disease of Marine and Euryhaline Fishes in the New York Bight,
W76-10524 5C

Dumping Sewage Sludge in the Ocean.
W76-10674 5E

Here Come De Sludge,
W76-10746 6E

NEW ZEALAND
The Conveyancer, Water Rights and the Environment,
W76-10736 6E

Water Quality and the Water and Soil Conservation Act 1967,
W76-10737 5G

NIGERIA (KONTAGORA WATERSHED)
Application of the Stanford Watershed Model to Nigerian Watersheds,
W76-10923 2A

NIGERIA (MALENDO WATERSHED)
Application of the Stanford Watershed Model to Nigerian Watersheds,
W76-10923 2A

NITRATES
Effect of Soil-Incorporated Dairy Cattle Manure on Runoff Water Quality and Soil Properties,
W76-10539 5B

Manure and the Nitrate Problem,
W76-10616 5E

Studies on the Toxicity of Ammonia, Nitrate and Their Mixtures to the Common Guppy,
W76-10811 5C

Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

NITROGEN
Oxidation of Ammonia in Water by Ferrates (VI) and (IV),
W76-10611 5D

Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

NITROGEN COMPOUNDS
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

Fertilizer Manufacturing Point Source Category, Urea Subcategory,
W76-10764 5G

Removal of Inorganic Nitrogen in an Integrated Food Chain System,
W76-10988 5C

NON-FERROUS METALS INDUSTRY
Water Pollution Control Act of 1972, Economic Impacts, Non-Ferrous Metals Industry,
W76-10565 5G

NON-STRUCTURAL ALTERNATIVES
Interboard Plan for the Greater Finger Lakes - Oswego River Basin,
W76-10506 4A

NONGAME ANIMALS
Nongame Mammal Inventory of the Utah Oil Shale Area,
W76-10823 6G

NONLINEAR PROGRAMMING
Linear and Nonlinear Approaches for Short-Term Runoff Estimations in Time-Invariant Open Hydrologic Systems,
W76-10699 2E

NONPOINT WATER POLLUTION SOURCES
Water Pollution Abatement Technology: Capabilities and Costs, Control of Water Pollution from Selected Nonpoint Sources.
W76-10567 5D

NORMAL MODE METHOD
A Normal Mode Method for Predicting Storm Surges on a Lake,
W76-10715 2H

NORTH CAROLINA
Water Quality Analysis, Santee River Basin,
W76-10578 5G

To Amend the Wild and Scenic Rivers Act (Part 2).
W76-10750 6E

NORTH DAKOTA
North Dakota Water Quality Standards for the Surface Waters of North Dakota.
W76-10788 6E

NORTH SEA
The Importance of Oil Pollution in the North Sea,
W76-11026 5B

NORTHEAST U. S.
Water Supply for the Greater New York Metropolitan Area,
W76-10983 6B

NUCLEAR MAGNETIC RESONANCE
Capabilities and Limitations in Identifying and Measuring Aquatic Pollutants,
W76-10669 5A

NUCLEATING INHIBITORS
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

NUCLEATION
Supersaturation and Time Dependence of Ice Nucleation from the Vapor on Single Crystal Substrates,
W76-10695 3B

Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

Inadvertent Effects in Weather Modification,
W76-10909 3B

Urban Aerosols and Inadvertent Weather Modification,
W76-10913 4C

NUISANCE LAWS
Legal Aspects of Odor and Dust from Feedlots,
W76-11054 5G

NUISANCE (WATER LAW)
Water Pollution--Civil Remedies.
W76-10782 6E

NUMBER 2 FUEL OIL
Uptake and Depuration of Specific Hydrocarbons from Oil by the Bivalves Rangia Cuneata and Crassostrea Virginica,
W76-11024 5C

NUMERICAL ANALYSIS
Seepage Flow Through Homogeneous Soil into a Row of Drain Pipes,
W76-10919 4A

Steady Laminar Flow in a Stationary Tank with a Spinning Bottom,
W76-11062 8B

NUTRIENT REMOVAL
Regina Tertiary Treatment Plant Study and Design, (Part II),
W76-10516 5D

Removal of Inorganic Nitrogen in an Integrated Food Chain System,
W76-10988 5C

NUTRIENT REQUIREMENTS
Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

Integrated Systems of Mollusk Culture,
W76-10996 5C

NUTRIENT TRANSPORT
Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

NUTRIENTS
Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

Yield and Removal of Nutrients by Oat Plants Depending on Fertilizer Rates and Soil Moisture Content, (In Belorussian),
W76-10962 3F

Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

OAHU (HI)
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

OATS
Yield and Removal of Nutrients by Oat Plants Depending on Fertilizer Rates and Soil Moisture Content, (In Belorussian),
W76-10962 3F

OBSERVATION WELLS
Ground-Water Levels in New Mexico, 1974,
W76-11073 2F

OBSTRUCTION OF FLOW
Phillips Ranch, Inc. V Banta (Rights in Water Adjacent to Plaintiff's Property Doesn't Give Defendant Easement to Carry Water Over Plaintiff's Property).
W76-10804 6E

OCEAN CURRENTS
An Example of the Modification of Ocean Currents by Bottom Topography,
W76-10931 2L

OCEANS
The Economics of Developing the Resources of the World's Oceans,
W76-10587 6B

National Ocean Policy: Priorities for the Future,
W76-10591 6E

Some Considerations on Monitoring of Trace Metals in Estuaries and Oceans,
W76-10653 5A

Fluid-Mechanics Aspects in the Design of Sewage Outfalls into the Sea (Stroemungsmechanische Entwurfsaspekte fuer Abwassereinleitungen ins Meer),
W76-10678 5E

Horizontal Random Temperature Structure of the Ocean,
W76-10691 2L

Repeated Profiling of Microstructure Lenses with a Midwater Float,
W76-10692 2L

Prospect for Sea-Bed Resources in a Recession,
W76-10979 6E

ODOR
Intact Manure Packs Halt Seepage.
W76-10544 5G

Legal Aspects of Odor and Dust from Feedlots,
W76-11054 5G

OFFSHORE DRILLING
Ocean Boundaries and Petroleum Resources,
W76-10596 6E

OFFSHORE OIL
The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf,
W76-10734 5G

OFFSHORE PIPELINES
Technical Capabilities in Offshore Pipeline Operations to Maximize Safety,
W76-11003 5G

OFFSHORE PLATFORMS
Safety and Pollution Control - Offshore Petroleum Producing Facilities,
W76-10603 5G

Materials Transportation Bureau: Transpiration of Natural and Other Gas by Pipeline,
W76-10756 5G

Deepwater Port Site Evaluation,
W76-10766 5G

Deepwater Ports: Licensing Procedures and Design Construction, Equipment and Operations,
W76-10767 5G

Outer Continental Shelf Resource Development Safety: A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products.
W76-11001 5G

Technical Capabilities of Offshore Exploration Operations to Maximize Safety amd Environmental Protection,
W76-11004 5G

Seabed Scour by Currents Near Platforms,
W76-11087 8B

Offshore Oil: Technology - And Emotion,
W76-11090 5G

A Thorough Look At Current Offshore Petroleum Operations.
W76-11091 6C

Oil Spills and Offshore Petroleum,
W76-11092 5G

OFFSHORE TECHNOLOGY
Marine Technology Society Eighth Annual Conference Preprints,
W76-10600 5G

Safety and Pollution Control - Offshore Petroleum Producing Facilities,
W76-10603 5G

Outer Continental Shelf Resource Development Safety: A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products.
W76-11001 5G

Technical Capabilities in Offshore Completion and Workover Operations to Maximize Safety,
W76-11002 5G

Technical Capabilities of Offshore Exploration Operations to Maximize Safety amd Environmental Protection,
W76-11004 5G

Regulation and Supervision of Outer Continental Shelf Operations on the Pacific Coast,
W76-11005 5G

Gulf Coast Lease Management Inspection Program,
W76-11006 5G

Oil Spills and Offshore Petroleum,
W76-11092 5G

OHIO
A Simulation Model of Tritium Kinetics in a Freshwater Marsh,
W76-10812 5B

OHIO RIVER
Automated Forecast Procedures for River Quality Management,
W76-10664 5A

OIL
Oil Ports on the Continental Shelf,
W76-10984 5G

The Occurance and Amount of Pelagic Tar in the Open Ocean,
W76-11008 5B

Biological Effects of Chronic Oil Pollution on Coastal Ecosystems,
W76-11019 5C

Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

Uptake and Depuration of Specific Hydrocarbons from Oil by the Bivalves Rangia Cuneata and Crassostrea Virginica,
W76-11024 5C

Oil in the Marine Environment,
W76-11025 5B

A Literature Review of the Biological Impact of Oil Spills in Marine Waters,
W76-11027 5C

Position Paper on the Effects of Acute Oil Spills,
W76-11028 5C

Some Biological Effects Related to the West Falmouth Oil Spill,
W76-11029 5C

Is Our Approach to the Oil Pollution Problem too Crude,
W76-11031 5C

Offshore Oil: Technology - And Emotion,
W76-11090 5G

OIL DISPERSANTS
A Literature Review of the Biological Impact of Oil Spills in Marine Waters,
W76-11027 5C

OIL INDUSTRY
Water Pollution Control Act of 1972, Economic Impacts, Petroleum Refining Industry,
W76-10560 5G

Ocean Boundaries and Petroleum Resources,
W76-10596 6E

Anatomy of an Oil Spill,
W76-10597 5B

Safety and Pollution Control - Offshore Petroleum Producing Facilities,
W76-10603 5G

National Oceanic and Atmospheric Administration: Coastal Zone Management Program, Administration Grants, Allocation of Section 306 Funds to States,
W76-10754 6E

Coastal Zone Management Program Development Grants, Outer Continental Shelf,
W76-10755 6E

Some Considerations of the Chronic Effects of Petroleum in the Marine Environment,
W76-11023 5C

Sharing the Offshore Oil Bonanza.
W76-11088 6C

A Thorough Look At Current Offshore Petroleum Operations.
W76-11091 6C

OIL POLLUTION
Anatomy of an Oil Spill,
W76-10597 5B

Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

Safety and Pollution Control - Offshore Petroleum Producing Facilities,
W76-10603 5G

An Integrated International and Domestic Approach to Civil Liability for Vessel-Source Oil Pollution,
W76-10730 5G

Energy Crisis, Supertankers and Ecology,
W76-10735 5G

The Great Maine Lobster War,
W76-10747 6E

The New Treaty on Vessel Pollution,
W76-10748 6E

Marine Molysmology: The Primary Production of Experimental Ecosystems Set up in the Rance River Estuary. Effect of Crude Oil,
W76-10830 5C

Technical Capabilities in Offshore Completion and Workover Operations to Maximize Safety,
W76-11002 5G

Regulation and Supervision of Outer Continental Shelf Operations on the Pacific Coast,
W76-11005 5G

Pelagic Tar in the North Pacific Ocean,
W76-11009 5A

Some Mechanisms of Weathering of Petroleum Hydrocarbons on Marine Waters: Competitive Pathways to Fate and Disposition of Petroleum Pollution,
W76-11010 5B

The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

Biological Fate of Petroleum Hydrocarbons in Aquatic Macroorganisms,
W76-11014 5C

Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

Biological Effects of Chronic Oil Pollution on Coastal Ecosystems,
W76-11019 5C

Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

Towards a Model of the Effects of Oil on Marine Organisms,
W76-11021 5C

An Analysis of the Main Scientific Papers Dealing with Long Term Low Level Effects of Oil Pollution,
W76-11022 5C

Some Considerations of the Chronic Effects of Petroleum in the Marine Environment,
W76-11023 5C

Uptake and Depuration of Specific Hydrocarbons from Oil by the Bivalves Rangia Cuneata and Crassostrea Virginica,
W76-11024 5C

Oil in the Marine Environment,
W76-11025 5B

The Importance of Oil Pollution in the North Sea,
W76-11026 5B

A Literature Review of the Biological Impact of Oil Spills in Marine Waters,
W76-11027 5C

Polynuclear Aromatic Hydrocarbon Pollution of the Marine Environment,
W76-11030 5B

Offshore Oil: Technology - And Emotion,
W76-11090 5G

Oil Spills and Offshore Petroleum,
W76-11092 5G

Offshore Oil Spills and the Marine Environment,
W76-11093 5G

Distribution of Suspended Oil Particles Following the Grounding of the Tanker Arrow,
W76-11096 5B

Oil in Sea Ice,
W76-11098 5B

Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

OIL POLLUTION ACT
Burning Waters,
W76-10740 5G

OIL RESERVOIRS
The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf,
W76-10734 5G

OIL SHALE AREA
Studies for Wildlife on Energy Areas,
W76-10820 6G

OIL SHALE AREA (UTAH)
Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

Raptor Study of Utah Oil Shale Area,
W76-10822 6G

Nongame Mammal Inventory of the Utah Oil Shale Area,
W76-10823 6G

OIL SLICKS
Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

OIL SPILL
Some Biological Effects Related to the West Falmouth Oil Spill,
W76-11029 5C

OIL SPILL PREVENTION
Oil in the Marine Environment,
W76-11025 5B

OIL SPILLS
Anatomy of an Oil Spill,
W76-10597 5B

Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

An Integrated International and Domestic Approach to Civil Liability for Vessel-Source Oil Pollution,
W76-10730 5G

Energy Crisis, Supertankers and Ecology,
W76-10735 5G

Burning Waters,
W76-10740 5G

Oil Pollution Prevention,
W76-10772 5G

People Ex Rel Younger V Superior Court (Damage Assessment to Public Entity Constitutional Because not Punitive).
W76-10800 6E

Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume II.
W76-11007 5C

The Occurance and Amount of Pelagic Tar in the Open Ocean,
W76-11008 5B

Pelagic Tar in the North Pacific Ocean,
W76-11009 5A

Some Mechanisms of Weathering of Petroleum Hydrocarbons on Marine Waters: Competitive Pathways to Fate and Disposition of Petroleum Pollution,
W76-11010 5B

The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

Accumulation, Release, and Retention of Petroleum Hydrocarbons by the Oyster, Crassostrea Virginica,
W76-11018 5C

Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

Oil in the Marine Environment,
W76-11025 5B

The Importance of Oil Pollution in the North Sea,
W76-11026 5B

A Literature Review of the Biological Impact of Oil Spills in Marine Waters,
W76-11027 5C

Position Paper on the Effects of Acute Oil Spills,
W76-11028 5C

Is Our Approach to the Oil Pollution Problem too Crude,
W76-11031 5C

Offshore Oil: Technology - And Emotion,
W76-11090 5G

Oil Spills and Offshore Petroleum,
W76-11092 5G

Offshore Oil Spills and the Marine Environment,
W76-11093 5G

Distribution of Suspended Oil Particles Following the Grounding of the Tanker Arrow,
W76-11096 5B

Oil in Sea Ice,
W76-11098 5B

Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

OIL SURFACE-TO-VOLUME RATIO
The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

OIL WASTES
Marine Molysmology: The Primary Production of Experimental Ecosystems Set up in the Rance River Estuary. Effect of Crude Oil,
W76-10830 5C

Some Considerations of the Chronic Effects of Petroleum in the Marine Environment,
W76-11023 5C

OIL WATER
The Occurance and Amount of Pelagic Tar in the Open Ocean,
W76-11008 5B

OIL-WATER INTERFACES
The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

Uptake and Depuration of Specific Hydrocarbons from Oil by the Bivalves Rangia Cuneata and Crassostrea Virginica,
W76-11024 5C

OILY WATER
Ink Formulating Point Source Category, Pretreatment Standards for Existing Sources,
W76-10774 5G

Some Mechanisms of Weathering of Petroleum Hydrocarbons on Marine Waters: Competitive Pathways to Fate and Disposition of Petroleum Pollution,
W76-11010 5B

The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

Accumulation, Release, and Retention of Petroleum Hydrocarbons by the Oyster, Crassostrea Virginica,
W76-11018 5C

Biological Effects of Chronic Oil Pollution on Coastal Ecosystems,
W76-11019 5C

Position Paper on the Effects of Acute Oil Spills,
W76-11028 5C

Some Biological Effects Related to the West Falmouth Oil Spill,
W76-11029 5C

Polynuclear Aromatic Hydrocarbon Pollution of the Marine Environment,
W76-11030 5B

OILY WATERS
Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume II.
W76-11007 5C

OKLAHOMA
Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma,
W76-10874 4B

Techniques for Estimating Flood Depths for Oklahoma Streams,
W76-11075 4A

ON-SITE DATA COLLECTIONS
Repeated Profiling of Microstructure Lenses with a Midwater Float,
W76-10692 2L

ON-SITE INVESTIGATIONS
Horizontal Random Temperature Structure of the Ocean,
W76-10691 2L

ON-SITE TESTS
An Evaluation of Automatic Wastewater Compositors,
W76-10652 5A

Field and Laboratory Evaluation of Bi-Level Drainage Theory,
W76-10934 4A

OPEN CHANNEL FLOW
The Relationship of Slope and Stream Channel Form in the River Dart, Devon,
W76-10698 2E

Application of Finite Element Method to Open Channel Flow,
W76-10939 8B

OPERATING COSTS
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

OPERATION AND MAINTENANCE
U.S. Geological Survey Water Quality Monitor, Operations Manual,
W76-11080 5A

OPERATIONS MANUAL (WATER QUALITY MONITOR)
U.S. Geological Survey Water Quality Monitor, Operations Manual,
W76-11080 5A

OPTIMIZATION
Solving Discrete-Variable Multiple-Constraint Non Linear Programs: The Decision State Method, (Vol. 3),
W76-10606 6A

OPTIMUM DEVELOPMENT PLANS
A Multi-Objective Framework for Environmental Management Using Goal Programming,
W76-10582 6A

Economic Framework for Groundwater Quality Monitoring,
W76-10657 5G

OREGON
Water Quality Analysis, Columbia River.
W76-10579 5G

Phillips Ranch, Inc. V Banta (Rights in Water Adjacent to Plaintiff's Property Doesn't Give Defendant Easement to Carry Water Over Plaintiff's Property).
W76-10804 6E

ORGANIC CARBON
Automated Determination of Carbon in Natural Waters,
W76-10936 5A

ORGANIC COMPOUNDS
Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

Water Contamination Detection,
W76-10648 5A

A Proposed National Monitoring System for Organics in Water,
W76-10668 5A

Capabilities and Limitations in Identifying and Measuring Aquatic Pollutants,
W76-10669 5A

A Transformations of Sulfate Turpentine in Natural Waters (Protsessy prevrashcheniya sul'fatnogo skipidara v prirodnykh vodakh),
W76-10845 5B

Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

ORGANIC OXIDATION
Electrochemical Production of Free Radicals for Wastewater Treatment,
W76-10876 5D

ORGANIC PESTICIDES
Pesticide Incineration,
W76-10675 5E

ORGANIC WASTES
Here Come De Sludge,
W76-10746 6E

ORGANIZATIONS
Interdisciplinary/Interinstitutional Requirements for Water Resource Planning: Processes to Enhance Cooperation,
W76-10609 6B

OROGRAPHY
Numerical Simulation of Japan Sea Effect Snowfall,
W76-10930 2C

OSCILLATORY FLOW
Experimental and Theoretical Investigations in an Oscillatory Turbulent Boundary Layer,
W76-10916 8B

OSWEGO RIVER BASIN (NY)
Interboard Plan for the Greater Finger Lakes - Oswego River Basin,
W76-10506 4A

OUTER CONTINENTAL SHELF
Ocean Boundaries and Petroleum Resources,
W76-10596 6E

Anatomy of an Oil Spill,
W76-10597 5B

Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

Marine Technology Society Eighth Annual Conference Preprints,
W76-10600 5G

An Environmental Analysis of a Simulated Sea-Floor Mining Operation,
W76-10601 5G

The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

Safety and Pollution Control - Offshore Petroleum Producing Facilities,
W76-10603 5G

The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf,
W76-10734 5G

Coastal Zone Management Program Development Grants, Outer Continental Shelf,
W76-10755 6E

Outer Continental Shelf Resource Development Safety: A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products.
W76-11001 5G

Technical Capabilities in Offshore Completion and Workover Operations to Maximize Safety,
W76-11002 5G

Technical Capabilities in Offshore Pipeline Operations to Maximize Safety,
W76-11003 5G

Technical Capabilities of Offshore Exploration Operations to Maximize Safety amd Environmental Protection,
W76-11004 5G

Regulation and Supervision of Outer Continental Shelf Operations on the Pacific Coast,
W76-11005 5G

Gulf Coast Lease Management Inspection Program,
W76-11006 5G

Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

Seabed Scour by Currents Near Platforms,
W76-11087 8B

Sharing the Offshore Oil Bonanza.
W76-11088 6C

Barium in Southern California Coastal Waters: A Potential Indicator of Marine Drilling Contamination,
W76-11089 5A

Offshore Oil: Technology - And Emotion,
W76-11090 5G

A Thorough Look At Current Offshore Petroleum Operations.
W76-11091 6C

Oil Spills and Offshore Petroleum,
W76-11092 5G

Offshore Oil Spills and the Marine Environment,
W76-11093 5G

Final Environmental Statement, Construction of Artificial Reefs in the Atlantic Ocean Off Cape Henry, Virginia.
W76-11094 8B

Distribution of Suspended Oil Particles Following the Grounding of the Tanker Arrow,
W76-11096 5B

A Public Authority to Manage the Atlantic Outer Continental Shelf,
W76-11097 6E

Oil in Sea Ice,
W76-11098 5B

Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

OUTFALL SEWERS
Fluid-Mechanics Aspects in the Design of Sewage Outfalls into the Sea (Stroemungsmechanische Entwurfsaspekte fuer Abwassereinleitungen ins Meer),
W76-10678 5E

OVERFLOW
Water Pollution Through Rain Overflows from Mixed Sewers (Gewasserverschmutzung Durch Regenuberlaufe Aus Mischkanalisationen),
W76-10688 5B

Baroclinic Instability in the Denmark Strait Overflow,
W76-10693 2L

Phillips Ranch, Inc. V Banta (Rights in Water Adjacent to Plaintiff's Property Doesn't Give Defendant Easement to Carry Water Over Plaintiff's Property).
W76-10804 6E

OWNERSHIP OF BEDS
Prices and Property Rights in the Fisheries,
W76-10586 6C

Sovereignty of State.
W76-10789 6E

OXIDATION
Oxidation of Ammonia in Water by Ferrates (VI) and (IV),
W76-10611 5D

A Transformations of Sulfate Turpentine in Natural Waters (Protsessy prevrashcheniya sul'fatnogo skipidara v prirodnykh vodakh),
W76-10845 5B

Electrochemical Production of Free Radicals for Wastewater Treatment,
W76-10876 5D

OXIDATION LAGOONS
Aerobic Waste Treatment,
W76-11035 5D

OXIDES
Electrochemical Properties of the Oxide-Solution Interface in Relation to Flotation,
W76-10629 5B

Characterization of Adsorbed Cobalt at the Oxide-Water Interface,
W76-10634 5D

OXYGEN
The Respiratory Strategies of two Species of Freshwater Gastropods (Ancylus Fluviatilis Mull and Planorbis Contortus Linn) in Relation to Temperature, Oxygen Concentration, Body Size and Season,
W76-10889 5C

OXYGEN DEMAND
Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

OYSTERS
Permissible Levels of Heavy Metals in Secondary Effluent for Use in a Combined Sewage Treatment-Marine Aquaculture System. I. Monitoring During Pilot Operation,
W76-10993 5D

Permissible Levels of Heavy Metals in Secondary Effluent for use in a Combined Sewage Treatment-Marine Aquaculture System. II. Development of Guidelines by Methods, of Additions,
W76-10994 5D

Uptake, Translocation and Elimination of Individual Chlorobiophenyls by Oysters,
W76-11000 5C

Accumulation, Release, and Retention of Petroleum Hydrocarbons by the Oyster, Crassostrea Virginica,
W76-11018 5C

Uptake and Depuration of Specific Hydrocarbons from Oil by the Bivalves Rangia Cuneata and Crassostrea Virginica,
W76-11024 5C

PACIFIC NORTHWEST U. S.
Indian Water Rights: Some Emerging Frontiers,
W76-10729 6E

PACIFIC OCEAN
Repeated Profiling of Microstructure Lenses with a Midwater Float,
W76-10692 2L

Pelagic Tar in the North Pacific Ocean,
W76-11009 5A

PAD AND FAN SYSTEMS
Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

PARALLEL AND SERIES RESERVOIR SYSTEMS
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

PARAQUAT
A Rapid Method for the Simultaneous Determination of Paraquat and Diquat in Pond and River Waters by Pyrolysis and Gas Chromatography,
W76-10870 5A

PARIS (FRANCE)
Possible Urban Effects on Maximum Daily Rainfall at Paris, St. Louis and Chicago,
W76-10929 4C

PATENTS
Shoreline Retaining Wall,
W76-10953 8B

Portable Floating Wave Tripper,
W76-10954 8B

Irrigation Systems Automation,
W76-10955 3F

Brake Means for an Air-Powered Sprinkler System,
W76-10956 3F

Alignment Control Apparatus for Center Pivot Irrigation Equipment,
W76-10957 3F

Method of Making Snow,
W76-10958 3B

Automatic Water Sprinkler for Irregular Areas,
W76-10959 3F

Metal Recovery from Waste Treatment Sludges,
W76-10960 5D

Oxygen Aeration System for Contaminated Liquids,
W76-10961 5D

Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

Purification of Waste Water Containing Organic and Inorganic Impurities,
W76-10966 5D

Geothermal Energy Recovery Process,
W76-10967 3A

Combined Drain and Flood Gate,
W76-10968 3F

Trickle Irrigator,
W76-10970 3F

Process of Water Treatment,
W76-10971 5F

Electrochemical Cell for Decreasing the Cyanide and Heavy Metal Content of an Aqueous Solution,
W76-10972 5D

Filter Apparatus,
W76-10975 5D

Filtration and Backwashing Apparatus for Use with a Water Filtration System,
W76-10977 5F

Reaction Arm for Rotary Sprinkler,
W76-10978 3F

PATH OF POLLUTANTS
Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

Density Current Surges I--Their Role in the Initial Dispersion of A Surface Field,
W76-10707 5B

Distribution of Stream Pollution in Lake Water,
W76-10712 5B

Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

Pulsed Dispersion of Trace Chemical Concentrations in a Saturated Sorbing Porous Medium,
W76-10915 5B

Longitudinal Dispersion for Flow Over Rough Beds,
W76-10921 5B

Monsoonal Deposition of Sea Salt and Air Pollutants Over Bombay,
W76-10932 5B

A Model for Water and Phosphorus Distribution on the Island of Goeteborg, (In Swedish),
W76-10963 5B

The Occurance and Amount of Pelagic Tar in the Open Ocean,
W76-11008 5B

Nature and Behavior of Manure,
W76-11038 5B

Construction and Testing of Two Waste-Injection Monitor Wells in Northwest Florida,
W76-11070 5B

Modeling Solute Transport in Ground Water,
W76-11076 5B

Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

Distribution of Suspended Oil Particles Following the Grounding of the Tanker Arrow,
W76-11096 5B

PATHOGENIC BACTERIA
Water Programs Secondary Treatment Information,
W76-10770 5D

PATHOLOGY
Red Crab (Geryon Quinquedens) and Snow Crab (Chionoecetes Opilio) Resistance to Infection by the Lobster Pathogen Aerococcus Viridans (Var.) Homari,
W76-10882 5C

Survival of Human Pathogens in the Marine Environment,
W76-10890 5C

PATUXENT RIVER (MD)
Deposition in Upper Patuxent Estuary, Maryland, 1968-1969,
W76-10925 4C

PCB
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

PEACHES
Antitranspirant Sprays Affecting Fruit Size of Early Amber Peaches,
W76-10725 3F

Peach Irrigation in Florida,
W76-10749 3F

PEAK DISCHARGE
Techniques for Estimating Flood Depths for Oklahoma Streams,
W76-11075 4A

Floodflow Characteristics at Proposed Bridge Site on Mohawk River in Towns of Frankfort and Schuyler, Herkimer County, New York,
W76-11079 4A

PEAS
Plant Measurements as Indicators of Crop Water Deficit,
W76-10622 3F

PELAGIC TAR LUMPS
The Occurance and Amount of Pelagic Tar in the Open Ocean,
W76-11008 5B

PENALTIES (LEGAL)
Burning Waters,
W76-10740 5G

Water Pollution--Civil Remedies.
W76-10782 6E

People Ex Rel Younger V Superior Court (Damage Assessment to Public Entity Constitutional Because not Punitive).
W76-10800 6E

San Francisco Civil Service Ass'n, Local 400 V State Ex Rel Regional Water Quality Control Board (Damages Assessment for Pollutants to Public Entity Constitutional).
W76-10801 6E

PENNSYLVANIA
Water Supply and Sewage Facilities Plan Update - 1970 (1974 Supplement),
W76-10508 5G

Excessive Manure Can Affect Potable Water.
W76-10542 5B

Greater Pittsburgh Regional Studies, Reports and Maps, April 1976.
W76-11072 7C

PERCOLATING WATERS
A Proposal for Adoption of A Legal Doctrine of Groundstream Water Interrelationship in Texas,
W76-10731 4B

PERFORMANCE
Samplers for Monitoring Runoff Waters,
W76-10550 5A

Final Report, Horizontal Spray Film (HTEX) and Vertical Tube (VTEX) Evaporator, OSW San Diego Test Facility.
W76-10553 3A

PERIPHYTON
Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

PERMEABILITY
Seepage Loss from Holding Ponds,
W76-11051 5B

PERMEAMETERS
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

PERMITS
New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

Deepwater Port Site Evaluation,
W76-10766 5G

Deepwater Ports: Licensing Procedures and Design Construction, Equipment and Operations,
W76-10767 5G

Pollution--Assembly Bill 128--To Create a System of State Discharge Permits Congruent with National Pollutant Discharge Elimination System,
W76-10780 6E

Water Management Districts--Water Resources--Authority to Consider and Protect Against Degradation of Water Quality Through Permitting Processes.
W76-10791 6E

Variances and Temporary Permits for Operation of Non-Conforming Sewage Disposal Facilities.
W76-10793 6E

PESTICIDE RESIDUES
Uptake, Translocation and Elimination of Individual Chlorobiophenyls by Oysters,
W76-11000 5C

PESTICIDES
Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

PETROLEUM HYDROCARBONS
Some Mechanisms of Weathering of Petroleum Hydrocarbons on Marine Waters: Competitive Pathways to Fate and Disposition of Petroleum Pollution,
W76-11010 5B

PETROLEUM REFINING INDUSTRY
Water Pollution Control Act of 1972, Economic Impacts, Petroleum Refining Industry,
W76-10560 5G

PETROLEUM RESOURCES
Ocean Boundaries and Petroleum Resources,
W76-10596 6E

PHOSPHATES
Regina Tertiary Treatment Plant Study and Design, (Part II),
W76-10516 5D

Sorption Capabilities of Soils for Phosphate Removal,
W76-10673 5D

Fertilizer Manufacturing Point Source Category, Effluent Limitations and Guidelines for Existing Sources and Standards for New Sources for the Phosphate Subcategory,
W76-10768 5G

PHOSPHOROUS
Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

PHOSPHORUS
A Model for Water and Phosphorus Distribution on the Island of Goeteborg, (In Swedish),
W76-10963 5B

Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

PHOTO-OXIDATION
Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

PHOTOOXIDATION
Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

PHYSICAL PROPERTIES
Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

Interfacial Chemistry of Particulate Flotation,
W76-10628 5B

A Comparison of Several Water Quality Indexes,
W76-10926 5A

Some Water Quality Aspects in a Nascent Impoundment in Central Illinois,
W76-10950 5B

Chemical Composition: A Control on the Physical and Chemical Processes Acting on Petroleum in the Marine Environment,
W76-11013 5B

PHYTOPLANKTON
Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

Determination of the Biomass and Detritus Content from Natural Phytoplankton Scoop Samples, (In German),
W76-10864 5A

Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

Polynuclear Aromatic Hydrocarbon Pollution of the Marine Environment,
W76-11030 5B

PICKLE PROCESSING ULTRAFILTRATION PROCEDURE
Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

PILOT PLANTS
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

PIPELINES
Materials Transportation Bureau: Transpiration of Natural and Other Gas by Pipeline,
W76-10756 5G

Hyrup V Kleppe (Right-of-way for Pipeline to Tap Water from Spring on Public Land).
W76-10797 6E

Transportation of Solids by Water in Pipelines,
W76-10806 8B

Technical Capabilities in Offshore Pipeline Operations to Maximize Safety,
W76-11003 5G

PIPES
Five Pumps Salvage a Quebec Sewer Job,
W76-10689 8C

PITTSBURGH (PENN)
Greater Pittsburgh Regional Studies, Reports and Maps, April 1976.
W76-11072 7C

PLANNING
Strategies for Natural Resource Decision-Making: Comments on the Staff Report,
W76-10503 6E

Interboard Plan for the Greater Finger Lakes - Oswego River Basin,
W76-10506 4A

Implementation of a Large Scale Water Quality Data Management System,
W76-10588 5A

Interdisciplinary/Interinstitutional Requirements for Water Resource Planning: Processes to Enhance Cooperation,
W76-10609 6B

South Dakota's System of Water Management and its Relation to Land Use and Economic Development,
W76-10721 4A

A Sound Water Plan for South Florida Implementation of the 1972 Water Resources Act,
W76-10742 6E

Environmental Protection Agency: Policies and Procedures for State Continuing Planning Process,
W76-10762 5G

How to Plan and Manage a Lagoon,
W76-11052 5D

PLASTICS
Fiber-Glass-Reinforced Polyesters and Furan Resins for Water- and Waste-Treatment Systems,
W76-10682 8G

POINT SOURCES (POLLUTION)
Soap and Detergent Manufacturing Category Pretreatment Standards for New Sources,
W76-10759 5G

Timber Products Processing Point Source Category,
W76-10761 5G

Ink Formulating Point Source Category, Pretreatment Standards for Existing Sources,
W76-10774 5G

POLAR-ACTIVE CONSTITUENTS
The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

POLDERS
Partial Depletion of Saline Groundwater by Seepage,
W76-10920 2L

POLICY PLANNING
Strategies for Natural Resource Decision-Making: Comments on the Staff Report,
W76-10503 6E

POLLUTANT IDENTIFICATION
Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

Sampling Techniques in Urban Runoff Quality Studies,
W76-10509 5A

Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water, Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci),
W76-10515 5A

Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

Implementation of a Large Scale Water Quality Data Management System,
W76-10588 5A

Anatomy of an Oil Spill,
W76-10597 5B

Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities.
W76-10623 5G

Report on Pollution of Interstate Waters of the Connecticut River.
W76-10626 5A

International Conference on Environmental Sensing and Assessment, Volumes 1 and 2.
W76-10637 5A

Sampling and Analysis of Metals in Air, Water and Waste Products,
W76-10639 5A

Monitoring: The Trigger for Action,
W76-10640 5A

Design of Nationwide Water-Quality Monitoring Networks,
W76-10643 5A

Network Design Considerations for the Global Environmental Monitoring System (GEMS) of the United Nations,
W76-10646 5A

Water Contamination Detection,
W76-10648 5A

Spark Source Mass Spectrometry: The Optimum Referee Method for Multielement Analysis,
W76-10649 5A

Frequency Distributions for Coliform Bacteria in Water,
W76-10650 5A

Trace Metal Analysis by Atomic Emission Using a D.C. Argon Plasma,
W76-10651 5A

An Evaluation of Automatic Wastewater Compositors,
W76-10652 5A

Some Considerations on Monitoring of Trace Metals in Estuaries and Oceans,
W76-10653 5A

Environmental Monitoring in Latin America and the Caribbean,
W76-10654 5A

Environmental Quality Surveillance in Indonesia,
W76-10655 5A

Development of a Methodology for Monitoring Groundwater Quality,
W76-10658 5A

Monitoring Groundwater Pollution,
W76-10659 5A

Groundwater Pollution Monitoring Case Studies,
W76-10661 5A

Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

A Proposed National Monitoring System for Organics in Water,
W76-10668 5A

Capabilities and Limitations in Identifying and Measuring Aquatic Pollutants,
W76-10669 5A

Evaluation of Water Samples Collected During LANDSAT-1 Overpasses of the Lower Chesapeake Bay Area,
W76-10672 5A

Dumping Sewage Sludge in the Ocean.
W76-10674 5E

Pesticide Incineration,
W76-10675 5E

Atomic-Absorption Determination of Vanadium and Molybdenum in Tap Water and Mineral Waters After Anion-Exchange Separation,
W76-10869 5A

A Rapid Method for the Simultaneous Determination of Paraquat and Diquat in Pond and River Waters by Pyrolysis and Gas Chromatography,
W76-10870 5A

Techniques De Determination Radide Des Effets De Synergie Radionucleides - Polluants, (Techniques for Rapid Determination of Effects of Synergy Between Radionuclides and Pollutants),
W76-10891 5A

The Total Aerobic Heterotrophic Bacteria Germ Content of Water from the Series of Shallow Inlets to the South of Darss Found by Investigation Using the Cast Plate and the MPN Methods, (In German),
W76-10897 5A

Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

Recent Developments in Chemical Aerosol Analysis,
W76-10910 5A

Automated Determination of Carbon in Natural Waters,
W76-10936 5A

Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

Near Surface Sampler,
W76-10995 5A

Pelagic Tar in the North Pacific Ocean,
W76-11009 5A

Effect of a Livestock Wintering Operation on a Western Mountain Stream,
W76-11059 5A

Water-Quality Investigation, Eel River, California,
W76-11069 5A

Barium in Southern California Coastal Waters: A Potential Indicator of Marine Drilling Contamination,
W76-11089 5A

Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

POLLUTANT IDENTIFICATTION
Determination of the Biomass and Detritus Content from Natural Phytoplankton Scoop Samples, (In German),
W76-10864 5A

POLLUTANTS
Atmospheric Effects of Pollutants,
W76-10903 5A

Dispersion of Pollutants,
W76-10907 5B

POLLUTION ABATEMENT
Pollution Potential of Runoff from Livestock Feeding Operations,
W76-10531 5B

Control of Pollution from Animal Feedlots,
W76-10533 5G

Water Pollution Abatement Technology: Capabilities and Costs, Metal Finishing Industry,
W76-10555 5D

Water Pollution Control Act of 1972, Economic Impacts, Metal Finishing Industry,
W76-10556 5G

Water Pollution Control Act of 1972, Economic Impacts, Iron and Steel Industry,
W76-10557 5G

Water Pollution Abatement Technology: Capabilities and Costs, Iron and Steel Industry,
W76-10558 5D

Water Pollution Control Act of 1972, Economic Impacts, Pulp and Paper Industry,
W76-10559 5G

Water Pollution Control Act of 1972, Economic Impacts, Petroleum Refining Industry,
W76-10560 5G

Water Pollution Control Act of 1972, Economic Impacts, Leather Tanning Industry.
W76-10561 5G

Water Pollution Control Act of 1972, Economic Impacts, Fertilizer Industry.
W76-10562 5G

Water Pollution Control Act of 1972, Economic Impacts, Plant Closures.
W76-10563 5G

Water Pollution Control Act of 1972, Economic Impacts, Non-Ferrous Metals Industry,
W76-10565 5G

Water Pollution Control Act of 1972, Economic Impacts, Textile Industry.
W76-10566 5G

Water Pollution Control Act of 1972, Municipal Options.
W76-10568 5G

Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 1).
W76-10570 5G

Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume I),
W76-10572 5G

Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume II),
W76-10573 5G

Benefits from Water Pollution Abatement, Property Values,
W76-10580 5G

Safety and Pollution Control - Offshore Petroleum Producing Facilities,
W76-10603 5G

Environmental Improvement Authorities Act of 1969 (Formation of Public Corporations to Deal with Pollution),
W76-10777 6E

Environmental and Social Factors (in the Paper Industry),
W76-10861 5G

Pollution Abatement Systems for Farm Animal Wastes in Southeast Michigan,
W76-11057 5D

POLLUTION CONTROL

Water Supply and Sewage Facilities Plan Update - 1970 (1974 Supplement),
W76-10508 5G

POLYCHLORINATED BIPHENYLS

Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

Environmental Levels of PCB'S,
W76-10641 5A

Polychlorinated Biphenyls Off Southern California,
W76-10647 5C

PCB'S in the Environment,
W76-10739 5C

Sources of Polychlorinated Biphenyls in Wisconsin,
W76-10844 5B

Uptake, Translocation and Elimination of Individual Chlorobiophenyls by Oysters,
W76-11000 5C

POLYELECTROLYTES

Coagulation of Textile Industry Effluents with Cationic Polyelectrolytes (Koagulacja sciekow przemyslu wlokienniczego przy uzyciu polielektrolitow kationowych),
W76-10836 5D

POLYMERS

Fiber-Glass-Reinforced Polyesters and Furan Resins for Water- and Waste-Treatment Systems,
W76-10682 8G

Sewers - Relining VS Replacement,
W76-10690 8G

Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

POLYNUCLEAR AROMATIC HYDROCARBONS

Polynuclear Aromatic Hydrocarbon Pollution of the Marine Environment,
W76-11030 5B

POLYSPECIES AQUICULTURE

Polyspecies Aquaculture Systems: The Detrital Trophic Level,
W76-10997 5C

Comparison of the Food Chain Dynamics of the Polychaete, Nereis Virens Cultured on Animal Tissue and Detritus,
W76-10998 5C

PORTER-COLOGNE WATER QUALITY ACT (CALIF)

An Analysis of Dairy Waste Management Alternatives for Southern California Dairymen,
W76-10534 5G

PORTUGAL (ARADE LAKE)

The Evaporation and Sedimentation in Man-Made Arade Lake, Southern Portugal,
W76-10703 2D

POTABLE WATER

Capabilities and Limitations in Identifying and Measuring Aquatic Pollutants,
W76-10669 5A

Village Safe Water Act.
W76-10790 6E

POTASSIUM

An Empirical Na-K-Ca Geothermometer for Natural Waters,
W76-10598 2K

POTASSIUM FERRATE (VI)

Oxidation of Ammonia in Water by Ferrates (VI) and (IV),
W76-10611 5D

POULTRY

Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

Preventing Water Pollution from Turkey Operations,
W76-10535 5G

Chemical and Microbiological Changes in Poultry Litter Applied to Soil as Influenced by the Time and Method of Application,
W76-10615 5E

Manure and the Nitrate Problem,
W76-10616 5E

Development Document for Effluent Limitations Guidelines and New Source Performance Standards: Feedlot Point Source Category,
W76-10829 5G

POULTRY EXCRETA

Biodegrading Poultry Excreta with House Fly Larvae: The Concept and Equipment,
W76-11053 5D

PRE-TREATMENT (WATER)

New Boiler Water Chemical Treatment Reduces Corrosion and Scale Buildup.
W76-10859 3E

PRECIPITATE FLOTATION

Precipitate Flotation of Calcium Sulfite from Dilute Aqueous Solution with an Anionic Surfactant,
W76-10631 5D

PRECIPITATION (ATMOSPHERIC)

Role of Precipitation in the Chemistry of Subsurface Waters in the Western Part of the Turgay Trough,
W76-10942 2F

PRICES

Prices and Property Rights in the Fisheries,
W76-10586 6C

The Effect of Changing Input andProduct Prices on the Demand for Irrigation Water in Texas,
W76-10810 3F

PRIMARY PRODUCTION INHIBITION

Marine Molysmology: The Primary Production of Experimental Ecosystems Set up in the Rance River Estuary. Effect of Crude Oil,
W76-10830 5C

PRIMARY PRODUCTIVITY

Tropic Status of Selected Northern New Mexico Lakes,
W76-10808 5C

Marine Molysmology: The Primary Production of Experimental Ecosystems Set up in the Rance River Estuary. Effect of Crude Oil,
W76-10830 5C

Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

PRODUCTIVITY

Bacterioplankton and its Significance in the Bioproductivity of the Reservoirs, (In Russian),
W76-10969 5C

PRODUCTIVITY

Polyspecies Aquaculture Systems: The Detrital Trophic Level,
W76-10997 5C

PROGRAM PLANNING
Strategies for Natural Resource Decision-Making: Comments on the Staff Report,
W76-10503 6E

PROGRAMS
Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities.
W76-10623 5G

PROJECT PLANNING
National Oceanic and Atmospheric Administration: Coastal Zone Management Program, Administration Grants, Allocation of Section 306 Funds to States,
W76-10754 6E

Coastal Zone Management Program Development Grants, Outer Continental Shelf,
W76-10755 6E

Preparation of State Water Quality Management Plans.
W76-10763 5G

Environmental Protection Agency: Grants and Other Federal Assistance, State and Local Assistance.
W76-10765 5G

PROPERTY RIGHTS
Prices and Property Rights in the Fisheries,
W76-10586 6C

PROPERTY VALUES
Benefits from Water Pollution Abatement, Property Values,
W76-10580 5G

PROTECTION
'Ware the Wadden Sea,
W76-10985 6G

PROTEINS
Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

PROTOZOA
Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

PUBLIC ADMINISTRATION
The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement Volume II,
W76-10575 5G

PUBLIC HEALTH
Village Safe Water Act.
W76-10790 6E

Is Our Approach to the Oil Pollution Problem too Crude,
W76-11031 5C

PUBLIC PARTICIPATION
The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement, Volume I,
W76-10574 5G

PUBLIC RIGHTS
Navigable Waters: Riparian Rights.
W76-10787 6E

PUBLICATIONS
Sources of Information in Water Resources, an Annotated Guide to Printed Materials,
W76-10881 10C

Greater Pittsburgh Regional Studies, Reports and Maps, April 1976.
W76-11072 7C

PUERTO RICO
Trace Element Interactions in the Estuarine Zone of the Anasco River, Puerto Rico,
W76-10892 5C

PULP AND PAPER INDUSTRY
Water Pollution Control Act of 1972, Economic Impacts, Pulp and Paper Industry,
W76-10559 5G

A Clean Piece of Paper,
W76-10842 5D

Effluents from Chlorination and Alkaline Extraction of Pine Sulfate Pulp,
W76-10858 5B

Sequential Chlorination -- Impact on the Environment,
W76-10860 5D

Environmental and Social Factors (in the Paper Industry),
W76-10861 5G

How to Meet Water Cleanup Deadlines,
W76-10862 5D

Particle Emissions from a Large Kraft Paper Mill and Their Effects on the Microstructure of Warm Clouds,
W76-10904 5A

PULP WASTES
Foam Formation in Plants for Biological Purification of Effluents from the Manufacture of Kraft Pulp (Penoobrazuvaneto v stantsiite za biologichno prechistvane naotpad' chite vodi ot proizvodstvoto na sulfatnatseluloza),
W76-10833 5D

Removal of Surface-Active and Other Substances Causing the Formation of Stable Foam During Purification of Effluents from the Manufacture of Unbleached Kraft Pulp (Opiti za otstranyavane na pov'rkhnostno-aktivnite i drugi veshchestva, obuslavyashchi obrazuvaneto na ustojchiva pyana pri prechistvaneto na otpad'chni vodi ot proizvodstvoto na neizbelena sulfatna tseluloza),
W76-10834 5D

Lignosulfonates and Natural Water-Soluble Lignin in the Lielupe River (Lignosul'fonaty i prirodnyi vodorastvorimyi lignin v vode r. Lielupe),
W76-10835 5B

Long-Term Stability of Waste Lignins in Aquatic Systems. Part 2. Stability in Saline Water,
W76-10838 5B

Biodegradation of Components of Pulp Waste Effluents by Bacteria. (3). Degradation of Lignin Preparation from Waste Liquor of Oxygen-Alkali Pulping (In Japanese),
W76-10840 5D

The Fiberlog, a New Monitor for Fibrous Effluents,
W76-10843 5A

A Transformations of Sulfate Turpentine in Natural Waters (Protsessy prevrashcheniya sul'fatnogo skipidara v prirodnykh vodakh),
W76-10845 5B

Environmental Protection Installations of Cellulose Attisholz AG. (Umweltschutzanlagen der Cellulose Attisholz AG.).
W76-10849 5D

Pollution Control through Utilization of Spent Sulfite Liquors from the Pulp Industry as Organic Nitrogen Fertilizer (Ein Beitrag zur umweltfreundlichen Technik durch Verwertung der Sulfitablaugen der Zellstoffindustrie als organischer Stickstoffduenger),
W76-10851 5D

Trends and Experience in the Primary Treatment of Papermaking Effluents (Indirizzi ed esperienze nel trattamento primario delle acque di scarico delle cartiere),
W76-10852 5D

Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

Foam Separation for Detoxification of Bleached Kraft Mill Effluents,
W76-10855 5D

Tough Illinois Effluent Standards are met by Celotex Boxboard Mill,
W76-10856 5G

Town Gives Primary and Secondary Treatment to Blandin's Effluent,
W76-10857 5D

Environmental and Social Factors (in the Paper Industry),
W76-10861 5G

The Use of Waste Fibers as Absorption Material in Grass Silage,
W76-10863 5E

Detoxification of Bleached Kraft Mill Effluents,
W76-10867 5D

Unique Process for Sulfite Spent Liquor Keeps Older Mill Viable,
W76-10871 5D

PUMPING
How to Use and Select a Screw Pump,
W76-10681 8C

PUMPS
How to Use and Select a Screw Pump,
W76-10681 8C

Five Pumps Salvage a Quebec Sewer Job,
W76-10689 8C

PYROLYSIS
A Rapid Method for the Simultaneous Determination of Paraquat and Diquat in Pond and River Waters by Pyrolysis and Gas Chromatography,
W76-10870 5A

QUICKSAND
Town Maintains Sewers Despite 'Sugar Sand',
W76-10687 5D

RADIOACTIVE DATING
Bog Stratigraphy, Radiocarbon Dates, and Pinedale to Holocene Glacial History in the Front Range, Colorado,
W76-11071 2C

RADIOACTIVITY
Trace Element Interactions in the Estuarine Zone of the Anasco River, Puerto Rico,
W76-10892 5C

RADIOISOTOPES
Techniques De Determination Radide Des Effets De Synergie Radionucleides - Polluants, (Techniques for Rapid Determination of Effects of Synergy Between Radionuclides and Pollutants),
W76-10891 5A

Incidence De La Charge Polluante Des Eaux Sur Le Comportement Des Radionucleides, (Effect of the Pollutant Burden of Water on the Behaviour of Radionuclides),
W76-10893 5C

RADIOLYSIS
Electrochemical Production of Free Radicals for Wastewater Treatment,
W76-10876 5D

RAIN GAGES
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

RAIN WATER
Water Pollution Through Rain Overflows from Mixed Sewers (Gewasserverschmutzung Durch Regenuberlaufe Aus Mischkanalisationen),
W76-10688 5B

RAINDROP SIZE
Some Observations on the Joss-Waldvogel Rainfall Disdrometer,
W76-10928 2B

RAINDROPS
Some Observations on the Joss-Waldvogel Rainfall Disdrometer,
W76-10928 2B

RAINFALL
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

Some Characteristics of A Dusty Rain in Yugoslavia,
W76-10906 5A

Some Observations on the Joss-Waldvogel Rainfall Disdrometer,
W76-10928 2B

Possible Urban Effects on Maximum Daily Rainfall at Paris, St. Louis and Chicago,
W76-10929 4C

Monsoonal Deposition of Sea Salt and Air Pollutants Over Bombay,
W76-10932 5B

RAINFALL INTENSITY
The Influence of Slope and Rain Intensity on Runoff and Infiltration.
W76-10702 2A

RAINFALL-RUNOFF RELATIONSHIPS
Entropy Principle Applied to the Rainfall-Runoff Process,
W76-10918 2A

RAINFALL SIMULATORS
The Influence of Slope and Rain Intensity on Runoff and Infiltration.
W76-10702 2A

RAPTORS
Raptor Study of Utah Oil Shale Area,
W76-10822 6G

RATES
Do Regulated Freight Rates Discourage Recycling,
W76-10676 5G

RECESSION
Prospect for Sea-Bed Resources in a Recession,
W76-10979 6E

RECIRCULATED WATER
Water Quality in a Recirculating Raceway System for Fish Culture,
W76-10546 5G

RECREATION
The Economic Impact of Recreational Land-Use in an Island Environment: A Case Study of Jekyll Island, Georgia,
W76-10581 6B

To Amend the Wild and Scenic Rivers Act (Part 4).
W76-10751 6E

RECREATION DEMAND
Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-10585 6B

RECREATION FACILITIES
Matching Resources and People,
W76-10723 6B

RECYCLING
Recycling of Liquid Digested Sewage Sludge on Dredged River Sand,
W76-10501 5D

Feasibility Study of a Nuclear Power-Sewage Treatment System for the Conservation and Reclamation of Water Resources,
W76-10614 5D

Manure and the Nitrate Problem,
W76-10616 5E

Do Regulated Freight Rates Discourage Recycling,
W76-10676 5G

Use of Electrodialysis in the Water Recycling System of Viscose Production (Primenenie elektrodializa v sisteme vodooborota viskoznogo proizodstva),
W76-10848 5D

Water Reuse, a Bibliography, Volume 5.
W76-10878 5D

The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Foodchain Studies,
W76-10986 5C

Social, Political, Regulatory and Marketing Problems of Marine Waste-Food Recycling Systems,
W76-10991 5G

Recycling Ground Water in Waushara County, Wisconsin: Resource Management for Cold-Water Fish Hatcheries,
W76-11082 4B

REFINING WASTES
An Analysis of the Main Scientific Papers Dealing with Long Term Low Level Effects of Oil Pollution,
W76-11022 5C

REGIONAL ANALYSIS
Water Pollution Control Act of 1972, Economic Impacts, Plant Closures.
W76-10563 5G

Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 1).
W76-10570 5G

Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 2),
W76-10571 5G

Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume I),
W76-10572 5G

Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume II),
W76-10573 5G

The Economic Impact of Recreational Land-Use in an Island Environment: A Case Study of Jekyll Island, Georgia,
W76-10581 6B

REGIONAL DEVELOPMENT
Strategies for Natural Resource Decision-Making: Comments on the Staff Report,
W76-10503 6E

REGRESSION ANALYSIS
Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma,
W76-10874 4B

Simplified Routing of Dam Break Waves,
W76-11085 4A

REGULATION
Control of Pollution from Animal Feedlots,
W76-10533 5G

Preventing Water Pollution from Turkey Operations,
W76-10535 5G

EPA Proposes New Feedlot Regulations.
W76-10536 5G

Excessive Manure Can Affect Potable Water.
W76-10542 5B

The Economics of Developing the Resources of the World's Oceans,
W76-10587 6B

National Ocean Policy: Priorities for the Future,
W76-10591 6E

Do Regulated Freight Rates Discourage Recycling,
W76-10676 5G

Fertilizer Manufacturing Point Source Category, Urea Subcategory,
W76-10764 5G

Ink Formulating Point Source Category, Pretreatment Standards for Existing Sources,
W76-10774 5G

REGULATION

Development Document for Effluent Limitations Guidelines and New Source Performance Standards: Feedlot Point Source Category,
W76-10829 5G

Social, Political, Regulatory and Marketing Problems of Marine Waste-Food Recycling Systems,
W76-10991 5G

Regulation and Supervision of Outer Continental Shelf Operations on the Pacific Coast,
W76-11005 5G

Legal Aspects of Odor and Dust from Feedlots,
W76-11054 5G

A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

The Impact on Dairy Farm Organization of Alternative Manure Disposal Systems. A Method of Assessing the Cost of Environmental Regulation,
W76-11061 5D

REGULATIONS
Oil in the Marine Environment,
W76-11025 5B

RELATIVE RIGHTS
The Conveyancer, Water Rights and the Environment,
W76-10736 6E

REMOTE SENSING
Diplomatic and Legal Aspects of Remote Sensing,
W76-10584 6E

Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

Assessment of the Benefits of Environmental Remote Sensing,
W76-10670 5A

Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

Evaluation of Water Samples Collected During LANDSAT-1 Overpasses of the Lower Chesapeake Bay Area,
W76-10672 5A

REPAIRING
Town Maintains Sewers Despite 'Sugar Sand',
W76-10687 5D

Sargent Lake Ass'n. V Dane (Rights of Property Owners Association in a Dam, Beach, and Shorefront Area).
W76-10795 6E

REPRODUCTION
Environmental Regulation of the Annual Reproductive Season of Strongylocentrotus Purpuratus (Stimpson),
W76-10888 5C

Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

RESEARCH AND DEVELOPMENT
Directory of Disaster-Related Technology,
W76-10502 10C

OWRT Interest in New Technologies for Water Treatment,
W76-10677 5G

RESEARCH AND DEVELOPMENT (COMPREHENSIVE PLANNING)
Assessment of Polyvinyl Chloride as a Packaging Material for Distilled Spirits, (Enivronmental Impact Assessment),
W76-10722 6G

RESEARCH FACILITIES
Reasons for Having the IVL-Institute for Water and Air Pollution Control Research. (Varfor ett IVL-institut for vatten- och luftvardsforskning.),
W76-10853 5G

RESEARCH PRIORITIES
Directory of Disaster-Related Technology,
W76-10502 10C

RESERVOIR OPERATION
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

RESERVOIR SITES
Harry S. Truman Dam and Reservoir, Osage River, Missouri. Appendix E, F, G, (Environmental Impact Statement.
W76-10827 4A

RESERVOIRS
Some Data on Zooplankton of Reservoirs in the Mary and Chardzhou Regions of the Turkmen SSR, (In Russian),
W76-10520 2H

Bushy and Vanguard V, Ltd V Seven Lakes Reservoir Co. (Seepage and Percolation from Subsurface Destroying Adverse Possessor's Claims).
W76-10802 6E

Simulation of Thermally-Influenced Hydrodynamic Flows: Final Report,
W76-10813 2H

Upstream Flood Lowering in Reservoirs,
W76-10938 4A

RESIDENCE TIME (LAKE WATER)
On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

RESINS
Fiber-Glass-Reinforced Polyesters and Furan Resins for Water- and Waste-Treatment Systems,
W76-10582 8G

RESOURCE ALLOCATION
Solving Discrete-Variable Multiple-Constraint Non Linear Programs: The Decision State Method, (Vol. 3),
W76-10606 6A

RESOURCE DEVELOPMENT
The Oceans: Wild West Scramble for Control,
W76-10745 6E

RESOURCES DEVELOPMENT
Interboard Plan for the Greater Finger Lakes - Oswego River Basin,
W76-10506 4A

The Economics of Developing the Resources of the World's Oceans,
W76-10587 6B

Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

Marine Technology Society Eighth Annual Conference Preprints,
W76-10600 5G

An Environmental Analysis of a Simulated Sea-Floor Mining Operation,
W76-10601 5G

The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

Safety and Pollution Control - Offshore Petroleum Producing Facilities,
W76-10603 5G

The Law of the Sea at the Caracas Session: A Brief Evaluation,
W76-10732 6E

Outer Continental Shelf Resource Development Safety: A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products.
W76-11001 5G

Technical Capabilities in Offshore Completion and Workover Operations to Maximize Safety,
W76-11002 5G

Technical Capabilities in Offshore Pipeline Operations to Maximize Safety,
W76-11003 5G

Technical Capabilities of Offshore Exploration Operations to Maximize Safety amd Environmental Protection,
W76-11004 5G

Regulation and Supervision of Outer Continental Shelf Operations on the Pacific Coast,
W76-11005 5G

Gulf Coast Lease Management Inspection Program,
W76-11006 5G

Sharing the Offshore Oil Bonanza.
W76-11088 6C

Barium in Southern California Coastal Waters: A Potential Indicator of Marine Drilling Contamination,
W76-11089 5A

A Thorough Look At Current Offshore Petroleum Operations.
W76-11091 6C

Oil Spills and Offshore Petroleum,
W76-11092 5G

Offshore Oil Spills and the Marine Environment,
W76-11093 5G

RETAINING WALLS
Shoreline Retaining Wall,
W76-10953 8B

RETURN FLOW
Water Pollution Control Act of 1972, Economic Impacts, Irrigated and Non-Irrigated Agriculture.
W76-10564 5G

REVERSE OSMOSIS
Purification of Lignosulfonates by Dynamic Membrane Ultrafiltration,
W76-10868 5D

REVIEWS
Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

Structure of Water in the Cell: Review of the Literature, (In Russian),
W76-10974 1A

Groundwater,
W76-11066 2F

REYNOLDS NUMBER
Oblique Impingement of Circular Turbulent Jets,
W76-10709 8B

RHODE ILISLAND
An Analog Model of the Chipuxet Aquifer, Rhode Island,
W76-10814 2F

RICE
Toxicity of Agricultural Chemicals to Larvivorous Fish in Korean Rice Fields,
W76-11095 5C

RICHARDS EQUATION
Soil Water Modeling I: A Generalized Simulator of Steady, Two-Dimensional Flow,
W76-10933 2G

RIFFLE POOL
Channel Width and the Riffle-Pool Sequence,
W76-10924 2E

RIGHT-OF-WAY
Hyrup V Kleppe (Right-of-way for Pipeline to Tap Water from Spring on Public Land).
W76-10797 6E

RIPARIAN RIGHTS
South Dakota's System of Water Management and its Relation to Land Use and Economic Development,
W76-10721 4A

Water Pollution--Civil Remedies.
W76-10782 6E

Navigable Waters: Riparian Rights.
W76-10785 6E

Navigable Waters: Riparian Rights.
W76-10787 6E

RIVER BASIN DEVELOPMENT
Interboard Plan for the Greater Finger Lakes - Oswego River Basin,
W76-10506 4A

Bear Creek Development Authority,
W76-10778 6E

RIVER BASINS
Selection of Typical Small Drainage Basins for Investigating and Computing Spring Runoff from Large River Basins,
W76-10705 4A

RIVER BEDS
Longitudinal Dispersion for Flow Over Rough Beds,
W76-10921 5B

RIVER DART (ENGLAND)
The Relationship of Slope and Stream Channel Form in the River Dart, Devon,
W76-10698 2E

RIVER FORECASTING
Water Quality Characteristics of the Illinois River at Peoria,
W76-10922 5A

RIVER RANCE (FRANCE)
Marine Molysmology: The Primary Production of Experimental Ecosystems Set up in the Rance River Estuary. Effect of Crude Oil,
W76-10830 5C

RIVERS
Environmental Monitoring in Latin America and the Caribbean,
W76-10654 5A

Pollutional Effects of Suspended, Sedimented and Eroded Particulate Material in the Aqueous Environment,
W76-10663 5C

A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

To Amend the Wild and Scenic Rivers Act (Part 2).
W76-10750 6E

To Amend the Wild and Scenic Rivers Act (Part 5).
W76-10752 6E

Variation in Concentration of Selected Water-Quality Constituents in the Sacramento River at Bend Bridge, California,
W76-11078 5A

ROLLING-GRAIN RIPPLES
On Rolling-Grain Ripples,
W76-10917 2J

ROOFED BEEF CONFINEMENT
Waste Management Systems for Roofed Beef Confinement Facilities,
W76-11040 5D

ROOKERY BAY (FLA)
Rookery Bay: Ecological Constraints on Coastal Development,
W76-10741 6G

ROTATING FLOW
Steady Laminar Flow in a Stationary Tank with a Spinning Bottom,
W76-11062 8B

ROTIFERS
Zooplankton of Lakes of the Bol'Shezemel-Skaya Tundra, (In Russian),
W76-11056 5C

ROUGHNESS (HYDRAULIC)
Flow Resistance in Broad Shallow Grassed Channels,
W76-10710 2E

RUNOFF
Linear and Nonlinear Approaches for Short-Term Runoff Estimations in Time-Invariant Open Hydrologic Systems,
W76-10699 2E

The Influence of Slope and Rain Intensity on Runoff and Infiltration.
W76-10702 2A

Application of a Residence Time Model to Dilution Gauging, with Particular Reference to the Problem of Changing Discharge,
W76-10935 2E

Nature and Behavior of Manure,
W76-11038 5B

Design Considerations in Feedlot Runoff Control,
W76-11039 5D

Soil Conservation Service Program in Animal Waste Management,
W76-11046 5G

Performance of Feedlot Runoff Control Facilities in Kansas,
W76-11058 5D

RUNOFF CONTROL
Rounding Up Runoff: Reflections in Waste Handling Systems,
W76-10530 5D

Waterway Cleans Feedlot Runoff,
W76-10537 5D

Large Commercial Feedlots - How Wastes are Handled in the West,
W76-11048 5D

Controlling Barnyard Runoff,
W76-11049 5D

RUNOFF FORECASTING
Selection of Typical Small Drainage Basins for Investigating and Computing Spring Runoff from Large River Basins,
W76-10705 4A

RURAL AREAS
Municipal Wastewater Treatment Works, Model Facility Plan For A Small, Rural Community.
W76-10511 5D

Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

RUSSIA
Role of Precipitation in the Chemistry of Subsurface Waters in the Western Part of the Turgay Trough,
W76-10942 2F

Subsurface Waters of Erosion Troughs in the Aktyuba Region of the Ural - A Source of Drinking Water Supply,
W76-10943 2F

SACRAMENTO RIVER
Variation in Concentration of Selected Water-Quality Constituents in the Sacramento River at Bend Bridge, California,
W76-11078 5A

SAFE DRINKING WATER ACT
Safe Drinking Water Act - Implications for Ground Water Quality Protection,
W76-11064 5F

SAFETY
Directory of Disaster-Related Technology,
W76-10502 10C

Materials Transportation Bureau: Transpiration of Natural and Other Gas by Pipeline,
W76-10756 5G

SAFETY FACTORS
Oil Ports on the Continental Shelf,
W76-10984 5G

SALINE WATER INTRUSION
Partial Depletion of Saline Groundwater by Seepage,
W76-10920 2L

SALINE WATER SYSTEMS
Partial Depletion of Saline Groundwater by Seepage,
W76-10920 2L

SALINITY
Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 1).
W76-10570 5G

Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 2),
W76-10571 5G

The Anomalous Influence of Salinity on Temperature Tolerances of Summer and Winter Population of the Copepod Eurytemora Affinis,
W76-10884 5C

SALTS
Monsoonal Deposition of Sea Salt and Air Pollutants Over Bombay,
W76-10932 5B

SAMPLING
Sampling Techniques in Urban Runoff Quality Studies,
W76-10509 5A

Samplers for Monitoring Runoff Waters,
W76-10550 5A

Sampling and Analysis of Metals in Air, Water and Waste Products,
W76-10639 5A

An Evaluation of Automatic Wastewater Compositors,
W76-10652 5A

Groundwater Pollution Monitoring Case Studies,
W76-10661 5A

Near Surface Sampler,
W76-10995 5A

Effect of a Livestock Wintering Operation on a Western Mountain Stream,
W76-11059 5A

SAN FRANCISCO BAY (CALIF)
Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume I),
W76-10572 5G

Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume II),
W76-10573 5G

Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

SANTA ANA RIVER (CALIF)
Problems of Public Works Projects in the Present Economic Climate,
W76-10980 6C

SANTEE RIVER BASIN
Water Quality Analysis, Santee River Basin,
W76-10578 5G

SATELLITES
Evaluation of Water Samples Collected During LANDSAT-1 Overpasses of the Lower Chesapeake Bay Area,
W76-10672 5A

SATURATED HYDROCARBONS
Chemical Composition: A Control on the Physical and Chemical Processes Acting on Petroleum in the Marine Environment,
W76-11013 5B

SCALING
Process of Water Treatment,
W76-10971 5F

SCOUR PROTECTION
Seabed Scour by Currents Near Platforms,
W76-11087 8B

SEA BIRDS
Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

SEA FOOD FARMING
Relative Growth of Different Species of Marine Algae in Wastewater-Seawater Mixtures,
W76-10989 5C

SEA ICE
Oil in Sea Ice,
W76-11098 5B

SEA SALT
Monsoonal Deposition of Sea Salt and Air Pollutants Over Bombay,
W76-10932 5B

SEA URCHINS
Environmental Regulation of the Annual Reproductive Season of Strongylocentrotus Purpuratus (Stimpson),
W76-10888 5C

SEA WATER
Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

Long-Term Stability of Waste Lignins in Aquatic Systems. Part 2. Stability in Saline Water,
W76-10838 5B

Relative Growth of Different Species of Marine Algae in Wastewater-Seawater Mixtures,
W76-10989 5C

SEABIRD CONSERVATION
Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

SEBASTICOOK LAKE (ME)
Report on Sebasticook Lake, Penobscot County, Maine.
W76-10528 5C

SEDIMENT CONTROL
Water Pollution Abatement Technology: Capabilities and Costs, Control of Water Pollution from Selected Nonpoint Sources.
W76-10567 5D

Agricultural Sediment Control for Water Quality Protection,
W76-10617 5G

SEDIMENT DISTRIBUTION
Pollutional Effects of Suspended, Sedimented and Eroded Particulate Material in the Aqueous Environment,
W76-10663 5C

SEDIMENT TRANSPORT
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

Pollutional Effects of Suspended, Sedimented and Eroded Particulate Material in the Aqueous Environment,
W76-10663 5C

The Ability of Debris, Heavily Freighted with Coarse Clastic Materials, To Flow on Gentle Slopes,
W76-10711 2J

On Rolling-Grain Ripples,
W76-10917 2J

Tide-Induced Mass Transport; A Flushing Mechanism for Shallow Lagoons,
W76-10947 2L

SEDIMENT YIELD
Water Pollution Abatement Technology: Capabilities and Costs, Control of Water Pollution from Selected Nonpoint Sources.
W76-10567 5D

SEDIMENTATION
The Evaporation and Sedimentation in Man-Made Arade Lake, Southern Portugal,
W76-10703 2D

State Water Control Board--Authority to Investigate all Problems Concerned with the Quality of Water,
W76-10779 6E

Trends and Experience in the Primary Treatment of Papermaking Effluents (Indirizzi ed esperienze nel trattamento primario delle acque di scarico delle cartiere),
W76-10852 5D

Loess Distribution by Variable Winds,
W76-10941 2J

Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

SEDIMENTATION RATES
Deposition in Upper Patuxent Estuary, Maryland, 1968-1969,
W76-10925 4C

Estimated Erosion Rates on Mount Rainier, Washington,
W76-10951 2J

SEDIMENTS
Agricultural Sediment Control for Water Quality Protection,
W76-10617 5G

Evaluation of Water Samples Collected During LANDSAT-1 Overpasses of the Lower Chesapeake Bay Area,
W76-10672 5A

Metabolism of Mercury Compounds in Microorganisms,
W76-10894 5C

Some Biological Effects Related to the West Falmouth Oil Spill,
W76-11029 5C

SEEPAGE
Seepage Flow Through Homogeneous Soil into a Row of Drain Pipes,
W76-10919 4A

Partial Depletion of Saline Groundwater by Seepage,
W76-10920 2L

SEEPAGE CONTROL
Intact Manure Packs Halt Seepage.
W76-10544 5G

Seepage Loss from Holding Ponds,
W76-11051 5B

SELENIUM DIOXIDE
Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

SEMI-SOLID RESIDUES
The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

SEPARATED SEWERS
Five Pumps Salvage a Quebec Sewer Job,
W76-10689 8C

SEPARATION TECHNIQUES
System Components to Separate Solids and Liquids,
W76-11036 5D

The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

SERPENTIVE WATERWAY
Waterway Cleans Feedlot Runoff,
W76-10537 5D

SESTON
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

SEWAGE
Report on Pollution of Interstate Waters of the Connecticut River.
W76-10626 5A

SEWAGE DISPOSAL
Marine Sanitation Device Standard,
W76-10758 5D

San Francisco Civil Service Ass'n, Local 400 V State Ex Rel Regional Water Quality Control Board (Damages Assessment for Pollutants to Public Entity Constitutional).
W76-10801 6E

SEWAGE EFFLUENS
Permissible Levels of Heavy Metals in Secondary Effluent for Use in a Combined Sewage Treatment-Marine Aquaculture System. I. Monitoring During Pilot Operation,
W76-10993 5D

SEWAGE EFFLUENTS
Timber Products Processing Point Source Category, Proposed Pretreatment Standards for Existing Sources,
W76-10760 5G

An Investigation of Effluent Control Standards and Practices (Atomic Energy Production),
W76-10828 5G

Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

Social, Political, Regulatory and Marketing Problems of Marine Waste-Food Recycling Systems,
W76-10991 5G

Permissible Levels of Heavy Metals in Secondary Effluent for use in a Combined Sewage Treatment-Marine Aquaculture System. II. Development of Guidelines by Methods, of Additions,
W76-10994 5D

Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

SEWAGE SLUDGE
Recycling of Liquid Digested Sewage Sludge on Dredged River Sand,
W76-10501 5D

Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

Dumping Sewage Sludge in the Ocean.
W76-10674 5E

Here Come De Sludge,
W76-10746 6E

Land Application of Sewage Sludge, III. Nitrate Accumulation and Wheat Growth Resulting from Addition of Sewage Sludge and Wood Wastes to Soils,
W76-10841 5E

SEWAGE SLUDGE DUMPING
Dumping Sewage Sludge in the Ocean.
W76-10674 5E

SEWAGE TREATMENT
Municipal Wastewater Treatment Works, Model Facility Plan For A Small, Rural Community.
W76-10511 5D

Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

Feasibility Study of a Nuclear Power-Sewage Treatment System for the Conservation and Reclamation of Water Resources,
W76-10614 5D

Aerosol Production from Land Application of Wastewater by Agricultural Irrigation Equipment,
W76-10625 5D

Cities Need Sewerless Toilets,
W76-10680 5D

How to Use and Select a Screw Pump,
W76-10681 8C

Water Programs Secondary Treatment Information,
W76-10770 5D

Village Safe Water Act.
W76-10790 6E

Variances and Temporary Permits for Operation of Non-Conforming Sewage Disposal Facilities.
W76-10793 6E

Town Gives Primary and Secondary Treatment to Blandin's Effluent,
W76-10857 5D

Water Reuse, a Bibliography, Volume 5.
W76-10878 5D

Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

Filter Apparatus,
W76-10975 5D

The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Foodchain Studies,
W76-10986 5C

Virus Survival Patterns in a Tertiary Sewage Treatment-Aquaculture Model System,
W76-10999 5D

SEWERAGE
Water Supply and Sewage Facilities Plan Update - 1970 (1974 Supplement),
W76-10508 5G

Municipal Wastewater Treatment Works, Model Facility Plan For A Small, Rural Community.
W76-10511 5D

Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

Report on Pollution of Interstate Waters of the Connecticut River.
W76-10626 5A

Fluid-Mechanics Aspects in the Design of Sewage Outfalls into the Sea (Stroemungsmechanische Entwurfsaspekte fuer Abwassereinleitungen ins Meer),
W76-10678 5E

Cities Need Sewerless Toilets,
W76-10680 5D

Underlake Sewer Spurs Resort Development,
W76-10685 5D

Water Pollution Through Rain Overflows from Mixed Sewers (Gewasserverschmutzung Durch Regenuberlaufe Aus Mischkanalisationen),
W76-10688 5B

SEWERLESS TOILETS
Cities Need Sewerless Toilets,
W76-10680 5D

SEWERS
Cities Need Sewerless Toilets,
W76-10680 5D

Comparing Inflow and Infiltration,
W76-10683 5D

Cleveland Mixes Methods in Sewer Construction.
W76-10684 5D

Underlake Sewer Spurs Resort Development,
W76-10685 5D

Hydraulic Jump in Circular Sewers,
W76-10686 5D

Town Maintains Sewers Despite 'Sugar Sand',
W76-10687 5D

Sewers - Relining VS Replacement,
W76-10690 8G

SHALLOW CHANNELS
Flow Resistance in Broad Shallow Grassed Channels,
W76-10710 2E

SHELLFISH
Prices and Property Rights in the Fisheries,
W76-10586 6C

SHIPS
Energy Crisis, Supertankers and Ecology,
W76-10735 5G

The New Treaty on Vessel Pollution,
W76-10748 6E

SHORELINES
Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

SHORT-TERM RUNOFF
Linear and Nonlinear Approaches for Short-Term Runoff Estimations in Time-Invariant Open Hydrologic Systems,
W76-10699 2E

SHRIMP
An Analysis of the Main Scientific Papers Dealing with Long Term Low Level Effects of Oil Pollution,
W76-11022 5C

SILAGE
The Use of Waste Fibers as Absorption Material in Grass Silage,
W76-10863 5E

SILICA
Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

SILICATES
Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

SILVER IODIDE
Supersaturation and Time Dependence of Ice Nucleation from the Vapor on Single Crystal Substrates,
W76-10695 3B

SIMULATION ANALYSIS
A Simulation Model of Tritium Kinetics in a Freshwater Marsh,
W76-10812 5B

Simulation of Thermally-Influenced Hydrodynamic Flows: Final Report,
W76-10813 2H

Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

SKIING
Method of Making Snow,
W76-10958 3B

SLOPES
The Influence of Slope and Rain Intensity on Runoff and Infiltration.
W76-10702 2A

SLUDGE
The Use of Waste Fibers as Absorption Material in Grass Silage,
W76-10863 5E

SLUDGE DISPOSAL
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

Dumping Sewage Sludge in the Ocean.
W76-10674 5E

Here Come De Sludge,
W76-10746 6E

SLUDGE TREATMENT
Recycling of Liquid Digested Sewage Sludge on Dredged River Sand,
W76-10501 5D

SLURRIES
Transportation of Solids by Water in Pipelines,
W76-10806 8B

SMALL DRAINAGE BASINS
Selection of Typical Small Drainage Basins for Investigating and Computing Spring Runoff from Large River Basins,
W76-10705 4A

SNOW
Identification of Nuclei and Concentrations of Chemical Species in Snow Crystals Sampled at the South Pole,
W76-10696 2C

Method of Making Snow,
W76-10958 3B

SNOW CRYSTALS
Identification of Nuclei and Concentrations of Chemical Species in Snow Crystals Sampled at the South Pole,
W76-10696 2C

SNOWFALL
Numerical Simulation of Japan Sea Effect Snowfall,
W76-10930 2C

SOCIAL FUNCTION
Lawyers and Ecomanagement,
W76-10753 6E

SOCIAL IMPACT
Water Pollution Control Act of 1972, Social Impacts, Eight Case Studies.
W76-10569 5G

SOCIAL NEEDS
Lawyers and Ecomanagement,
W76-10753 6E

SOCIAL VALUES
Rationale for a Water Pollution Code (Part II): Social Assessment,
W76-10592 5G

SODIUM
An Empirical Na-K-Ca Geothermometer for Natural Waters,
W76-10598 2K

SODIUM PENTACHLOROPHENATE
Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

SOIL AMENDMENTS
Land Application of Sewage Sludge, III. Nitrate Accumulation and Wheat Growth Resulting from Addition of Sewage Sludge and Wood Wastes to Soils,
W76-10841 5E

SOIL CATCHMENT AREA
The Influence of Slope and Rain Intensity on Runoff and Infiltration.
W76-10702 2A

SOIL CONSERVATION
Agricultural Sediment Control for Water Quality Protection,
W76-10617 5G

Soil Conservation Service Program in Animal Waste Management,
W76-11046 5G

SOIL EROSION
Water Pollution Abatement Technology: Capabilities and Costs, Control of Water Pollution from Selected Nonpoint Sources.
W76-10567 5D

SOIL MOISTURE
Capillary Hysteresis and the Relationship Between Drying and Wetting Curves,
W76-10914 2G

Yield and Removal of Nutrients by Oat Plants Depending on Fertilizer Rates and Soil Moisture Content, (In Belorussian),
W76-10962 3F

Germination of Weed Seeds Depending on Soil Moisture and Density, (In Russian),
W76-10965 3F

SOIL POLLUTION
Intact Manure Packs Halt Seepage.
W76-10544 5G

SOIL PROFILES
Beef Cattle Feedlots: Impact on Underlying Soil,
W76-11047 5B

SOIL WATER
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

Soil Water Modeling I: A Generalized Simulator of Steady, Two-Dimensional Flow,
W76-10933 2G

SOIL WATER MOVEMENT
Seepage Flow Through Homogeneous Soil into a Row of Drain Pipes,
W76-10919 4A

Soil Water Modeling I: A Generalized Simulator of Steady, Two-Dimensional Flow,
W76-10933 2G

SOILS
Monitoring Groundwater Pollution,
W76-10659 5A

Sorption Capabilities of Soils for Phosphate Removal,
W76-10673 5D

Loess Distribution by Variable Winds,
W76-10941 2J

Waste Application to Soils,
W76-11042 5D

SOLAR RADIATION
Milankovitch Solar Radiation Variations and Ice Age Ice Sheet Sizes,
W76-10949 2C

SOLID WASTES
Determination of Surface Equilibria and Mass Transfer Rates in a Concurrent Flow Bubble Column,
W76-10632 5D

System Components to Separate Solids and Liquids,
W76-11036 5D

SOLIDS TRANSPORT (PIPES)
Transportation of Solids by Water in Pipelines,
W76-10806 8B

SOLUTE-TRANSPORT MODELS
Modeling Solute Transport in Ground Water,
W76-11076 5B

SORPTION
Sorption Capabilities of Soils for Phosphate Removal,
W76-10673 5D

SOUTH CAROLINA
Water Quality Analysis, Santee River Basin,
W76-10578 5G

SOUTH DAKOTA
Pollution Potential of Runoff from Livestock Feeding Operations,
W76-10531 5B

South Dakota's System of Water Management and its Relation to Land Use and Economic Development,
W76-10721 4A

South Dakota Weather Modification Program, Research Cooperative Studies Under Project Skywater,
W76-10819 3B

SPARTA AQUIFER SYSTEM (MISS)
The Sparta Aquifer System in Mississippi,
W76-11067 7C

SPECTROPHOTOMETRY
Trace Metal Analysis by Atomic Emission Using a D.C. Argon Plasma,
W76-10651 5A

SPECTROSCOPY
Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems using Electron Spectroscopy for Chemical Analysis,
W76-10635 5D

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN
Oil Pollution Prevention,
W76-10772 5G

SPLEEN (FISH)
Some Characteristics of Spleen Growth in the Lake Minnow, (In Russian),
W76-10521 2I

SPORT FISHING
Annual Cycle of Sportfishing Activity at a Warmwater Discharge into Galveston Bay, Texas,
W76-10541 5G

SPREADING
The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

SPRINGS
Hyrup V Kleppe (Right-of-way for Pipeline to Tap Water from Spring on Public Land).
W76-10797 6E

SPRINKLER IRRIGATION
Peach Irrigation in Florida,
W76-10749 3F

Brake Means for an Air-Powered Sprinkler System,
W76-10956 3F

Automatic Water Sprinkler for Irregular Areas,
W76-10959 3F

Reaction Arm for Rotary Sprinkler,
W76-10978 3F

SPRUCE TREES
Land Application of Sewage Sludge, III. Nitrate Accumulation and Wheat Growth Resulting from Addition of Sewage Sludge and Wood Wastes to Soils,
W76-10841 5E

ST. LOUIS (MO)
Possible Urban Effects on Maximum Daily Rainfall at Paris, St. Louis and Chicago,
W76-10929 4C

STANDARDS
Permissible Levels of Heavy Metals in Secondary Effluent for use in a Combined Sewage Treatment-Marine Aquaculture System. II. Development of Guidelines by Methods, of Additions,
W76-10994 5D

STANFORD WATERSHED MODEL
Application of the Stanford Watershed Model to Nigerian Watersheds,
W76-10923 2A

STATE GOVERNMENTS
Strategies for Natural Resource Decision-Making: Comments on the Staff Report,
W76-10503 6E

National Oceanic and Atmospheric Administration: Coastal Zone Management Program, Administration Grants, Allocation of Section 306 Funds to States,
W76-10754 6E

A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

STATE JURISDICTION
The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf,
W76-10734 5G

Natural Resources, Dept of; Navigable Waters.
W76-10786 6E

North Dakota Water Quality Standards for the Surface Waters of North Dakota.
W76-10788 6E

STATE WATER QUALITY MANAGEMENT PLAN
Preparation of State Water Quality Management Plans.
W76-10763 5G

STATISTICAL ANALYSIS
Pollution Potential of Runoff from Livestock Feeding Operations,
W76-10531 5B

STATISTICAL METHODS
Frequency Distributions for Coliform Bacteria in Water,
W76-10650 5A

STATISTICAL MODELS
Frequency Distributions for Coliform Bacteria in Water,
W76-10650 5A

STONEFLIES
Life History and Ecology of Megarcys Signata (Plecoptera: Perlodidae), Mill Creek, Wasatch Mountains, Utah,
W76-10887 2I

STORAGE OF HYDROCARBONS
Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

STORAGE TANKS
Oil Pollution Prevention,
W76-10772 5G

STORM DRAINS
Five Pumps Salvage a Quebec Sewer Job,
W76-10689 8C

STORM RUNOFF
Sampling Techniques in Urban Runoff Quality Studies,
W76-10509 5A

STORM SURGE
A Normal Mode Method for Predicting Storm Surges on a Lake,
W76-10715 2H

STORM WATER
Sampling Techniques in Urban Runoff Quality Studies,
W76-10509 5A

STORMS
Hydrologic Effects of Storms of June 24-28, 1974 in Lee and Collier Counties, Florida,
W76-11077 4A

STRAITS
Baroclinic Instability in the Denmark Strait Overflow,
W76-10693 2L

STREAM GEOMETRY
The Relationship of Slope and Stream Channel Form in the River Dart, Devon,
W76-10698 2E

STREAMFLOW
A Note on the Contribution of Fog Drip to Streamflow,
W76-10927 2B

STREAMS
Application of the Stanford Watershed Model to Nigerian Watersheds,
W76-10923 2A

Flood Frequency of Mississippi Streams,
W76-11083 4A

SUBLETHAL EFFECTS
Towards a Model of the Effects of Oil on Marine Organisms,
W76-11021 5C

An Analysis of the Main Scientific Papers Dealing with Long Term Low Level Effects of Oil Pollution,
W76-11022 5C

SUBMERGED LANDS ACT
Beach and Shore Restoration; Authority of State Over Federal and Local Beach Restoration Projects.
W76-10794 6E

SUBSURFACE DRAINAGE
Underlake Sewer Spurs Resort Development,
W76-10685 5D

SUBSURFACE WATERS
Role of Precipitation in the Chemistry of Subsurface Waters in the Western Part of the Turgay Trough,
W76-10942 2F

Subsurface Waters of Erosion Troughs in the Aktyuba Region of the Ural - A Source of Drinking Water Supply,
W76-10943 2F

SULFATE TURPENTINE
A Transformations of Sulfate Turpentine in Natural Waters (Protsessy prevrashcheniya sul'fatnogo skipidara v prirodnykh vodakh),
W76-10845 5B

SULFIDES
Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems using Electron Spectroscopy for Chemical Analysis,
W76-10635 5D

Adsorption Mechanism of Sulfides at a Platinum-Solution Interface,
W76-10636 5D

SULFITE LIQUORS
Precipitate Flotation of Calcium Sulfite from Dilute Aqueous Solution with an Anionic Surfactant,
W76-10631 5D

Studies on Coagulation Treatment of Spent Water from Pulping Process. Part 2. Coagulation Characteristics of Hemicellulose (In Japanese),
W76-10839 5D

Pollution Control through Utilization of Spent Sulfite Liquors from the Pulp Industry as Organic Nitrogen Fertilizer (Ein Beitrag zur umweltfreundlichen Technik durch Verwertung der Sulfitablaugen der Zellstoffindustrie als organischer Stickstoffduenger),
W76-10851 5D

Purification of Lignosulfonates by Dynamic Membrane Ultrafiltration,
W76-10868 5D

Unique Process for Sulfite Spent Liquor Keeps Older Mill Viable,
W76-10871 5D

SUNFISHES
Production Response of the Bluegill Sunfish, Lepomis Macrochirus Rafinesque, to Added Attachment Surface for Fish-Food Organisms,
W76-10522 2I

Behavioural Thermoregulation and Activity Patterns in the Green Sunfish, Lepomis Cyanellus,
W76-10883 5C

SUPERTANKERS
Energy Crisis, Supertankers and Ecology,
W76-10735 5G

SUPERVISORY CONTROL (POWER)
Illinois Laws Relating to Waterways 1973.
W76-10720 6E

SUPPLEMENTAL IRRIGATION
Peach Irrigation in Florida,
W76-10749 3F

SURFACE FIELD DISPERSION
Density Current Surges II--The Movement of Surges in a Turbulent Environment and Their Role in Surface Field Dispersion,
W76-10708 5B

SURFACE-GROUNDWATER RELATIONSHIPS
Indian Water Rights: Some Emerging Frontiers,
W76-10729 6E

An Analog Model of the Chipuxet Aquifer, Rhode Island,
W76-10814 2F

SURFACE IRRIGATION
Irrigation Systems Automation,
W76-10955 3F

SURFACE WATERS
Flow of Toxic Metals in the Environment,
W76-10638 5B

Water-Quality Investigation, Eel River, California,
W76-11069 5A

SURFACTANTS
Advances in Interfacial Phenomena of Particulate/Solution/Gas Systems; Applications to Flotation Research,
W76-10627 5D

Precipitate Flotation of Calcium Sulfite from Dilute Aqueous Solution with an Anionic Surfactant,
W76-10631 5D

Determination of Surface Equilibria and Mass Transfer Rates in a Concurrent Flow Bubble Column,
W76-10632 5D

Removal of Surface-Active and Other Substances Causing the Formation of Stable Foam During Purification of Effluents from the Manufacture of Unbleached Kraft Pulp (Opiti za otstranyavane na pov'rkhnostno-aktivnite i drugi veshchestva, obuslavyashchi obrazuvaneto na ustojchiva pyana pri prechistvaneto na otpad'chni vodi ot proizvodstvoto na neizbelena sulfatna tseluloza),
W76-10834 5D

SURGES
Density Current Surges I--Their Role in the Initial Dispersion of A Surface Field,
W76-10707 5B

SURVEYS
Nongame Mammal Inventory of the Utah Oil Shale Area,
W76-10823 6G

SUSPENDED SOLIDS
Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

Pollutional Effects of Suspended, Sedimented and Eroded Particulate Material in the Aqueous Environment,
W76-10663 5C

SWEDEN
Reasons for Having the IVL-Institute for Water and Air Pollution Control Research. (Varfor ett IVL-institut for vatten- och luftvardsforskning.),
W76-10853 5G

SWEDEN (GOETEBORG ISLAND)
A Model for Water and Phosphorus Distribution on the Island of Goeteborg, (In Swedish),
W76-10963 5B

SYNOPTIC ANALYSIS
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

Abundance and Biomass of Zooplankton during the Synoptic Investigation of the Shallow Inlets to the South of the Zingst Peninsula (South Baltic) During May/June, 1972. (In German),
W76-10817 5C

SYNTHETIC HYDROLOGY
A Discrete Linear Cascade Model for Hydrology,
W76-10946 2E

SYSTEMS ANALYSIS
Monitoring of Subsurface Waste-Disposal Operations: A Generalized Systems Approach with Examples from Canadian Case Histories,
W76-10662 5D

TALLAHASSEE (FLA)
The Impact of Highway Construction on a North Florida Watershed,
W76-10945 5B

TALUS
Investigation of the Hydrologic Characteristics of Talus,
W76-10706 2F

TANNERY WASTES
Water Pollution Control Act of 1972, Economic Impacts, Leather Tanning Industry.
W76-10561 5G

TAR BALLS
Pelagic Tar in the North Pacific Ocean,
W76-11009 5A

Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

Chemical Composition: A Control on the Physical and Chemical Processes Acting on Petroleum in the Marine Environment,
W76-11013 5B

TECHNOLOGY
Directory of Disaster-Related Technology,
W76-10502 10C

OWRT Interest in New Technologies for Water Treatment,
W76-10677 5G

TECHNOLOGY ASSESSMENT
Outer Continental Shelf Resource Development Safety: A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products.
W76-11001 5G

TELEMETRY
U.S. Geological Survey Water Quality Monitor, Operations Manual,
W76-11080 5A

TEMPERATURE
Horizontal Random Temperature Structure of the Ocean,
W76-10691 2L

Repeated Profiling of Microstructure Lenses with a Midwater Float,
W76-10692 2L

Behavioural Thermoregulation and Activity Patterns in the Green Sunfish, Lepomis Cyanellus,
W76-10883 5C

The Anomalous Influence of Salinity on Temperature Tolerances of Summer and Winter Population of the Copepod Eurytemora Affinis,
W76-10884 5C

Bacterial Growth Rates and Temperature Optima in a Stream with a Fluctuating Thermal Regime.
W76-10886 5C

Environmental Regulation of the Annual Reproductive Season of Strongylocentrotus Purpuratus (Stimpson),
W76-10888 5C

The Respiratory Strategies of two Species of Freshwater Gastropods (Ancylus Fluviatilis Mull and Planorbis Contortus Linn) in Relation to Temperature, Oxygen Concentration, Body Size and Season,
W76-10889 5C

Some Mechanisms of Weathering of Petroleum Hydrocarbons on Marine Waters: Competitive Pathways to Fate and Disposition of Petroleum Pollution,
W76-11010 5B

TEMPERATURE MICROSTRUCTURE
Repeated Profiling of Microstructure Lenses with a Midwater Float,
W76-10692 2L

TENNESSEE
Economic Effects of Agricultural Land-Use Management on Soil Erosion and Farm Income in the Obion-Forked Deer River Basin,
W76-10612 4A

Upstream Flood Lowering in Reservoirs,
W76-10938 4A

TERRITORIAL SEAS
The Law of the Sea at the Caracas Session: A Brief Evaluation,
W76-10732 6E

TERRITORIAL ZONE
U. S. Position on Law of the Sea Reviewed,
W76-10743 6E

TERTIARY TREATMENT
Permissible Levels of Heavy Metals in Secondary Effluent for Use in a Combined Sewage Treatment-Marine Aquaculture System. I. Monitoring During Pilot Operation,
W76-10993 5D

Virus Survival Patterns in a Tertiary Sewage Treatment-Aquaculture Model System,
W76-10999 5D

TEXAS
Annual Cycle of Sportfishing Activity at a Warmwater Discharge into Galveston Bay, Texas,
W76-10541 5G

A Proposal for Adoption of A Legal Doctrine of Groundstream Water Interrelationship in Texas,
W76-10731 4B

Coastal Industrial Water Authority V. York (No Change to Title to Land by Avulsion Even Through Avulsion Artificially Caused).
W76-10796 6E

Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma,
W76-10874 4B

TEXAS HIGH PLAINS
The Effect of Changing Input andProduct Prices on the Demand for Irrigation Water in Texas,
W76-10810 3F

TEXTILE INDUSTRY
Water Pollution Control Act of 1972, Economic Impacts, Textile Industry.
W76-10566 5G

TEXTILES
Water Pollution Control Act of 1972, Economic Impacts, Textile Industry.
W76-10566 5G

Coagulation of Textile Industry Effluents with Cationic Polyelectrolytes (Koagulacja sciekow przemyslu wlokienniczego przy uzyciu polielektrolitow kationowych),
W76-10836 5D

Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

THEORETICAL ANALYSIS
Field and Laboratory Evaluation of Bi-Level Drainage Theory,
W76-10934 4A

THERMAL CONDUCTIVITY
Geothermal Energy Recovery Process,
W76-10967 3A

THERMAL POLLUTION
Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

Annual Cycle of Sportfishing Activity at a Warmwater Discharge into Galveston Bay, Texas,
W76-10541 5G

Simulation of Thermally-Influenced Hydrodynamic Flows: Final Report,
W76-10813 2H

Temperatures Selected and Avoided by Fish at Various Acclimation Temperatures,
W76-10885 5C

Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish,
W76-10896 5C

Design of Alternating Diffuser Pipes,
W76-10952 8B

THERMAL POWERPLANTS
Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish,
W76-10896 5C

THERMAL PROPERTIES
Geothermal Energy Recovery Process,
W76-10967 3A

THERMOCLINE
On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

THERMOMETER
An Empirical Na-K-Ca Geothermometer for Natural Waters,
W76-10598 2K

THIN FILMS
Final Report, Horizontal Spray Film (HTEX) and Vertical Tube (VTEX) Evaporator, OSW San Diego Test Facility.
W76-10553 3A

THIRD PARTY EFFECTS
People Ex Rel Younger V Superior Court (Damage Assessment to Public Entity Constitutional Because not Punitive).
W76-10800 6E

THUNDERSTORMS
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

TIDAL ENERGY
A Normal Mode Method for Predicting Storm Surges on a Lake,
W76-10715 2H

TIDAL STREAMS
Application of Finite Element Method to Open Channel Flow,
W76-10939 8B

TIDES
Tide-Induced Mass Transport; A Flushing Mechanism for Shallow Lagoons,
W76-10947 2L

TIME
Linear and Nonlinear Approaches for Short-Term Runoff Estimations in Time-Invariant Open Hydrologic Systems,
W76-10699 2E

TIME-INVARIANT
Linear and Nonlinear Approaches for Short-Term Runoff Estimations in Time-Invariant Open Hydrologic Systems,
W76-10699 2E

TIME SERIES ANALYSIS
A Discrete Linear Cascade Model for Hydrology,
W76-10946 2E

TISSUE HYDROCARBON CONTROL
Uptake and Depuration of Specific Hydrocarbons from Oil by the Bivalves Rangia Cuneata and Crassostrea Virginica,
W76-11024 5C

TOPOGRAPHY
An Example of the Modification of Ocean Currents by Bottom Topography,
W76-10931 2L

TORREY CANYON
A Literature Review of the Biological Impact of Oil Spills in Marine Waters,
W76-11027 5C

TORREY CANYON DISASTER
The Importance of Oil Pollution in the North Sea,
W76-11026 5B

TOXIC PETROLEUM BASED COMPOUNDS
Is Our Approach to the Oil Pollution Problem too Crude,
W76-11031 5C

TOXICITY
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

Flow of Toxic Metals in the Environment,
W76-10638 5B

Studies on the Toxicity of Ammonia, Nitrate and Their Mixtures to the Common Guppy,
W76-10811 5C

Marine Molysmology: The Primary Production of Experimental Ecosystems Set up in the Rance River Estuary. Effect of Crude Oil,
W76-10830 5C

Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

Foam Separation for Detoxification of Bleached Kraft Mill Effluents,
W76-10855 5D

Detoxification of Bleached Kraft Mill Effluents,
W76-10867 5D

Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

Biological Fate of Petroleum Hydrocarbons in Aquatic Macroorganisms,
W76-11014 5C

Towards a Model of the Effects of Oil on Marine Organisms,
W76-11021 5C

Some Considerations of the Chronic Effects of Petroleum in the Marine Environment,
W76-11023 5C

A Literature Review of the Biological Impact of Oil Spills in Marine Waters,
W76-11027 5C

Position Paper on the Effects of Acute Oil Spills,
W76-11028 5C

Toxicity of Agricultural Chemicals to Larvivorous Fish in Korean Rice Fields,
W76-11095 5C

The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

TOXINS
PCB'S in the Environment,
W76-10739 5C

TRACE CHEMICAL CONCENTRATIONS
Pulsed Dispersion of Trace Chemical Concentrations in a Saturated Sorbing Porous Medium,
W76-10915 5B

TRACE ELEMENTS
Trace Element Interactions in the Estuarine Zone of the Anasco River, Puerto Rico,
W76-10892 5C

TRACER TECHNIQUES
Distribution of Stream Pollution in Lake Water,
W76-10712 5B

TRACERS
Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

TRACKING TECHNIQUES
Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

TRANSPORTATION
Do Regulated Freight Rates Discourage Recycling,
W76-10676 5G

Materials Transportation Bureau: Transpiration of Natural and Other Gas by Pipeline,
W76-10756 5G

TREATIES
An Integrated International and Domestic Approach to Civil Liability for Vessel-Source Oil Pollution,
W76-10730 5G

U. S. Position on Law of the Sea Reviewed,
W76-10743 6E

The Oceans: Wild West Scramble for Control,
W76-10745 6E

The New Treaty on Vessel Pollution,
W76-10748 6E

TREATMENT FACILITIES
Water Supply and Sewage Facilities Plan Update - 1970 (1974 Supplement),
W76-10508 5G

Municipal Wastewater Treatment Works, Model Facility Plan For A Small, Rural Community.
W76-10511 5D

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards System Design,
W76-10512 5D

Regina Tertiary Treatment Plant Study and Design, (Part II),
W76-10516 5D

Water Pollution Abatement Technology: Capabilities and Costs, Metal Finishing Industry,
W76-10555 5D

Water Pollution Abatement Technology: Capabilities and Costs, Iron and Steel Industry,
W76-10558 5D

Water Pollution Control Act of 1972, Municipal Options.
W76-10568 5G

Aerosol Production from Land Application of Wastewater by Agricultural Irrigation Equipment,
W76-10625 5D

Pesticide Incineration,
W76-10675 5E

Cities Need Sewerless Toilets,
W76-10680 5D

Underlake Sewer Spurs Resort Development,
W76-10685 5D

Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

Environmental Protection Installations of Cellulose Attisholz AG. (Umweltschutzanlagen der Cellulose Attisholz AG.).
W76-10849 5D

Tough Illinois Effluent Standards are met by Celotex Boxboard Mill,
W76-10856 5G

Town Gives Primary and Secondary Treatment to Blandin's Effluent,
W76-10857 5D

TREATMENT OF OILED BIRDS
Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

TRITIUM
Conformity of Groundwater Recharge Rate by Tritium Method and Mathematical Modelling,
W76-10700 2F

A Simulation Model of Tritium Kinetics in a Freshwater Marsh,
W76-10812 5B

TROPHIC LEVEL
Use of A Trophodynamic Chain of the Benthic Type for the Study of Transfers of Metallic Pollutants, (In French),
W76-10944 5C

TUNNELING
Cleveland Mixes Methods in Sewer Construction.
W76-10684 5D

TUNNELING MACHINES
Cleveland Mixes Methods in Sewer Construction.
W76-10684 5D

TUNNELS
Cleveland Mixes Methods in Sewer Construction.
W76-10684 5D

TURBIDITY
Regina Tertiary Treatment Plant Study and Design, (Part II),
W76-10516 5D

TURBULENCE
Density Current Surges I--Their Role in the Initial Dispersion of A Surface Field,
W76-10707 5B

Density Current Surges II--The Movement of Surges in a Turbulent Environment and Their Role in Surface Field Dispersion,
W76-10708 5B

TURBULENT BOUNDARY LAYERS
Experimental and Theoretical Investigations in an Oscillatory Turbulent Boundary Layer,
W76-10916 8B

TURKEYS
Preventing Water Pollution from Turkey Operations,
W76-10535 5G

U.S. OCEAN POLICY
National Ocean Policy: Priorities for the Future,
W76-10591 6E

ULTIMATE DISPOSAL
Pesticide Incineration,
W76-10675 5E

ULTRAFILTRATION
Purification of Lignosulfonates by Dynamic Membrane Ultrafiltration,
W76-10868 5D

UNIT HYDROGRAPHS
A Discrete Linear Cascade Model for Hydrology,
W76-10946 2E

UNITED NATIONS
A New International Law for the Deep Seabed Regime,
W76-10726 6E

The Law of the Sea at the Caracas Session: A Brief Evaluation,
W76-10732 6E

The New Treaty on Vessel Pollution,
W76-10748 6E

UNITED STATES
U. S. Position on Law of the Sea Reviewed,
W76-10743 6E

UPSTREAM FLOOD LOWERING
Upstream Flood Lowering in Reservoirs,
W76-10938 4A

UPTAKE
Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

URAL ANTICLINES
Subsurface Waters of Erosion Troughs in the Aktyuba Region of the Ural - A Source of Drinking Water Supply,
W76-10943 2F

URBAN RUNOFF
Sampling Techniques in Urban Runoff Quality Studies,
W76-10509 5A

Deposition in Upper Patuxent Estuary, Maryland, 1968-1969,
W76-10925 4C

URBANIZATION
Urban-Industrial Effects on Clouds and Precipitation,
W76-10905 4C

Possible Urban Effects on Maximum Daily Rainfall at Paris, St. Louis and Chicago,
W76-10929 4C

UREAS
Fertilizer Manufacturing Point Source Category, Urea Subcategory,
W76-10764 5G

UTAH
Provo City V Lambert (Modification of City's Appropriation Certificate).
W76-10803 6E

Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

Studies for Wildlife on Energy Areas,
W76-10820 6G

Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

Raptor Study of Utah Oil Shale Area,
W76-10822 6G

Nongame Mammal Inventory of the Utah Oil Shale Area,
W76-10823 6G

Studies on the Least Chub (Iotichthys Phlegethontiscope) in Geothermal Activities Area of Snake and Tule Valleys, Utah,
W76-10824 6G

VALUE ENGINEERING
Rationale for a Water Pollution Code (Part II): Social Assessment,
W76-10592 5G

VANADIUM
Atomic-Absorption Determination of Vanadium and Molybdenum in Tap Water and Mineral Waters After Anion-Exchange Separation,
W76-10869 5A

VARIABLE WINDS
Loess Distribution by Variable Winds,
W76-10941 2J

VARIATES
Entropy Principle Applied to the Rainfall-Runoff Process,
W76-10918 2A

VEGETABLE CROPS
A Method for Determining the Irrigation Requirement in Antigua, W. I.,
W76-10981 3F

VEGETATION
Legal Interpretation of Term 'Wetlands'.
W76-10792 6E

VERTICAL TUBE EVAPORATORS
Final Report, Horizontal Spray Film (HTEX) and Vertical Tube (VTEX) Evaporator, OSW San Diego Test Facility.
W76-10553 3A

VIABILITY
Virus Survival Patterns in a Tertiary Sewage Treatment-Aquaculture Model System,
W76-10999 5D

VIRGINIA
State Water Control Board--Authority to Investigate all Problems Concerned with the Quality of Water,
W76-10779 6E

Final Environmental Statement, Construction of Artificial Reefs in the Atlantic Ocean Off Cape Henry, Virginia.
W76-11094 8B

VIRUSES
Survival of Human Pathogens in the Marine Environment,
W76-10890 5C

Virus Survival Patterns in a Tertiary Sewage Treatment-Aquaculture Model System,
W76-10999 5D

VISCOSE RAYON
Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

Production Studies on the Electrolytic Method of Recovering Zinc from Effluent Sediments (Proizvodstvennye issledovaniya elektroliticheskogo sposoba regeneratsii tsinka iz osadkov stochnykh vod),
W76-10846 5D

WADDENSEA (THE NETHERLANDS)
'Ware the Wadden Sea,
W76-10985 6G

WASHINGTON
Water Quality Analysis, Columbia River.
W76-10579 5G

Estimated Erosion Rates on Mount Rainier, Washington,
W76-10951 2J

WASTE DILUTION
Fluid-Mechanics Aspects in the Design of Sewage Outfalls into the Sea (Stroemungsmechanische Entwurfsaspekte fuer Abwassereinleitungen ins Meer),
W76-10678 5E

WASTE DISPOSAL
Disposal of Cattle Feedlot Waste in an Anaerobic Lagoon on the Organic Soils of South Florida--Preliminary Results,
W76-10540 5E

Chemical and Microbiological Changes in Poultry Litter Applied to Soil as Influenced by the Time and Method of Application,
W76-10615 5E

Disposal Lagoon.
W76-10618 5D

Monitoring of Subsurface Waste-Disposal Operations: A Generalized Systems Approach with Examples from Canadian Case Histories,
W76-10662 5D

Land Disposal of Wastes: Potential for Groundwater Pollution,
W76-10667 5E

Fluid-Mechanics Aspects in the Design of Sewage Outfalls into the Sea (Stroemungsmechanische Entwurfsaspekte fuer Abwassereinleitungen ins Meer),
W76-10678 5E

Assessment of Polyvinyl Chloride as a Packaging Material for Distilled Spirits, (Enivronmental Impact Assessment),
W76-10722 6G

Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

Animal Waste Management Conference.
W76-11032 5D

WASTE DISPOSAL

Economic Considerations Involved in Selecting Types of Confinement and Waste Disposal Systems for Swine and Beef,
W76-11043 5D

Controlling Barnyard Runoff,
W76-11049 5D

Farm Animal Waste Management: What our Milk Market Requires,
W76-11050 5D

How to Plan and Manage a Lagoon,
W76-11052 5D

Pollution Abatement Systems for Farm Animal Wastes in Southeast Michigan,
W76-11057 5D

The Impact on Dairy Farm Organization of Alternative Manure Disposal Systems. A Method of Assessing the Cost of Environmental Regulation,
W76-11061 5D

Decision Mapping - Tool for Underground Waste Management,
W76-11063 5B

Construction and Testing of Two Waste-Injection Monitor Wells in Northwest Florida,
W76-11070 5B

Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

WASTE DISPOSAL WELLS

Monitoring of Subsurface Waste-Disposal Operations: A Generalized Systems Approach with Examples from Canadian Case Histories,
W76-10662 5D

Construction and Testing of Two Waste-Injection Monitor Wells in Northwest Florida,
W76-11070 5B

WASTE HANDLING

Large Commercial Feedlots - How Wastes are Handled in the West,
W76-11048 5D

WASTE HEAT

Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

WASTE IDENTIFICATION

Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

WASTE MANAGEMENT

An Analysis of Dairy Waste Management Alternatives for Southern California Dairymen,
W76-10534 5G

An Economic Appraisal of Alternative Dairy Waste Management Systems Designed for Pollution Control,
W76-10547 5D

A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

Decision Mapping - Tool for Underground Waste Management,
W76-11063 5B

WASTE MANAGEMENT SYSTEMS

Waste Management Systems for Roofed Beef Confinement Facilities,
W76-11040 5D

WASTE STORAGE

Quality Variation of Feedlot Runoff in Storage,
W76-10549 5B

Animal Waste Management Conference.
W76-11032 5D

Pollution Abatement Systems for Farm Animal Wastes in Southeast Michigan,
W76-11057 5D

WASTE TREATMENT

EPA'S New Feedlot Disposal Plan,
W76-10532 5D

Disposal Lagoon.
W76-10618 5D

Advances in Interfacial Phenomena of Particulate/Solution/Gas Systems; Applications to Flotation Research,
W76-10627 5D

Electrochemical Properties of the Oxide-Solution Interface in Relation to Flotation,
W76-10629 5B

Behavior of Hydrogen and Hydroxyl Ions at the Oxide-Water Interface,
W76-10633 5B

Characterization of Adsorbed Cobalt at the Oxide-Water Interface,
W76-10634 5D

Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems using Electron Spectroscopy for Chemical Analysis,
W76-10635 5D

How to Use and Select a Screw Pump,
W76-10681 8C

Animal Waste Management Conference.
W76-11032 5D

Aerobic Waste Treatment,
W76-11035 5D

System Components to Separate Solids and Liquids,
W76-11036 5D

Swine Manure Collection and Removal Systems,
W76-11037 5D

Biodegrading Poultry Excreta with House Fly Larvae: The Concept and Equipment,
W76-11053 5D

Pollution Abatement Systems for Farm Animal Wastes in Southeast Michigan,
W76-11057 5D

WASTE WATER DISPOSAL

Timber Products Processing Point Source Category, Proposed Pretreatment Standards for Existing Sources,
W76-10760 5G

Development Document for Effluent Limitations Guidelines and New Source Performance Standards: Feedlot Point Source Category,
W76-10829 5G

WASTE WATER (POLLUTION)

Water Contamination Detection,
W76-10648 5A

Frequency Distributions for Coliform Bacteria in Water,
W76-10650 5A

An Evaluation of Automatic Wastewater Compositors,
W76-10652 5A

WASTE WATER TREATMENT

Municipal Wastewater Treatment Works, Model Facility Plan For A Small, Rural Community.
W76-10511 5D

How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards System Design,
W76-10512 5D

Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water, Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci),
W76-10515 5A

Regina Tertiary Treatment Plant Study and Design, (Part II),
W76-10516 5D

Water Pollution Abatement Technology: Capabilities and Costs, Iron and Steel Industry,
W76-10558 5D

Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Animal Feed, Breakfast Cereal, and Wheat Starch Segments of the Grain Mills Point Source Category,
W76-10594 5G

Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textile, Friction Materials and Sealing Devices Segment of the Asbestos Manufacturing Point Source Category,
W76-10595 5G

Oxidation of Ammonia in Water by Ferrates (VI) and (IV),
W76-10611 5D

Feasibility Study of a Nuclear Power-Sewage Treatment System for the Conservation and Reclamation of Water Resources,
W76-10614 5D

An Integrated Power Process Model of Water Use and Wastewater Treatment in Chlorine Caustic Production,
W76-10621 5D

Aerosol Production from Land Application of Wastewater by Agricultural Irrigation Equipment,
W76-10625 5D

Precipitate Flotation of Calcium Sulfite from Dilute Aqueous Solution with an Anionic Surfactant,
W76-10631 5D

Determination of Surface Equilibria and Mass Transfer Rates in a Concurrent Flow Bubble Column,
W76-10632 5D

Sorption Capabilities of Soils for Phosphate Removal,
W76-10673 5D

A Feasibility Study of the Control of Pollution from Industrial Waste Waters Discharged into the Lagoon of Venice,
W76-10679 5D

Cities Need Sewerless Toilets,
W76-10680 5D

Fiber-Glass-Reinforced Polyesters and Furan Resins for Water- and Waste-Treatment Systems,
W76-10682 8G

Underlake Sewer Spurs Resort Development,
W76-10685 5D

Marine Sanitation Device Standard,
W76-10758 5D

Soap and Detergent Manufacturing Category Pretreatment Standards for New Sources,
W76-10759 5G

Timber Products Processing Point Source Category,
W76-10761 5G

Organic Chemicals Manufacturing Point Source Category, Ethylene Oxide, Ethylene Glycol, Methyl Amines and Oxo Chemicals Processes,
W76-10769 5G

Water Programs Secondary Treatment Information,
W76-10770 5D

Domestic Wastewater Disinfection, Secondary Treatment,
W76-10771 5D

Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

Foam Formation in Plants for Biological Purification of Effluents from the Manufacture of Kraft Pulp (Penoobrazuvaneto v stantsiite za biologichno prechistvane naotpad' chite vodi ot proizvodstvoto na sulfatnatseluloza),
W76-10833 5D

Removal of Surface-Active and Other Substances Causing the Formation of Stable Foam During Purification of Effluents from the Manufacture of Unbleached Kraft Pulp (Opiti za otstranyavane na pov'rkhnostno-aktivnite i drugi veshchestva, obuslavyashchi obrazuvaneto na ustojchiva pyana pri prechistvaneto na otpad'chni vodi ot proizvodstvoto na neizbelena sulfatna tseluloza),
W76-10834 5D

Coagulation of Textile Industry Effluents with Cationic Polyelectrolytes (Koagulacja sciekow przemyslu wlokienniczego przy uzyciu polielektrolitow kationowych),
W76-10836 5D

Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

Production Studies on the Electrolytic Method of Recovering Zinc from Effluent Sediments (Proizvodstvennye issledovaniya elektroliticheskogo sposoba regeneratsii tsinka iz osadkov stochnykh vod),
W76-10846 5D

Adaptation of Feed Yeast to a Cellulosic Effluent Medium (in Armenian with Russian summary),
W76-10847 5D

Use of Electrodialysis in the Water Recycling System of Viscose Production (Primenenie elektrodializa v sisteme vodooborota viskoznogo proizodstva),
W76-10848 5D

Environmental Protection Installations of Cellulose Attisholz AG. (Umweltschutzanlagen der Cellulose Attisholz AG.).
W76-10849 5D

Biological Filters (Biologicheskie fil'try),
W76-10850 5D

Trends and Experience in the Primary Treatment of Papermaking Effluents (Indirizzi ed esperienze nel trattamento primario delle acque di scarico delle cartiere),
W76-10852 5D

Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

Foam Separation for Detoxification of Bleached Kraft Mill Effluents,
W76-10855 5D

Tough Illinois Effluent Standards are met by Celotex Boxboard Mill,
W76-10856 5G

Town Gives Primary and Secondary Treatment to Blandin's Effluent,
W76-10857 5D

How to Meet Water Cleanup Deadlines,
W76-10862 5D

Detoxification of Bleached Kraft Mill Effluents,
W76-10867 5D

Purification of Lignosulfonates by Dynamic Membrane Ultrafiltration,
W76-10868 5D

Unique Process for Sulfite Spent Liquor Keeps Older Mill Viable,
W76-10871 5D

Electrochemical Production of Free Radicals for Wastewater Treatment,
W76-10876 5D

Water Reuse, a Bibliography, Volume 5.
W76-10878 5D

Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish,
W76-10896 5C

Metal Recovery from Waste Treatment Sludges,
W76-10960 5D

Oxygen Aeration System for Contaminated Liquids,
W76-10961 5D

Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

Purification of Waste Water Containing Organic and Inorganic Impurities,
W76-10966 5D

Electrochemical Cell for Decreasing the Cyanide and Heavy Metal Content of an Aqueous Solution,
W76-10972 5D

Filter Apparatus,
W76-10975 5D

Filtration and Backwashing Apparatus for Use with a Water Filtration System,
W76-10977 5F

Removal of Inorganic Nitrogen in an Integrated Food Chain System,
W76-10988 5C

Relative Growth of Different Species of Marine Algae in Wastewater-Seawater Mixtures,
W76-10989 5C

WASTES

Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

WATER ALLOCATION (POLICY)

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

The Conveyancer, Water Rights and the Environment,
W76-10736 6E

Environmental Protection Agency: Policies and Procedures for State Continuing Planning Process,
W76-10762 5G

Provo City V Lambert (Modification of City's Appropriation Certificate).
W76-10803 6E

A Selected Annotated Bibliography on Fish and Wildlife Implications of Missouri Basin Water Allocation,
W76-10825 4C

Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

WATER ANALYSIS

Atomic-Absorption Determination of Vanadium and Molybdenum in Tap Water and Mineral Waters After Anion-Exchange Separation,
W76-10869 5A

A Rapid Method for the Simultaneous Determination of Paraquat and Diquat in Pond and River Waters by Pyrolysis and Gas Chromatography,
W76-10870 5A

WATER ANALYSIS

Ground Water Quality Monitoring for California's Needs,
W76-11065 5A

Variation in Concentration of Selected Water-Quality Constituents in the Sacramento River at Bend Bridge, California,
W76-11078 5A

WATER AND SOIL CONSERVATION ACT 1967 (NZ)

Water Quality and the Water and Soil Conservation Act 1967,
W76-10737 5G

WATER AND SOIL CONSERVATION ACT OF 1967 (NZ)

The Conveyancer, Water Rights and the Environment,
W76-10736 6E

WATER BIRDS

Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

WATER CHEMISTRY

Water Transport Across Cation-Exchange Membrane. I. Experimental Technique. Influence of the Concentration and Temperature on the Water Transport Number,
W76-10620 3A

Tropic Status of Selected Northern New Mexico Lakes,
W76-10808 5C

Automated Determination of Carbon in Natural Waters,
W76-10936 5A

Role of Precipitation in the Chemistry of Subsurface Waters in the Western Part of the Turgay Trough,
W76-10942 2F

WATER CONSERVATION

OWRT Interest in New Technologies for Water Treatment,
W76-10677 5G

Water Quality and the Water and Soil Conservation Act 1967,
W76-10737 5G

A Sound Water Plan for South Florida Implementation of the 1972 Water Resources Act,
W76-10742 6E

WATER DISTRIBUTION (APPLIED)

Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

WATER DISTRICTS

A Sound Water Plan for South Florida Implementation of the 1972 Water Resources Act,
W76-10742 6E

Water Management Districts--Water Resources--Authority to Consider and Protect Against Degradation of Water Quality Through Permitting Processes.
W76-10791 6E

WATER LAW

Water Resources Planning Act,
W76-10776 6E

WATER LEVEL FLUCTUATIONS

Geohydrology of the Anza-Terwilliger Area, Riverside County, California,
W76-11074 4B

WATER LEVELS

Water Pollution Through Rain Overflows from Mixed Sewers (Gewasserverschmutzung Durch Regenuberlaufe Aus Mischkanalisationen),
W76-10688 5B

Ground-Water Levels in New Mexico, 1974,
W76-11073 2F

WATER LOSS

Plant Measurements as Indicators of Crop Water Deficit,
W76-10622 3F

WATER MANAGEMENT (APPLIED)

Quality of Water Considerations in Arid Area Water Management,
W76-10608 5B

Economic Effects of Agricultural Land-Use Management on Soil Erosion and Farm Income in the Obion-Forked Deer River Basin,
W76-10612 4A

Assessment of the Benefits of Environmental Remote Sensing,
W76-10670 5A

A Sound Water Plan for South Florida Implementation of the 1972 Water Resources Act,
W76-10742 6E

Recycling Ground Water in Waushara County, Wisconsin: Resource Management for Cold-Water Fish Hatcheries,
W76-11082 4B

WATER PERMITS

Provo City V Lambert (Modification of City's Appropriation Certificate).
W76-10803 6E

WATER POLICY

Water to the Fields: India's Changing Strategy,
W76-10589 3F

WATER POLLUTION

Sampling Techniques in Urban Runoff Quality Studies,
W76-10509 5A

Environmental Levels of PCB'S,
W76-10641 5A

Polychlorinated Biphenyls Off Southern California,
W76-10647 5C

San Francisco Civil Service Ass'n, Local 400 V State Ex Rel Regional Water Quality Control Board (Damages Assessment for Pollutants to Public Entity Constitutional).
W76-10801 6E

A Simulation Model of Tritium Kinetics in a Freshwater Marsh,
W76-10812 5B

Effect of a Livestock Wintering Operation on a Western Mountain Stream,
W76-11059 5A

A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

WATER POLLUTION CONTROL

Report of Kelly's Falls Pond, Hillsborough County, New Hampshire,
W76-10525 5C

Report on Powder Mill Pond, Hillsborough County, New Hampshire.
W76-10526 5C

Report on Glen Lake, Hillsborough County, New Hampshire.
W76-10527 5C

Report on Sebasticook Lake, Penobscot County, Maine.
W76-10528 5C

Report on Lake Winnepesaukee, Carroll and Belknap Counties, New Hampshire.
W76-10529 5C

Control of Pollution from Animal Feedlots,
W76-10533 5G

Water Quality and the Water and Soil Conservation Act 1967,
W76-10737 5G

Burning Waters,
W76-10740 5G

Water Management Districts--Water Resources--Authority to Consider and Protect Against Degradation of Water Quality Through Permitting Processes.
W76-10791 6E

An Investigation of Effluent Control Standards and Practices (Atomic Energy Production),
W76-10828 5G

A Clean Piece of Paper,
W76-10842 5D

Reasons for Having the IVL-Institute for Water and Air Pollution Control Research. (Varfor ett IVL-institut for vatten- och luftvardsforskning.),
W76-10853 5G

Tough Illinois Effluent Standards are met by Celotex Boxboard Mill,
W76-10856 5G

Sequential Chlorination -- Impact on the Environment,
W76-10860 5D

Environmental and Social Factors (in the Paper Industry),
W76-10861 5G

The Cost of Complying with Federal Water Pollution Law.
W76-10872 5G

Metal Recovery from Waste Treatment Sludges,
W76-10960 5D

WATER POLLUTION EFFECTS

Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

Flow of Toxic Metals in the Environment,
W76-10638 5B

Environmental Levels of PCB'S,
W76-10641 5A

Earthwatch-Sentinel for the Future,
W76-10645 5A

Polychlorinated Biphenyls Off Southern California,
W76-10647 5C

Pollutional Effects of Suspended, Sedimented and Eroded Particulate Material in the Aqueous Environment,
W76-10663 5C

A Strategy for Aquatic Pollutants Fate and Transport Determination,
W76-10665 5B

A Feasibility Study of the Control of Pollution from Industrial Waste Waters Discharged into the Lagoon of Venice,
W76-10679 5D

Incidence De La Charge Polluante Des Eaux Sur Le Comportement Des Radionucleides, (Effect of the Pollutant Burden of Water on the Behaviour of Radionuclides),
W76-10893 5C

Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume II.
W76-11007 5C

Some Considerations of the Chronic Effects of Petroleum in the Marine Environment,
W76-11023 5C

The Importance of Oil Pollution in the North Sea,
W76-11026 5B

Position Paper on the Effects of Acute Oil Spills,
W76-11028 5C

Some Biological Effects Related to the West Falmouth Oil Spill,
W76-11029 5C

Distribution of Suspended Oil Particles Following the Grounding of the Tanker Arrow,
W76-11096 5B

WATER POLLUTION SOURCES

Pollution Potential of Runoff from Livestock Feeding Operations,
W76-10531 5B

Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

Fertilizer Manufacturing Point Source Category, Effluent Limitations and Guidelines for Existing Sources and Standards for New Sources for the Phosphate Subcategory,
W76-10768 5G

Ink Formulating Point Source Category, Pretreatment Standards for Existing Sources,
W76-10774 5G

Lignosulfonates and Natural Water-Soluble Lignin in the Lielupe River (Lignosul'fonaty i prirodnyi vodorastvorimyi lignin v vode r. Lielupe),
W76-10835 5B

Sources of Polychlorinated Biphenyls in Wisconsin,
W76-10844 5B

Adaptation of Feed Yeast to a Cellulosic Effluent Medium (in Armenian with Russian summary),
W76-10847 5D

Polycyclic Aromatic Compounds in Nature,
W76-10865 5B

Nature and Behavior of Manure,
W76-11038 5B

Barium in Southern California Coastal Waters: A Potential Indicator of Marine Drilling Contamination,
W76-11089 5A

WATER POLLUTION TREATMENT

Interfacial Chemistry of Particulate Flotation,
W76-10628 5B

Metal Recovery from Waste Treatment Sludges,
W76-10960 5D

Oxygen Aeration System for Contaminated Liquids,
W76-10961 5D

Purification of Waste Water Containing Organic and Inorganic Impurities,
W76-10966 5D

Filter Apparatus,
W76-10975 5D

WATER PURIFICATION

Ion and Precipitate Flotation of Metal Ions from Solution,
W76-10630 5D

OWRT Interest in New Technologies for Water Treatment,
W76-10677 5G

Village Safe Water Act.
W76-10790 6E

Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

Oxygen Aeration System for Contaminated Liquids,
W76-10961 5D

Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

Purification of Waste Water Containing Organic and Inorganic Impurities,
W76-10966 5D

Filtration and Backwashing Apparatus for Use with a Water Filtration System,
W76-10977 5F

WATER QUALITY

Water Quality and Management Characteristics of Feedlot Runoff Holding Ponds,
W76-10545 5D

Water Quality in a Recirculating Raceway System for Fish Culture,
W76-10546 5G

Quality of Water Considerations in Arid Area Water Management,
W76-10608 5B

Agricultural Sediment Control for Water Quality Protection,
W76-10617 5G

Report on Pollution of Interstate Waters of the Connecticut River.
W76-10626 5A

International Conference on Environmental Sensing and Assessment, Volumes 1 and 2.
W76-10637 5A

Monitoring: The Trigger for Action,
W76-10640 5A

A Preliminary Design for a National Environmental Census,
W76-10642 5A

Design of Nationwide Water-Quality Monitoring Networks,
W76-10643 5A

Some International Activities in Environmental Monitoring,
W76-10644 5A

Earthwatch-Sentinel for the Future,
W76-10645 5A

Network Design Considerations for the Global Environmental Monitoring System (GEMS) of the United Nations,
W76-10646 5A

Water Contamination Detection,
W76-10648 5A

Spark Source Mass Spectrometry: The Optimum Referee Method for Multielement Analysis,
W76-10649 5A

Environmental Monitoring in Latin America and the Caribbean,
W76-10654 5A

Environmental Quality Surveillance in Indonesia,
W76-10655 5A

Development of a Methodology for Monitoring Groundwater Quality,
W76-10658 5A

Management of Groundwater Quality Data,
W76-10660 5A

Automated Forecast Procedures for River Quality Management,
W76-10664 5A

A Strategy for Aquatic Pollutants Fate and Transport Determination,
W76-10665 5B

Land Disposal of Wastes: Potential for Groundwater Pollution,
W76-10667 5E

A Proposed National Monitoring System for Organics in Water,
W76-10668 5A

Assessment of the Benefits of Environmental Remote Sensing,
W76-10670 5A

Groundwater Availability in Champaign County,
W76-10718 4B

Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

Studies for Wildlife on Energy Areas,
W76-10820 6G

Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

Water Resources Data for Wisconsin. Part 1. Surface Water Records. Part 2. Water Quality Records.
W76-10832 7C

Water Quality Characteristics of the Illinois River at Peoria,
W76-10922 5A

A Comparison of Several Water Quality Indexes,
W76-10926 5A

Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

The Impact of Highway Construction on a North Florida Watershed,
W76-10945 5B

Some Water Quality Aspects in a Nascent Impoundment in Central Illinois,
W76-10950 5B

The Sparta Aquifer System in Mississippi,
W76-11067 7C

Water-Quality Investigation, Eel River, California,
W76-11069 5A

Geohydrology of the Anza-Terwilliger Area, Riverside County, California,
W76-11074 4B

Variation in Concentration of Selected Water-Quality Constituents in the Sacramento River at Bend Bridge, California,
W76-11078 5A

U.S. Geological Survey Water Quality Monitor, Operations Manual,
W76-11080 5A

Water-Quality Data for Canals in Eastern Broward County, Florida, 1969-1974,
W76-11081 7C

Recycling Ground Water in Waushara County, Wisconsin: Resource Management for Cold-Water Fish Hatcheries,
W76-11082 4B

WATER QUALITY CONTROL

Implementation of a Large Scale Water Quality Data Management System,
W76-10588 5A

Rationale for a Water Pollution Code (Part II): Social Assessment,
W76-10592 5G

Marine Technology Society Eighth Annual Conference Preprints,
W76-10600 5G

An Environmental Analysis of a Simulated Sea-Floor Mining Operation,
W76-10601 5G

The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

Water Quality and the Water and Soil Conservation Act 1967,
W76-10737 5G

Ei Du Pont De Nemours and Company V Train (Federal Water Pollution Prevention and Control Act Quality Standards of Water and Effluent Discharged into that Water).
W76-10799 6E

Technical Capabilities in Offshore Completion and Workover Operations to Maximize Safety,
W76-11002 5G

Technical Capabilities in Offshore Pipeline Operations to Maximize Safety,
W76-11003 5G

Technical Capabilities of Offshore Exploration Operations to Maximize Safety amd Environmental Protection,
W76-11004 5G

Regulation and Supervision of Outer Continental Shelf Operations on the Pacific Coast,
W76-11005 5G

Gulf Coast Lease Management Inspection Program,
W76-11006 5G

Ground Water Quality Monitoring for California's Needs,
W76-11065 5A

WATER QUALITY INDEXES

A Comparison of Several Water Quality Indexes,
W76-10926 5A

WATER QUALITY STANDARDS

Environmental Investigation of Eden Isles,
W76-10510 5G

Rationale for a Water Pollution Code (Part II): Social Assessment,
W76-10592 5G

Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Animal Feed, Breakfast Cereal, and Wheat Starch Segments of the Grain Mills Point Source Category,
W76-10594 5G

Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textile, Friction Materials and Sealing Devices Segment of the Asbestos Manufacturing Point Source Category,
W76-10595 5G

Disposal Lagoon.
W76-10618 5D

Soap and Detergent Manufacturing Category Pretreatment Standards for New Sources,
W76-10759 5G

Timber Products Processing Point Source Category,
W76-10761 5G

Preparation of State Water Quality Management Plans.
W76-10763 5G

Organic Chemicals Manufacturing Point Source Category, Ethylene Oxide, Ethylene Glycol, Methyl Amines and Oxo Chemicals Processes,
W76-10769 5G

Water Programs Secondary Treatment Information,
W76-10770 5D

Domestic Wastewater Disinfection, Secondary Treatment,
W76-10771 5D

Ink Formulating Point Source Category, Pretreatment Standards for Existing Sources,
W76-10774 5G

North Dakota Water Quality Standards for the Surface Waters of North Dakota.
W76-10788 6E

Ei Du Pont De Nemours and Company V Train (Federal Water Pollution Prevention and Control Act Quality Standards of Water and Effluent Discharged into that Water).
W76-10799 6E

An Investigation of Effluent Control Standards and Practices (Atomic Energy Production),
W76-10828 5G

Development Document for Effluent Limitations Guidelines and New Source Performance Standards: Feedlot Point Source Category,
W76-10829 5G

Tough Illinois Effluent Standards are met by Celotex Boxboard Mill,
W76-10856 5G

WATER REQUIREMENTS

A Method for Determining the Irrigation Requirement in Antigua, W. I.,
W76-10981 3F

WATER RESOURCES

Interboard Plan for the Greater Finger Lakes - Oswego River Basin,
W76-10506 4A

OWRT Interest in New Technologies for Water Treatment,
W76-10677 5G

Water Resources Data for Wisconsin. Part 1. Surface Water Records. Part 2. Water Quality Records.
W76-10832 7C

WATER RESOURCES CONTROL BOARD

Ground Water Quality Monitoring for California's Needs,
W76-11065 5A

WATER RESOURCES DEVELOPMENT

Illinois Laws Relating to Waterways 1973.
W76-10720 6E

Coal Mining, Development and Processing – The Associated Water Problems,
W76-10727 6E

U. S. Position on Law of the Sea Reviewed,
W76-10743 6E

To Amend the Wild and Scenic Rivers Act (Part 2).
W76-10750 6E

To Amend the Wild and Scenic Rivers Act (Part 4).
W76-10751 6E

Environmental Protection Agency: Policies and Procedures for State Continuing Planning Process,
W76-10762 5G

H.R. 5952 (Water Resources Planning Act),
W76-10775 6E

Problems of Public Works Projects in the Present Economic Climate,
W76-10980 6C

WATER RESOURCES PLANNING ACT
H.R. 5952 (Water Resources Planning Act),
W76-10775 6E

Water Resources Planning Act,
W76-10776 6E

WATER REUSE
Feasibility Study of a Nuclear Power-Sewage Treatment System for the Conservation and Reclamation of Water Resources,
W76-10614 5D

Use of Electrodialysis in the Water Recycling System of Viscose Production (Primenenie elektrodializa v sisteme vodooborota viskoznogo proizodstva),
W76-10848 5D

Water Reuse, a Bibliography, Volume 5.
W76-10878 5D

The Use of Power Plant Waste Heat in Marine Aquaculture,
W76-10992 5D

WATER RIGHTS
Indian Water Rights: Some Emerging Frontiers,
W76-10729 6E

The Conveyancer, Water Rights and the Environment,
W76-10736 6E

WATER RIGHTS (NON-RIPARIANS)
Water Pollution--Civil Remedies.
W76-10782 6E

Navigable Waters: Riparian Rights.
W76-10787 6E

WATER SAMPLING
Near Surface Sampler,
W76-10995 5A

WATER SOFTENING
Process of Water Treatment,
W76-10971 5F

WATER STORAGE
Bushy and Vanguard V, Ltd V Seven Lakes Reservoir Co. (Seepage and Percolation from Subsurface Destroying Adverse Possessor's Claims).
W76-10802 6E

WATER STRUCTURE
Structure of Water in the Cell: Review of the Literature, (In Russian),
W76-10974 1A

WATER SUPPLY
Water Supply and Sewage Facilities Plan Update - 1970 (1974 Supplement),
W76-10508 5G

Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

Quality of Water Considerations in Arid Area Water Management,
W76-10608 5B

Public Groundwater Supplies in McHenry County,
W76-10719 4B

Provo City V Lambert (Modification of City's Appropriation Certificate).
W76-10803 6E

Comprehensive Water Supply Study for New York State,
W76-10982 6B

Water Supply for the Greater New York Metropolitan Area,
W76-10983 6B

The Sparta Aquifer System in Mississippi,
W76-11067 7C

WATER SUPPLY DEVELOPMENT
A Proposal for Adoption of A Legal Doctrine of Groundstream Water Interrelationship in Texas,
W76-10731 4B

WATER TEMPERATURE
Design of Alternating Diffuser Pipes,
W76-10952 8B

A Kinetic Approach to the Effect of Temperature on Algal Growth,
W76-10987 5C

Integrated Systems of Mollusk Culture,
W76-10996 5C

WATER TRACING
Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

WATER TRANSPORT
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

WATER TRANSPORT NUMBER
Water Transport Across Cation-Exchange Membrane. I. Experimental Technique. Influence of the Concentration and Temperature on the Water Transport Number,
W76-10620 3A

WATER TREATMENT
Monitoring: The Trigger for Action,
W76-10640 5A

OWRT Interest in New Technologies for Water Treatment,
W76-10677 5G

Process of Water Treatment,
W76-10971 5F

Filtration and Backwashing Apparatus for Use with a Water Filtration System,
W76-10977 5F

WATER UTILIZATION
An Integrated Power Process Model of Water Use and Wastewater Treatment in Chlorine Caustic Production,
W76-10621 5D

South Dakota's System of Water Management and its Relation to Land Use and Economic Development,
W76-10721 4A

Coal Mining, Development and Processing -- The Associated Water Problems,
W76-10727 6E

A Method for Determining the Irrigation Requirement in Antigua, W. I.,
W76-10981 3F

WATER WELLS
Groundwater Availability in Champaign County,
W76-10718 4B

WATER YIELD
Maps Showing Ground-Water Conditions in the Lower Hassayampa Area, Maricopa County, Arizona--1975,
W76-11068 7C

WATERFOWL
Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

WATERSHED MANAGEMENT
Bear Creek Development Authority,
W76-10778 6E

Application of the Stanford Watershed Model to Nigerian Watersheds,
W76-10923 2A

WAVE FRICTION FACTOR
Experimental and Theoretical Investigations in an Oscillatory Turbulent Boundary Layer,
W76-10916 8B

WAVES (WATER)
On Rolling-Grain Ripples,
W76-10917 2J

WEATHER
The Inadvertent Impacts of Agriculture on Weather and Climate and Agricultural Methods for Amelioration of Climatic Stress,
W76-10902 3B

WEATHER MODIFICATION
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

Text and Commentary for Weather Modification Control Law,
W76-10809 3B

WSSI Final Report for the Colorado River Basin Pilot Project,
W76-10818 3B

South Dakota Weather Modification Program, Research Cooperative Studies Under Project Skywater,
W76-10819 3B

Proceedings from a Workshop on Inadvertent Weather Modification.
W76-10901 3B

The Inadvertent Impacts of Agriculture on Weather and Climate and Agricultural Methods for Amelioration of Climatic Stress,
W76-10902 3B

Atmospheric Effects of Pollutants,
W76-10903 5A

Particle Emissions from a Large Kraft Paper Mill and Their Effects on the Microstructure of Warm Clouds,
W76-10904 5A

WEATHER MODIFICATION

Urban-Industrial Effects on Clouds and Precipitation,
W76-10905 4C

The Legal Requirement for the Assessment of Inadvertent Weather Modification - An Engineering Viewpoint,
W76-10912 3B

Urban Aerosols and Inadvertent Weather Modification,
W76-10913 4C

WEATHERING
Some Mechanisms of Weathering of Petroleum Hydrocarbons on Marine Waters: Competitive Pathways to Fate and Disposition of Petroleum Pollution,
W76-11010 5B

The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

Chemical Composition: A Control on the Physical and Chemical Processes Acting on Petroleum in the Marine Environment,
W76-11013 5B

WEEDS
Germination of Weed Seeds Depending on Soil Moisture and Density, (In Russian),
W76-10965 3F

WEIGHT
Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

WELFARE (ECONOMICS)
Rationale for a Water Pollution Code (Part II): Social Assessment,
W76-10592 5G

WELL DATA
Public Groundwater Supplies in McHenry County,
W76-10719 4B

WELLS
Monitoring Groundwater Pollution,
W76-10659 5A

Groundwater Pollution Monitoring Case Studies,
W76-10661 5A

WETLANDS
Rookery Bay: Ecological Constraints on Coastal Development,
W76-10741 6G

Legal Interpretation of Term 'Wetlands'.
W76-10792 6E

WETTING SCANNING CURVE
Capillary Hysteresis and the Relationship Between Drying and Wetting Curves,
W76-10914 2G

WHITE RIVER (UTAH)
Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

WILD AND SCENIC RIVERS ACT
To Amend the Wild and Scenic Rivers Act (Part 2).
W76-10750 6E

WILD RIVER ACT
To Amend the Wild and Scenic Rivers Act (Part 4).
W76-10751 6E

To Amend the Wild and Scenic Rivers Act (Part 5).
W76-10752 6E

WILD RIVERS
To Amend the Wild and Scenic Rivers Act (Part 4).
W76-10751 6E

WILD RIVERS ACT
To Amend the Wild and Scenic Rivers Act (Part 2).
W76-10750 6E

WILDLIFE
Studies for Wildlife on Energy Areas,
W76-10820 6G

A Selected Annotated Bibliography on Fish and Wildlife Implications of Missouri Basin Water Allocation,
W76-10825 4C

Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

WINDS
Wind-Tunnel Simulation of Atmospheric Flow and Dispersion,
W76-10908 5A

Loess Distribution by Variable Winds,
W76-10941 2J

WISCONSIN
To Amend the Wild and Scenic Rivers Act (Part 5).
W76-10752 6E

Pollution--Assembly Bill 128--To Create a System of State Discharge Permits Congruent with National Pollutant Discharge Elimination System,
W76-10780 6E

Zoning--Flood Control.
W76-10781 6E

Water Pollution--Civil Remedies.
W76-10782 6E

Natural Resources, Dept of; Nuisances: Water.
W76-10783 6E

Drainage Districts.
W76-10784 6E

Navigable Waters: Riparian Rights.
W76-10785 6E

Natural Resources, Dept of; Navigable Waters.
W76-10786 6E

Navigable Waters: Riparian Rights.
W76-10787 6E

Water Resources Data for Wisconsin. Part 1. Surface Water Records. Part 2. Water Quality Records.
W76-10832 7C

Sources of Polychlorinated Biphenyls in Wisconsin,
W76-10844 5B

Recycling Ground Water in Waushara County, Wisconsin: Resource Management for Cold-Water Fish Hatcheries,
W76-11082 4B

WITHDRAWAL
Geohydrology of the Anza-Terwilliger Area, Riverside County, California,
W76-11074 4B

WOOD WASTES
Land Application of Sewage Sludge, III. Nitrate Accumulation and Wheat Growth Resulting from Addition of Sewage Sludge and Wood Wastes to Soils,
W76-10841 5E

WORLD MARKETS
Prospect for Sea-Bed Resources in a Recession,
W76-10979 6E

WYOMING
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

X-RAY FLUORESCENCE
Capabilities and Limitations in Identifying and Measuring Aquatic Pollutants,
W76-10669 5A

YEASTS
Adaptation of Feed Yeast to a Cellulosic Effluent Medium (in Armenian with Russian summary),
W76-10847 5D

YUGOSLAVIA
Some Characteristics of A Dusty Rain in Yugoslavia,
W76-10906 5A

ZACCO-PLATYPUS
Toxicity of Agricultural Chemicals to Larvivorous Fish in Korean Rice Fields,
W76-11095 5C

ZINC
Production Studies on the Electrolytic Method of Recovering Zinc from Effluent Sediments (Proizvodstvennye issledovaniya elektroliticheskogo sposoba regeneratsii tsinka iz osadkov stochnykh vod),
W76-10846 5D

ZOOPLANKTON
Some Data on Zooplankton of Reservoirs in the Mary and Chardzhou Regions of the Turkmen SSR, (In Russian),
W76-10520 2H

Abundance and Biomass of Zooplankton during the Synoptic Investigation of the Shallow Inlets to the South of the Zingst Peninsula (South Baltic) During May/June, 1972. (In German),
W76-10817 5C

Bacterioplankton and its Significance in the Bioproductivity of the Reservoirs, (In Russian),
W76-10969 5C

Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

Zooplankton of Lakes of the Bol'Shezemel-Skaya Tundra, (In Russian),
W76-11056 5C

AUTHOR INDEX

ABER, H. S.
Process of Water Treatment,
W76-10971 5F

ADAMS, M. V.
Regulation and Supervision of Outer Continental Shelf Operations on the Pacific Coast,
W76-11005 5G

ADEDE, A. O.
Settlement of Disputes Arising Under the Law of the Sea Convention,
W76-10590 6E

AGBIM, N. N.
Land Application of Sewage Sludge, III. Nitrate Accumulation and Wheat Growth Resulting from Addition of Sewage Sludge and Wood Wastes to Soils,
W76-10841 5E

AGNELLO, R. J.
Prices and Property Rights in the Fisheries,
W76-10586 6C

AHMED, A. K.
PCB'S in the Environment,
W76-10739 5C

AHMED, S. M.
Electrochemical Properties of the Oxide-Solution Interface in Relation to Flotation,
W76-10629 5B

AHN, S. H.
Frequency Distributions for Coliform Bacteria in Water,
W76-10650 5A

AKERLUND, G.
Effluents from Chlorination and Alkaline Extraction of Pine Sulfate Pulp,
W76-10858 5B

AKHINYAN, R. M.
Adaptation of Feed Yeast to a Cellulosic Effluent Medium (in Armenian with Russian summary),
W76-10847 5D

ALBRECHT, O. W.
Do Regulated Freight Rates Discourage Recycling,
W76-10676 5G

ALBRIGHT, L. J.
Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

ALBRIGO, L. G.
Antitranspirant Sprays Affecting Fruit Size of Early Amber Peaches,
W76-10725 3F

ALFTHAN, C. J.
Effluents from Chlorination and Alkaline Extraction of Pine Sulfate Pulp,
W76-10858 5B

ALLEN, J. B.
Transportation of Solids by Water in Pipelines,
W76-10806 8B

ALONSO, C. V.
Steady Laminar Flow in a Stationary Tank with a Spinning Bottom,
W76-11062 8B

ALTHEN, C.
Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

AMBERG, H. R.
Environmental and Social Factors (in the Paper Industry),
W76-10861 5G

AMERMAN, C. R.
Soil Water Modeling I: A Generalized Simulator of Steady, Two-Dimensional Flow,
W76-10933 2G

AMOS, A. F.
The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

ANDERSON, B. J.
Supersaturation and Time Dependence of Ice Nucleation from the Vapor on Single Crystal Substrates,
W76-10695 3B

ANDERSON, J. W.
Uptake and Depuration of Specific Hydrocarbons from Oil by the Bivalves Rangia Cuneata and Crassostrea Virginica,
W76-11024 5C

ANDERSON, M. H.
Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

ANDREW, H.
EPA's Role in the Animal Waste Problem: Panel Discussion,
W76-11045 5G

ANDREW, R. W.
Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

APLAN, F. F.
Ion and Precipitate Flotation of Metal Ions from Solution,
W76-10630 5D

ARDENTE, V.
On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

ARMSTRONG, J. M.
Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

ARTHUR, J. W.
Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

ARTYUKHOV, A. I.
Use of Electrodialysis in the Water Recycling System of Viscose Production (Primenenie elektrodializa v sisteme vodooborota viskoznogo proizodstva),
W76-10848 5D

ASHRAF, M.
The Impact on Dairy Farm Organization of Alternative Manure Disposal Systems. A Method of Assessing the Cost of Environmental Regulation,
W76-11061 5D

AUBERT, M.
Use of A Trophodynamic Chain of the Benthic Type for the Study of Transfers of Metallic Pollutants, (In French),
W76-10944 5C

AUNIN'SH, E. A.
Lignosulfonates and Natural Water-Soluble Lignin in the Lielupe River (Lignosul'fonaty i prirodnyi vodorastvorimyi lignin v vode r. Lielupe),
W76-10835 5B

AVERETT, R. C.
Variation in Concentration of Selected Water-Quality Constituents in the Sacramento River at Bend Bridge, California,
W76-11078 5A

AWERBUCH, L.
Geothermal Energy Recovery Process,
W76-10967 3A

AZEVEDO, J.
Farm Animal Manures: An Overview of Their Role in the Agricultural Environment,
W76-10548 5G

BACHE, D. H.
Density Current Surges I--Their Role in the Initial Dispersion of A Surface Field,
W76-10707 5B

Density Current Surges II--The Movement of Surges in a Turbulent Environment and Their Role in Surface Field Dispersion,
W76-10708 5B

BADENHOP, M. B.
Economic Effects of Agricultural Land-Use Management on Soil Erosion and Farm Income in the Obion-Forked Deer River Basin,
W76-10612 4A

BAI, B. M.
Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

BAICHEVA, D.
Foam Formation in Plants for Biological Purification of Effluents from the Manufacture of Kraft Pulp (Penoobrazuvaneto v stantsiite za biologichno prechistvane naotpad' chite vodi ot proizvodstvoto na sulfatnatseluloza),
W76-10833 5D

Removal of Surface-Active and Other Substances Causing the Formation of Stable Foam During Purification of Effluents from the Manufacture of Unbleached Kraft Pulp (Opiti za otstranyavane na pov'rkhnostno-aktivnite i drugi veshchestva, obuslavyashchi obrazuvaneto na ustojchiva pyana pri prechistvaneto na otpad'chni vodi ot proizvodstvoto na neizbelena sulfatna tseluloza),
W76-10834 5D

BAILEY, T. E.
Ground Water Quality Monitoring for California's Needs,
W76-11065 5A

BAILIE, R. C.
Assessment of Polyvinyl Chloride as a Packaging Material for Distilled Spirits, (Enivronmental Impact Assessment),
W76-10722 6G

BANKS, H. O.
Legal Requirements for Monitoring Groundwater Quality,
W76-10656 5G

BARELLI, M.
Use of A Trophodynamic Chain of the Benthic Type for the Study of Transfers of Metallic Pollutants, (In French),
W76-10944 5C

BARMORE, C. R.
Antitranspirant Sprays Affecting Fruit Size of Early Amber Peaches,
W76-10725 3F

BARTON, L. L.
Tropic Status of Selected Northern New Mexico Lakes,
W76-10808 5C

BARTON, N. G.
An Example of the Modification of Ocean Currents by Bottom Topography,
W76-10931 2L

BASCH, R. E.
Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish,
W76-10896 5C

BAUM, R. L.
Oil Pollution Prevention,
W76-10772 5G

BAUMANN, R. W.
Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

Studies for Wildlife on Energy Areas,
W76-10820 6G

BEAVEN, T. R.
Water-Quality Data for Canals in Eastern Broward County, Florida, 1969-1974,
W76-11081 7C

BEAVER, J. A.
Problems of Public Works Projects in the Present Economic Climate,
W76-10980 6C

BECK, R. P.
A Preliminary Design for a National Environmental Census,
W76-10642 5A

BEHLE, W. H.
Raptor Study of Utah Oil Shale Area,
W76-10822 6G

Studies for Wildlife on Energy Areas,
W76-10820 6G

BEITENGER, T. L.
Behavioural Thermoregulation and Activity Patterns in the Green Sunfish, Lepomis Cyanellus,
W76-10883 5C

BELTAOS, S.
Oblique Impingement of Circular Turbulent Jets,
W76-10709 8B

BENSON, A. A.
Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

BENSON, M. A.
Hydrologic Effects of Storms of June 24-28, 1974 in Lee and Collier Counties, Florida,
W76-11077 4A

BEONIO-BROCCHIERI, F.
On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

BERG, N. A.
Matching Resources and People,
W76-10723 6B

BERK, W. L.
How to Use and Select a Screw Pump,
W76-10681 8C

BERQUIST, R. J.
Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

BHATTACHARYYA, D.
Precipitate Flotation of Calcium Sulfite from Dilute Aqueous Solution with an Anionic Surfactant,
W76-10631 5D

BISHOP, S. E.
An Analysis of Dairy Waste Management Alternatives for Southern California Dairymen,
W76-10534 5G

BITTEL, R.
Use of A Trophodynamic Chain of the Benthic Type for the Study of Transfers of Metallic Pollutants, (In French),
W76-10944 5C

BLANCHARD, E. V. JR.
Water Pollution Control Act of 1972, Economic Impacts, Metal Finishing Industry,
W76-10556 5G

BLUMER, M.
Polycyclic Aromatic Compounds in Nature,
W76-10865 5B

BOES, R. J.
Automated Forecast Procedures for River Quality Management,
W76-10664 5A

BOESCH, B. E.
Pollution Abatement Systems for Farm Animal Wastes in Southeast Michigan,
W76-11057 5D

BOESCH, D. S.
Biological Effects of Chronic Oil Pollution on Coastal Ecosystems,
W76-11019 5C

BOGOEV, S.
Foam Formation in Plants for Biological Purification of Effluents from the Manufacture of Kraft Pulp (Penoobrazuvaneto v stantsiite za biologichno prechistvane naotpad' chite vodi ot proizvodstvoto na sulfatnatseluloza),
W76-10833 5D

BONDURANT, D. T.
Soil Conservation Service Program in Animal Waste Management,
W76-11046 5G

BOOKHOUT, C. G.
Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

BOOKHOUT, T. A.
A Simulation Model of Tritium Kinetics in a Freshwater Marsh,
W76-10812 5B

BOOTH, D. P.
Dredged Material Disposal--Effects and Alternatives,
W76-10724 5E

BORDEN, R. W.
A Method for Determining the Irrigation Requirement in Antigua, W. I.,
W76-10981 3F

BOTT, T. L.
Bacterial Growth Rates and Temperature Optima in a Stream with a Fluctuating Thermal Regime.
W76-10886 5C

BOUVENG, H. O.
Long-Term Stability of Waste Lignins in Aquatic Systems. Part 2. Stability in Saline Water,
W76-10838 5B

BOVARD, P.
Incidence De La Charge Polluante Des Eaux Sur Le Comportement Des Radionucleides. (Effect of the Pollutant Burden of Water on the Behaviour of Radionuclides),
W76-10893 5C

BOWKER, D. E.
Evaluation of Water Samples Collected During LANDSAT-1 Overpasses of the Lower Chesapeake Bay Area,
W76-10672 5A

BRADLEY, B. P.
The Anomalous Influence of Salinity on Temperature Tolerances of Summer and Winter Population of the Copepod Eurytemora Affinis,
W76-10884 5C

BRAY, R. A.
Technical Capabilities of Offshore Exploration Operations to Maximize Safety amd Environmental Protection,
W76-11004 5G

BRESLER, E.
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

BREZNY, O.
Studies on Evapotranspiration of Some Aquatic Weeds,
W76-10554 2D

BRITTON, L. J.
Variation in Concentration of Selected Water-Quality Constituents in the Sacramento River at Bend Bridge, California,
W76-11078 5A

BROOKFIELD, F. M.
The Conveyancer, Water Rights and the Environment,
W76-10736 6E

BROUSSARD, D. E.
Technical Capabilities in Offshore Pipeline Operations to Maximize Safety,
W76-11003 5G

BROUWER, G. K.
The Evaporation and Sedimentation in Man-Made Arade Lake, Southern Portugal,
W76-10703 2D

BROWN, D. W.
Earthwatch-Sentinel for the Future,
W76-10645 5A

BROWNE, M. G.
Polyspecies Aquaculture Systems: The Detrital Trophic Level,
W76-10997 5C

BRUNNER, D. R.
Land Disposal of Wastes: Potential for Groundwater Pollution,
W76-10667 5E

BRUSYNINA, I. N.
Some Characteristics of Spleen Growth in the Lake Minnow, (In Russian),
W76-10521 2I

BUCHANAN, D. W.
Antitranspirant Sprays Affecting Fruit Size of Early Amber Peaches,
W76-10725 3F

Peach Irrigation in Florida,
W76-10749 3F

BUEHLER, B.
Upstream Flood Lowering in Reservoirs,
W76-10938 4A

BUMSTEAD, J. C.
Comprehensive Water Supply Study for New York State,
W76-10982 6B

BUNICH, P.
The Economics of Developing the Resources of the World's Oceans,
W76-10587 6B

BURTON, T. M.
The Impact of Highway Construction on a North Florida Watershed,
W76-10945 5B

BUTCHER, W. S.
OWRT Interest in New Technologies for Water Treatment,
W76-10677 5G

BUTLER, J. N.
The Occurance and Amount of Pelagic Tar in the Open Ocean,
W76-11008 5B

BUXTON, B.
An Economic Appraisal of Alternative Dairy Waste Management Systems Designed for Pollution Control,
W76-10547 5D

BUXTON, K. S.
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

BYERSTAW, I. I.
Yield and Removal of Nutrients by Oat Plants Depending on Fertilizer Rates and Soil Moisture Content, (In Belorussian),
W76-10962 3F

CAIRNS, J. JR.
Temperatures Selected and Avoided by Fish at Various Acclimation Temperatures,
W76-10885 5C

CALOW, P.
The Respiratory Strategies of two Species of Freshwater Gastropods (Ancylus Fluviatilis Mull and Planorbis Contortus Linn) in Relation to Temperature, Oxygen Concentration, Body Size and Season,
W76-10889 5C

CALVERT, C. C.
Biodegrading Poultry Excreta with House Fly Larvae: The Concept and Equipment,
W76-11053 5D

CAMINOS, H.
The Law of the Sea at the Caracas Session: A Brief Evaluation,
W76-10732 6E

CANALE, R. P.
Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

CANNARD, A. J.
A Rapid Method for the Simultaneous Determination of Paraquat and Diquat in Pond and River Waters by Pyrolysis and Gas Chromatography,
W76-10870 5A

CANTILLO, A. Y.
Some Considerations on Monitoring of Trace Metals in Estuaries and Oceans,
W76-10653 5A

CARDWELL, R. D.
Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

CARLSEN, N. A.
Experimental and Theoretical Investigations in an Oscillatory Turbulent Boundary Layer,
W76-10916 8B

CARNAHAN, R. L.
National Oceanic and Atmospheric Administration: Coastal Zone Management Program, Administration Grants, Allocation of Section 306 Funds to States,
W76-10754 6E

CARNES, R. A.
Land Disposal of Wastes: Potential for Groundwater Pollution,
W76-10667 5E

Pesticide Incineration,
W76-10675 5E

CARPENTER, E. J.
A Kinetic Approach to the Effect of Temperature on Algal Growth,
W76-10987 5C

CARSTENS, T.
Seabed Scour by Currents Near Platforms,
W76-11087 8B

CASSELMAN, T. W.
Disposal of Cattle Feedlot Waste in an Anaerobic Lagoon on the Organic Soils of South Florida--Preliminary Results,
W76-10540 5E

CASTAGNINO, W.
Environmental Monitoring in Latin America and the Caribbean,
W76-10654 5A

CASTLEBERRY, J. N. JR.
A Proposal for Adoption of A Legal Doctrine of Groundstream Water Interrelationship in Texas,
W76-10731 4B

CATHER, M. R.
Life History and Ecology of Megarcys Signata (Plecoptera: Perlodidae), Mill Creek, Wasatch Mountains, Utah,
W76-10887 2I

CATO, J. C.
Enabling Legislation: Possibilities for the Commercial Fishing Industry,
W76-10593 6E

CERMAK, J. E.
Wind-Tunnel Simulation of Atmospheric Flow and Dispersion,
W76-10908 5A

CHALMERS, R. K.
A Feasibility Study of the Control of Pollution from Industrial Waste Waters Discharged into the Lagoon of Venice,
W76-10679 5D

CHANGNON, S. A. JR.
Possible Urban Effects on Maximum Daily Rainfall at Paris, St. Louis and Chicago,
W76-10929 4C

Urban-Industrial Effects on Clouds and Precipitation,
W76-10905 4C

CHAWLA, V. K.
Recycling of Liquid Digested Sewage Sludge on Dredged River Sand,
W76-10501 5D

CHEN, C-L.
Flow Resistance in Broad Shallow Grassed Channels,
W76-10710 2E

CHERRY, D. S.
Temperatures Selected and Avoided by Fish at Various Acclimation Temperatures,
W76-10885 5C

CHESNESS, J. L.
Water Quality in a Recirculating Raceway System for Fish Culture,
W76-10546 5G

CHESNEY, E. J.
Polyspecies Aquaculture Systems: The Detrital Trophic Level,
W76-10997 5C

CHOW, T. J.
Barium in Southern California Coastal Waters: A Potential Indicator of Marine Drilling Contamination,
W76-11089 5A

CHRISTENSEN, R. L.
The Impact on Dairy Farm Organization of Alternative Manure Disposal Systems. A Method of Assessing the Cost of Environmental Regulation,
W76-11061 5D

CHU, S. T.
Field and Laboratory Evaluation of Bi-Level Drainage Theory,
W76-10934 4A

CHUDOBA, J.
Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water, Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci),
W76-10515 5A

Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

CHURILOVA, T. P.
A Transformations of Sulfate Turpentine in Natural Waters (Protsessy prevrashcheniya sul'fatnogo skipidara v prirodnykh vodakh),
W76-10845 5B

CITRON, R.
Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities.
W76-10623 5G

Network Design Considerations for the Global Environmental Monitoring System (GEMS) of the United Nations,
W76-10646 5A

CLARK, J.
Rookery Bay: Ecological Constraints on Coastal Development,
W76-10741 6G

CLARK, M.
Electrochemical Production of Free Radicals for Wastewater Treatment,
W76-10876 5D

CLARK, R. B.
Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

CLARK, R. C.
Biological Fate of Petroleum Hydrocarbons in Aquatic Macroorganisms,
W76-11014 5C

CLARK, R. N.
Effect of Cattle Feedyard Runoff on Soil Infiltration Rates,
W76-10538 5B

Plant Measurements as Indicators of Crop Water Deficit,
W76-10622 3F

CLARK, T. L.
Use of Log-Normal Distributions for Numerical Calculations of Condensation and Collection,
W76-10694 2B

CLIFFORD, R. K.
Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems using Electron Spectroscopy for Chemical Analysis,
W76-10635 5D

CLYDE, C. G.
Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

CLYDE, E. W.
Coal Mining, Development and Processing -- The Associated Water Problems,
W76-10727 6E

COCHRAN, A.
A Selected Annotated Bibliography on Fish and Wildlife Implications of Missouri Basin Water Allocation,
W76-10825 4C

COCHRAN, G. F.
Quality of Water Considerations in Arid Area Water Management,
W76-10608 5B

COCHRAN, R. C.
Environmental Regulation of the Annual Reproductive Season of Strongylocentrotus Purpuratus (Stimpson),
W76-10888 5C

CODISPOTI, L. A.
Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

COHEN, D. B.
Recycling of Liquid Digested Sewage Sludge on Dredged River Sand,
W76-10501 5D

COLLINS, J. W.
Purification of Lignosulfonates by Dynamic Membrane Ultrafiltration,
W76-10868 5D

COLLINS, M. A.
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

Solving Discrete-Variable Multiple-Constraint Non Linear Programs: The Decision State Method, (Vol. 3),
W76-10606 6A

COLSON, B. E.
Flood Frequency of Mississippi Streams,
W76-11083 4A

COLWELL, R. R.
Metabolism of Mercury Compounds in Microorganisms,
W76-10894 5C

Survival of Human Pathogens in the Marine Environment,
W76-10890 5C

CONDRA, G. D.
The Effect of Changing Input andProduct Prices on the Demand for Irrigation Water in Texas,
W76-10810 3F

CONNOR, L. J.
A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

CORNICK, J. W.
Red Crab (Geryon Quinquedens) and Snow Crab (Chionoecetes Opilio) Resistance to Infection by the Lobster Pathogen Aerococcus Viridans (Var.) Homari,
W76-10882 5C

COSTLOW, J. D. R.
Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

COX, W. G.
Trace Metal Analysis by Atomic Emission Using a D.C. Argon Plasma,
W76-10651 5A

CRETNEY, W. J.
Pelagic Tar in the North Pacific Ocean,
W76-11009 5A

CRIDDLE, W. J.
A Rapid Method for the Simultaneous Determination of Paraquat and Diquat in Pond and River Waters by Pyrolysis and Gas Chromatography,
W76-10870 5A

CROCKETT, J. R.
Disposal of Cattle Feedlot Waste in an Anaerobic Lagoon on the Organic Soils of South Florida--Preliminary Results,
W76-10540 5E

CROUCH, R. L.
Economic Framework for Groundwater Quality Monitoring,
W76-10657 5G

CROW, L. W.
WSSI Final Report for the Colorado River Basin Pilot Project,
W76-10818 3B

DAL'YAN, I. B.
Subsurface Waters of Erosion Troughs in the Aktyuba Region of the Ural - A Source of Drinking Water Supply,
W76-10943 2F

DAVAR, K. S.
Longitudinal Dispersion for Flow Over Rough Beds,
W76-10921 5B

DAVIS, G.
Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

DAVIS, R. J.
Text and Commentary for Weather Modification Control Law,
W76-10809 3B

DAY, D. L.
Aerobic Waste Treatment,
W76-11035 5D

DEACON, J. E.
Distribution of Stream Pollution in Lake Water,
W76-10712 5B

DEAN, J. W.
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

DEBOER, D. W.
Field and Laboratory Evaluation of Bi-Level Drainage Theory,
W76-10934 4A

DECARLO, V. J.
Environmental Levels of PCB'S,
W76-10641 5A

DEININGER, R. A.
A Comparison of Several Water Quality Indexes,
W76-10926 5A

DEL BALZO, D. R.
Horizontal Random Temperature Structure of the Ocean,
W76-10691 2L

DELEON, C.
Materials Transportation Bureau: Transpiration of Natural and Other Gas by Pipeline,
W76-10756 5G

DEMARTY, M.
Water Transport Across Cation-Exchange Membrane. I. Experimental Technique. Influence of the Concentration and Temperature on the Water Transport Number,
W76-10620 3A

DENSMORE, J.
Controlling Barnyard Runoff,
W76-11049 5D

DERR, S. K.
Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

DESAI, H. C.
Volume and Strength of a Dolos,
W76-10523 8F

DETTWILLER, J.
Possible Urban Effects on Maximum Daily Rainfall at Paris, St. Louis and Chicago,
W76-10929 4C

DEUEL, D. G.
A Fin Rot Disease of Marine and Euryhaline Fishes in the New York Bight,
W76-10524 5C

DHARMADHIKARI, V. K.
Solving Discrete-Variable Multiple-Constraint Non Linear Programs: The Decision State Method, (Vol. 3),
W76-10606 6A

DIANA, E.
On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

DICKEY, E. C.
Water Quality and Management Characteristics of Feedlot Runoff Holding Ponds,
W76-10545 5D

DICKSON, K. L.
Temperatures Selected and Avoided by Fish at Various Acclimation Temperatures,
W76-10885 5C

DIEREN, W.
'Ware the Wadden Sea,
W76-10985 6G

DISALVO, L. H.
Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

DONALDSON, W. T.
Capabilities and Limitations in Identifying and Measuring Aquatic Pollutants,
W76-10669 5A

DONNAN, J. A.
South Dakota Weather Modification Program, Research Cooperative Studies Under Project Skywater,
W76-10819 3B

DONNELLEY, L. P.
Prices and Property Rights in the Fisheries,
W76-10586 6C

DORNBUSCH, D. M.
Benefits from Water Pollution Abatement, Property Values,
W76-10580 5G

DORNBUSH, J. N.
Pollution Potential of Runoff from Livestock Feeding Operations,
W76-10531 5B

DOUSA, A.
Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water, Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci),
W76-10515 5A

DRANEY, C. T.
Geothermal Energy Recovery Process,
W76-10967 3A

DRITT, J. O.
Interdisciplinary/Interinstitutional Requirements for Water Resource Planning: Processes to Enhance Cooperation,
W76-10609 6B

DUKE, H. R.
Beef Cattle Feedlots: Impact on Underlying Soil,
W76-11047 5B

DUNN, B.
Floodflow Characteristics at Proposed Bridge Site on Mohawk River in Towns of Frankfort and Schuyler, Herkimer County, New York,
W76-11079 4A

DUNSMORE, D. A.
Automated Forecast Procedures for River Quality Management,
W76-10664 5A

DUPRE, H. K.
Method of Making Snow,
W76-10958 3B

EBY, R. H.
Reaction Arm for Rotary Sprinkler,
W76-10978 3F

ECKERT, R. D.
Economic Framework for Groundwater Quality Monitoring,
W76-10657 5G

EFTINK, B.
How to Plan and Manage a Lagoon,
W76-11052 5D

EGBUNIWE, N.
Application of the Stanford Watershed Model to Nigerian Watersheds,
W76-10923 2A

EGDORF, S. S.
Distribution of Stream Pollution in Lake Water,
W76-10712 5B

EIDEM, I.
Reasons for Having the IVL-Institute for Water and Air Pollution Control Research. (Varfor ett IVL-institut for vatten- och luftvardsforskning.),
W76-10853 5G

EIFER, I. Z.
Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

Use of Electrodialysis in the Water Recycling System of Viscose Production (Primenenie elektrodializa v sisteme vodoobrota viskoznogo proizvodstva),
W76-10848 5D

EL-HADI, N. D. A.
Longitudinal Dispersion for Flow Over Rough Beds,
W76-10921 5B

ELLIS, J. R.
Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

Quality Variation of Feedlot Runoff in Storage,
W76-10549 5B

ELMARAGHY, M. A.
Studies on the Toxicity of Ammonia, Nitrate and Their Mixtures to the Common Guppy,
W76-10811 5C

EMERY, K. O.
Offshore Oil: Technology - And Emotion,
W76-11090 5G

ENGELMANN, F.
Environmental Regulation of the Annual Reproductive Season of Strongylocentrotus Purpuratus (Stimpson),
W76-10888 5C

ENNIS, G. L.
Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

ERIKSSON, E.
A Model for Water and Phosphorus Distribution on the Island of Goeteborg, (In Swedish),
W76-10963 5B

ERIKSSON, L.
The Fiberlog, a New Monitor for Fibrous Effluents,
W76-10843 5A

ERMAN, D. C.
Upstream Changes in Fish Populations Following Impoundment of Sagehen Creek, California,
W76-10619 2I

ESTOQUE, M. A.
Numerical Simulation of Japan Sea Effect Snowfall,
W76-10930 2C

EVANS, J. C. W.
Unique Process for Sulfite Spent Liquor Keeps Older Mill Viable,
W76-10871 5D

EVANS, R. L.
Some Water Quality Aspects in a Nascent Impoundment in Central Illinois,
W76-10950 5B

EVERETT, L. G.
Development of a Methodology for Monitoring Groundwater Quality,
W76-10658 5A

FAIRBANK, W. C.
An Analysis of Dairy Waste Management Alternatives for Southern California Dairymen,
W76-10534 5G

FALCKE, C. O.
Benefits from Water Pollution Abatement, Property Values,
W76-10580 5G

FALLAH, M. H.
Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

FARBER, M.
Water Pollution Control Act of 1972, Economic Impacts, Pulp and Paper Industry,
W76-10559 5G

FARMER, D.
Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

FAZZOLARE, R.
Feasibility Study of a Nuclear Power-Sewage Treatment System for the Conservation and Reclamation of Water Resources,
W76-10614 5D

FELDMAN, M. H.
Some Mechanisms of Weathering of Petroleum Hydrocarbons on Marine Waters: Competitive Pathways to Fate and Disposition of Petroleum Pollution,
W76-11010 5B

FESTA, J. F.
A Two-Dimensional Numerical Model of Estuarine Circulation: The Effects of Altering Depth and River Discharge,
W76-10948 2L

FICKE, J. F.
Design of Nationwide Water-Quality Monitoring Networks,
W76-10643 5A

FICKEN, J. H.
U.S. Geological Survey Water Quality Monitor, Operations Manual,
W76-11080 5A

FILIPPOV, G. N.
Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

FISANOVICH, T. I.
Structure of Water in the Cell: Review of the Literature, (In Russian),
W76-10974 1A

FISCHER, F.
Abundance and Biomass of Zooplankton during the Synoptic Investigation of the Shallow Inlets to the South of the Zingst Peninsula (South Baltic) During May/June, 1972. (In German),
W76-10817 5C

FISCHER, W. H.
Equitable Apportionment of Interstate Ground Waters,
W76-10728 4B

FISYUNOV, A. V.
Germination of Weed Seeds Depending on Soil Moisture and Density, (In Russian),
W76-10965 3F

FITZSIMMONS, D.
Quality of Water Considerations in Arid Area Water Management,
W76-10608 5B

FLADDA, G.
The Fiberlog, a New Monitor for Fibrous Effluents,
W76-10843 5A

FLAIG, W.
Pollution Control through Utilization of Spent Sulfite Liquors from the Pulp Industry as Organic Nitrogen Fertilizer (Ein Beitrag zur umweltfreundlichen Technik durch Verwertung der Sulfitablaugen der Zellstoffindustrie als organischer Stickstoffduenger),
W76-10851 5D

FLOODGATE, G. D.
Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

FLORY, J. F.
Oil Ports on the Continental Shelf,
W76-10984 5G

FLOYD, C. F.
The Economic Impact of Recreational Land-Use in an Island Environment: A Case Study of Jekyll Island, Georgia,
W76-10581 6B

FOREMAN, D. G.
Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

FORRESTER, W. D.
Distribution of Suspended Oil Particles Following the Grounding of the Tanker Arrow,
W76-11096 5B

FORSTER, W. O.
Trace Element Interactions in the Estuarine Zone of the Anasco River, Puerto Rico,
W76-10892 5C

FOURNIER, R. O.
An Empirical Na-K-Ca Geothermometer for Natural Waters,
W76-10598 2K

FOWLER, W. J. JR.
Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

FRANKS, A. L.
Safe Drinking Water Act - Implications for Ground Water Quality Protection,
W76-11064 5F

FRICK, G. E.
The Impact on Dairy Farm Organization of Alternative Manure Disposal Systems. A Method of Assessing the Cost of Environmental Regulation,
W76-11061 5D

FRITZ, J. E.
Water Supply and Sewage Facilities Plan Update - 1970 (1974 Supplement),
W76-10508 5G

FUJII, T.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

GAITHER, W. S.
A Public Authority to Manage the Atlantic Outer Continental Shelf,
W76-11097 6E

GAK, D. Z.
Bacterioplankton and its Significance in the Bioproductivity of the Reservoirs, (In Russian),
W76-10969 5C

GALL, R. J.
Sequential Chlorination -- Impact on the Environment,
W76-10860 5D

GALLOWAY, J. A.
An Integrated Power Process Model of Water Use and Wastewater Treatment in Chlorine Caustic Production,
W76-10621 5D

GARRET, W. P.
The Surface Activity of Petroleum and its Influence on the Behavior of Oil at Sea,
W76-11011 5B

GARRETT, J.
Quality of Water Considerations in Arid Area Water Management,
W76-10608 5B

GARSIDE, C.
The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

GARTON, W. A.
South Dakota's System of Water Management and its Relation to Land Use and Economic Development,
W76-10721 4A

GAUFIN, A. R.
Life History and Ecology of Megarcys Signata (Plecoptera: Perlodidae), Mill Creek, Wasatch Mountains, Utah,
W76-10887 2I

GAUTHIER, M.
Use of A Trophodynamic Chain of the Benthic Type for the Study of Transfers of Metallic Pollutants, (In French),
W76-10944 5C

GEBELEIN, C. D.
Sedimentation Processes Involving Hydrocarbons in the Marine Environment,
W76-11012 5B

GELB, P. M.
Benefits from Water Pollution Abatement, Property Values,
W76-10580 5G

GIBB, D. F.
Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

GIBSON, C. I.
The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

GIEFER, G. J.
Sources of Information in Water Resources, an Annotated Guide to Printed Materials,
W76-10881 10C

GIFFORD, C. E.
Removal of Inorganic Nitrogen in an Integrated Food Chain System,
W76-10988 5C

GILBERTSON, C. B.
Large Commercial Feedlots - How Wastes are Handled in the West,
W76-11048 5D

Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

GILMAN, K.
Application of a Residence Time Model to Dilution Gauging, with Particular Reference to the Problem of Changing Discharge,
W76-10935 2E

GINN, J. R.
Water Pollution Control Act of 1972, Economic Impacts, Metal Finishing Industry,
W76-10556 5G

GLASS, G. E.
Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

GLENN, J. R.
Water Pollution Control Act of 1972, Economic Impacts, Iron and Steel Industry,
W76-10557 5G

GNILKA, S.
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

GOLDMAN, J. C.
A Kinetic Approach to the Effect of Temperature on Algal Growth,
W76-10987 5C

Relative Growth of Different Species of Marine Algae in Wastewater-Seawater Mixtures,
W76-10989 5C

Removal of Inorganic Nitrogen in an Integrated Food Chain System,
W76-10988 5C

GOODNOW, W.
Underlake Sewer Spurs Resort Development,
W76-10685 5D

GOPALAN, U. K.
Comparison of the Food Chain Dynamics of the Polychaete, Nereis Virens Cultured on Animal Tissue and Detritus,
W76-10998 5C

GOULDEN, P. D.
Automated Determination of Carbon in Natural Waters,
W76-10936 5A

Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

GRAUBY, A.
Incidence De La Charge Polluante Des Eaux Sur Le Comportement Des Radionucleides, (Effect of the Pollutant Burden of Water on the Behaviour of Radionuclides),
W76-10893 5C

Techniques De Determination Radide Des Effets De Synergie Radionucleides - Polluants, (Techniques for Rapid Determination of Effects of Synergy Between Radionuclides and Pollutants),
W76-10891 5A

GREEN, D. R.
Pelagic Tar in the North Pacific Ocean,
W76-11009 5A

GREGG, R. T.
Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textile, Friction Materials and Sealing Devices Segment of the Asbestos Manufacturing Point Source Category,
W76-10595 5G

GREGORY, E. J.
Predicting Consumptive use with Climatological Data,
W76-10873 2D

GRENNEY, W. J.
Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

GRIEVES, R. B.
Advances in Interfacial Phenomena of Particulate/Solution/Gas Systems; Applications to Flotation Research,
W76-10627 5D

Precipitate Flotation of Calcium Sulfite from Dilute Aqueous Solution with an Anionic Surfactant,
W76-10631 5D

GUARD, H. E.
Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

GUBSCH, G.
The Total Aerobic Heterotrophic Bacteria Germ Content of Water from the Series of Shallow Inlets to the South of Darss Found by Investigation Using the Cast Plate and the MPN Methods, (In German),
W76-10897 5A

GUM, R. L.
Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-10585 6B

GUNKEL, W.
Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

GURNELL, A. M.
A Note on the Contribution of Fog Drip to Streamflow,
W76-10927 2B

HADDAD, R.
Environmental Monitoring in Latin America and the Caribbean,
W76-10654 5A

HAGEMEYER, R. R.
Coastal Zone Management Program Development Grants, Outer Continental Shelf,
W76-10755 6E

HAHN, H. H.
Pollutional Effects of Suspended, Sedimented and Eroded Particulate Material in the Aqueous Environment,
W76-10663 5C

HALL, K.
The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement, Volume I,
W76-10574 5G

The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement Volume II,
W76-10575 5G

HALLETT, J.
Supersaturation and Time Dependence of Ice Nucleation from the Vapor on Single Crystal Substrates,
W76-10695 3B

HAMPTON, N. F.
Management of Groundwater Quality Data,
W76-10660 5A

HANCOCK, N.
Five Pumps Salvage a Quebec Sewer Job,
W76-10689 8C

HANDY, R. L.
Loess Distribution by Variable Winds,
W76-10941 2J

HANSEN, D. V.
A Two-Dimensional Numerical Model of Estuarine Circulation: The Effects of Altering Depth and River Discharge,
W76-10948 2L

HANSON, E. G.
Predicting Consumptive use with Climatological Data,
W76-10873 2D

HARL, N. E.
Legal Aspects of Livestock Production and Waste Management,
W76-11044 5D

HARRIS, D. J.
An Evaluation of Automatic Wastewater Compositors,
W76-10652 5A

HARRISON, D. S.
Peach Irrigation in Florida,
W76-10749 3F

HARRISS, R. C.
The Impact of Highway Construction on a North Florida Watershed,
W76-10945 5B

HARTZELL, C. L.
WSSI Final Report for the Colorado River Basin Pilot Project,
W76-10818 3B

HASEMAN, W. D.
Implementation of a Large Scale Water Quality Data Management System,
W76-10588 5A

HAYES, J. V.
Aerosol Production from Land Application of Wastewater by Agricultural Irrigation Equipment,
W76-10625 5D

HEBERLE, R. A.
Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

HEDBERG, H. D.
Ocean Boundaries and Petroleum Resources,
W76-10596 6E

HEESEN, T. C.
Polychlorinated Biphenyls Off Southern California,
W76-10647 5C

HEINRICH, H.
Determination of the Biomass and Detritus Content from Natural Phytoplankton Scoop Samples, (In German),
W76-10864 5A

HEMPHILL, L.
Electrochemical Production of Free Radicals for Wastewater Treatment,
W76-10876 5D

HERIK, A. G.
Water Pollution Through Rain Overflows from Mixed Sewers (Gewasserverschmutzung Durch Regenuberlaufe Aus Mischkanalisationen),
W76-10688 5B

HERMANSON, R. E.
Effect of Soil-Incorporated Dairy Cattle Manure on Runoff Water Quality and Soil Properties,
W76-10539 5B

HERSHAFT, A.
Assessment of the Benefits of Environmental Remote Sensing,
W76-10670 5A

HETRICK, F. M.
Survival of Human Pathogens in the Marine Environment,
W76-10890 5C

HIDY, G. M.
Urban Aerosols and Inadvertent Weather Modification,
W76-10913 4C

HILL, A.
Water Pollution Control Act of 1972, Economic Impacts, Metal Finishing Industry,
W76-10556 5G

HILL, J.
The Fiberlog, a New Monitor for Fibrous Effluents,
W76-10843 5A

HILL, T. K.
Water Quality in a Recirculating Raceway System for Fish Culture,
W76-10546 5G

HILLER, E. A.
Plant Measurements as Indicators of Crop Water Deficit,
W76-10622 3F

HIRST, E.
Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

HOBBS, P. V.
Atmospheric Effects of Pollutants,
W76-10903 5A

Particle Emissions from a Large Kraft Paper Mill and Their Effects on the Microstructure of Warm Clouds,
W76-10904 5A

HOGLUND, C. B.
A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

HOGLUND, C. R.
An Economic Appraisal of Alternative Dairy Waste Management Systems Designed for Pollution Control,
W76-10547 5D

HOLLINGS, E. F.
National Ocean Policy: Priorities for the Future,
W76-10591 6E

HOLSAPPLE, C.
Implementation of a Large Scale Water Quality Data Management System,
W76-10588 5A

HORNEY, L. F.
Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

HOSKING, R. J.
Seepage Flow Through Homogeneous Soil into a Row of Drain Pipes,
W76-10919 4A

HOSOKAWA, J.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

HUDSON, J. D.
Ground-Water Levels in New Mexico, 1974,
W76-11073 2F

HUDSON, J. W.
Flood Frequency of Mississippi Streams,
W76-11083 4A

HUGUENIN, J. E.
Heat Exchangers for Use in the Culturing of Marine Organisms,
W76-10990 5G

Social, Political, Regulatory and Marketing Problems of Marine Waste-Food Recycling Systems,
W76-10991 5G

The Use of Power Plant Waste Heat in Marine Aquaculture,
W76-10992 5D

HUMENIK, F. J.
Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

HUNTER, L.
Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

IRWIN, G. A.
Water-Quality Investigation, Eel River, California,
W76-11069 5A

IRWIN, W. A.
The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement, Volume I,
W76-10574 5G

The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement Volume II,
W76-10575 5G

IWASAKI, I.
Adsorption Mechanism of Sulfides at a Platinum-Solution Interface,
W76-10636 5D

JACOBS, S. A.
Permissible Levels of Heavy Metals in Secondary Effluent for Use in a Combined Sewage Treatment-Marine Aquaculture System. I. Monitoring During Pilot Operation,
W76-10993 5D

JANSEN, W.
Purification of Waste Water Containing Organic and Inorganic Impurities,
W76-10966 5D

JASZKA, D. J.
Sequential Chlorination -- Impact on the Environment,
W76-10860 5D

JENKINS, D. W.
Flow of Toxic Metals in the Environment,
W76-10638 5B

JENKINS, S. H.
A Feasibility Study of the Control of Pollution from Industrial Waste Waters Discharged into the Lagoon of Venice,
W76-10679 5D

JENSEN, C. E.
Earthwatch-Sentinel for the Future,
W76-10645 5A

JETLAND, J.
Town Gives Primary and Secondary Treatment to Blandin's Effluent,
W76-10857 5D

JO, M.
Studies on Coagulation Treatment of Spent Water from Pulping Process. Part 2. Coagulation Characteristics of Hemicellulose (In Japanese),
W76-10839 5D

JOHNSON, A. I.
Groundwater,
W76-11066 2F

JOHNSON, A. M.
The Ability of Debris, Heavily Freighted with Coarse Clastic Materials, To Flow on Gentle Slopes,
W76-10711 2J

JOHNSON, G. V.
Tropic Status of Selected Northern New Mexico Lakes,
W76-10808 5C

JOHNSON, J. B.
An Economic Appraisal of Alternative Dairy Waste Management Systems Designed for Pollution Control,
W76-10547 5D

A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

JOHNSTON, N. T.
Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

JONES, C. T.
Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

JONES, L. L.
Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma,
W76-10874 4B

JONSSON, I. G.
Experimental and Theoretical Investigations in an Oscillatory Turbulent Boundary Layer,
W76-10916 8B

JURKOVICH, J. C.
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

KABEYA, H.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

KAKAR, Y. P.
Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

KAMIJO, H.
A Biological Study on the Pollution of the Sai-Gawa River and its Tributaries, Ishikawa Prefecture, (In Japanese),
W76-10973 5B

KAMISHIMA, H.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

KANDA, T.
Biodegradation of Components of Pulp Waste Effluents by Bacteria. (3). Degradation of Lignin Preparation from Waste Liquor of Oxygen-Alkali Pulping (In Japanese),
W76-10840 5D

KAWAKAMI, H.
Biodegradation of Components of Pulp Waste Effluents by Bacteria. (3). Degradation of Lignin Preparation from Waste Liquor of Oxygen-Alkali Pulping (In Japanese),
W76-10840 5D

KAWAM, A.
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

KEEFER, T. N.
Application of Simple Dam Break Routing Model,
W76-11084 8B

Simplified Routing of Dam Break Waves,
W76-11085 4A

KEFFER, W. J.
An Evaluation of Automatic Wastewater Compositors,
W76-10652 5A

KELLY, W. E.
An Analog Model of the Chipuxet Aquifer, Rhode Island,
W76-10814 2F

KENNEDY, J. F.
A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

KERFOOT, W. B.
Permissible Levels of Heavy Metals in Secondary Effluent for Use in a Combined Sewage Treatment-Marine Aquaculture System. I. Monitoring During Pilot Operation,
W76-10993 5D

Permissible Levels of Heavy Metals in Secondary Effluent for use in a Combined Sewage Treatment-Marine Aquaculture System. II. Development of Guidelines by Methods, of Additions,
W76-10994 5D

KESSELRING, D. F.
Pollution Abatement Systems for Farm Animal Wastes in Southeast Michigan,
W76-11057 5D

KETCHUM, B. H.
Oil in the Marine Environment,
W76-11025 5B

KEUNING, D. H.
Application of Finite Element Method to Open Channel Flow,
W76-10939 8B

KILDOW, J. T.
Social, Political, Regulatory and Marketing Problems of Marine Waste-Food Recycling Systems,
W76-10991 5G

KING, C. J.
Determination of Surface Equilibria and Mass Transfer Rates in a Concurrent Flow Bubble Column,
W76-10632 5D

KINNELL, P. I. A.
Some Observations on the Joss-Waldvogel Rainfall Disdrometer,
W76-10928 2B

KIRSCHBAUM, N. E.
Farm Animal Waste Management: What our Milk Market Requires,
W76-11050 5D

KLEINERT, S. J.
Sources of Polychlorinated Biphenyls in Wisconsin,
W76-10844 5B

KLEMAS, V.
Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

KLOPFENSTEIN, T. J.
Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

KLUTE, R.
Pollutional Effects of Suspended, Sedimented and Eroded Particulate Material in the Aqueous Environment,
W76-10663 5C

KOBUS, H.
Fluid-Mechanics Aspects in the Design of Sewage Outfalls into the Sea (Stroemungsmechanische Entwurfsaspekte fuer Abwassereinleitungen ins Meer),
W76-10678 5E

KOELLIKER, J. K.
Performance of Feedlot Runoff Control Facilities in Kansas,
W76-11058 5D

Waste Application to Soils,
W76-11042 5D

KONIKOW, L. F.
Modeling Solute Transport in Ground Water,
W76-11076 5B

KOONS, C. B.
Chemical Composition: A Control on the Physical and Chemical Processes Acting on Petroleum in the Marine Environment,
W76-11013 5B

KORKISCH, J.
Atomic-Absorption Determination of Vanadium and Molybdenum in Tap Water and Mineral Waters After Anion-Exchange Separation,
W76-10869 5A

KORRINGA, P.
The Importance of Oil Pollution in the North Sea,
W76-11026 5B

KOTHANDARAMAN, V.
Some Water Quality Aspects in a Nascent Impoundment in Central Illinois,
W76-10950 5B

Water Quality Characteristics of the Illinois River at Peoria,
W76-10922 5A

KOZIMOR, L. W.
Benefits from Water Pollution Abatement, Property Values,
W76-10580 5G

KRAHL, R. B.
Gulf Coast Lease Management Inspection Program,
W76-11006 5G

KRAIZMAN, M. A.
Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

Use of Electrodialysis in the Water Recycling System of Viscose Production (Primenenie elektrodializa v sisteme vodooborota viskoznogo proizodstva),
W76-10848 5D

KRESTOVSKIY, O. I.
Selection of Typical Small Drainage Basins for Investigating and Computing Spring Runoff from Large River Basins,
W76-10705 4A

KREUTZMANN, R.
Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

KRIVANEC, H.
Atomic-Absorption Determination of Vanadium and Molybdenum in Tap Water and Mineral Waters After Anion-Exchange Separation,
W76-10869 5A

KUBELKA, V.
Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water, Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci),
W76-10515 5A

KUBO, T.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

KUMAI, M.
Identification of Nuclei and Concentrations of Chemical Species in Snow Crystals Sampled at the South Pole,
W76-10696 2C

KUPPENBENDER, G.
Purification of Waste Water Containing Organic and Inorganic Impurities,
W76-10966 5D

KURMANGALIYEV, R. M.
Role of Precipitation in the Chemistry of Subsurface Waters in the Western Part of the Turgay Trough,
W76-10942 2F

KUZNETSOV, A. I.
Production Studies on the Electrolytic Method of Recovering Zinc from Effluent Sediments (Proizvodstvennye issledovaniya elektroliticheskogo sposoba regeneratsii tsinka iz osadkov stochnykh vod),
W76-10846 5D

LACAZE, J. C.
Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

Marine Molysmology: The Primary Production of Experimental Ecosystems Set up in the Rance River Estuary. Effect of Crude Oil,
W76-10830 5C

LACEWELL, R. D.
Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma,
W76-10874 4B

The Effect of Changing Input andProduct Prices on the Demand for Irrigation Water in Texas,
W76-10810 3F

LAMANTIA, J.
Process of Water Treatment,
W76-10971 5F

LAMB, J. C. III
Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

LAMPILA, M.
The Use of Waste Fibers as Absorption Material in Grass Silage,
W76-10863 5E

LANCY, L. E.
Metal Recovery from Waste Treatment Sludges,
W76-10960 5D

LANDRETH, R. E.
Land Disposal of Wastes: Potential for Groundwater Pollution,
W76-10667 5E

LANDRY, A. M. JR.
Annual Cycle of Sportfishing Activity at a Warmwater Discharge into Galveston Bay, Texas,
W76-10541 5G

LANDWEHR, J. M.
A Comparison of Several Water Quality Indexes,
W76-10926 5A

LANE, M.
Rounding Up Runoff: Reflections in Waste Handling Systems,
W76-10530 5D

LANEY, R. L.
Maps Showing Ground-Water Conditions in the Lower Hassayampa Area, Maricopa County, Arizona--1975,
W76-11068 7C

LAREW, H. G.
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

LAUMOND, F.
Use of A Trophodynamic Chain of the Benthic Type for the Study of Transfers of Metallic Pollutants, (In French),
W76-10944 5C

LEBLANG, R. S.
South Dakota Weather Modification Program, Research Cooperative Studies Under Project Skywater,
W76-10819 3B

LEE, C. L.
A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

LEE, L. WU.
Water Pollution Control Act of 1972, Economic Impacts, Non-Ferrous Metals Industry,
W76-10565 5G

LEE, R. F.
Fates of Petroleum in the Sea: Biological Aspects,
W76-11017 5C

LEHMAN, O. R.
Effect of Cattle Feedyard Runoff on Soil Infiltration Rates,
W76-10538 5B

LEMON, D.
Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

LEONE, R. A.
Water Pollution Control Act of 1972, Economic Impacts, Iron and Steel Industry,
W76-10557 5G

Water Pollution Control Act of 1972, Economic Impacts, Non-Ferrous Metals Industry,
W76-10565 5G

Water Pollution Control Act of 1972, Economic Impacts, Petroleum Refining Industry,
W76-10560 5G

Water Pollution Control Act of 1972, Economic Impacts, Pulp and Paper Industry,
W76-10559 5G

LEWIS, D. H.
Regina Tertiary Treatment Plant Study and Design, (Part II),
W76-10516 5D

LEWIS, E. L.
Oil in Sea Ice,
W76-11098 5B

LEWIS, R. A.
Physical Growth and Behavioral Development of Mice Receiving Chlorine and Fluorine,
W76-10551 5C

LIANG, T.
Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

LIEBHARDT, W. C.
Manure and the Nitrate Problem,
W76-10616 5E

LIN, A.-L.
Water Pollution Control Act of 1972, Economic Impacts, Iron and Steel Industry,
W76-10557 5G

LINDERMAN, C. L.
Quality Variation of Feedlot Runoff in Storage,
W76-10549 5B

LINDSTROM, F. T.
Pulsed Dispersion of Trace Chemical Concentrations in a Saturated Sorbing Porous Medium,
W76-10915 5B

LIPPER, R. I.
Performance of Feedlot Runoff Control Facilities in Kansas,
W76-11058 5D

LIROFF, R. A.
The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement, Volume I,
W76-10574 5G

The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement Volume II,
W76-10575 5G

LISAC, I.
Some Characteristics of A Dusty Rain in Yugoslavia,
W76-10906 5A

LISCHKE, P.
Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water, Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci),
W76-10515 5A

Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

LISSITZYN, O. L.
A New International Law for the Deep Seabed Regime,
W76-10726 6E

LITTLE, L. W.
Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

LOCH, J. P. G.
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

LOE, J. W.
An Investigation of Effluent Control Standards and Practices (Atomic Energy Production),
W76-10828 5G

LONG, F. L.
Effect of Soil-Incorporated Dairy Cattle Manure on Runoff Water Quality and Soil Properties,
W76-10539 5B

LORD, W. B.
Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

LOWE, K. E.
Tough Illinois Effluent Standards are met by Celotex Boxboard Mill,
W76-10856 5G

LOWMAN, F. G.
Trace Element Interactions in the Estuarine Zone of the Anasco River, Puerto Rico,
W76-10892 5C

LUND, Z. F.
Effect of Soil-Incorporated Dairy Cattle Manure on Runoff Water Quality and Soil Properties,
W76-10539 5B

LUTZ, J. J.
Comparing Inflow and Infiltration,
W76-10683 5D

LYSYJ, I.
Water Contamination Detection,
W76-10648 5A

MACEK, K. J.
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

MADDEN, J. M.
Pollution Potential of Runoff from Livestock Feeding Operations,
W76-10531 5B

MADOLE, R. F.
Bog Stratigraphy, Radiocarbon Dates, and Pinedale to Holocene Glacial History in the Front Range, Colorado,
W76-11071 2C

MAGLICOVA, A.
Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

MAGNUSON, J. J.
Behavioural Thermoregulation and Activity Patterns in the Green Sunfish, Lepomis Cyanellus,
W76-10883 5C

MAHONEY, J. B.
A Fin Rot Disease of Marine and Euryhaline Fishes in the New York Bight,
W76-10524 5C

MAJORS, K. R.
Animal Waste Management--Comments on the National Situation,
W76-11033 5D

MALONE, T. C.
The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

MALONEY, F. E.
A Sound Water Plan for South Florida Implementation of the 1972 Water Resources Act,
W76-10742 6E

MANGES, H. L.
Performance of Feedlot Runoff Control Facilities in Kansas,
W76-11058 5D

Samplers for Monitoring Runoff Waters,
W76-10550 5A

MARKOW, H. L.
Burning Waters,
W76-10740 5G

MARKSTROM, D. C.
Land Application of Sewage Sludge, III. Nitrate Accumulation and Wheat Growth Resulting from Addition of Sewage Sludge and Wood Wastes to Soils,
W76-10841 5E

MARSALEK, J.
Sampling Techniques in Urban Runoff Quality Studies,
W76-10509 5A

MARTIN, R. D.
Biodegrading Poultry Excreta with House Fly Larvae: The Concept and Equipment,
W76-11053 5D

MARTIN, W. E.
Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-10585 6B

MATSNEV, A. I.
Production Studies on the Electrolytic Method of Recovering Zinc from Effluent Sediments (Proizvodstvennye issledovaniya elektroliticheskogo sposoba regeneratsii tsinka iz osadkov stochnykh vod),
W76-10846 5D

MATTSON, V. R.
Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

MAUREL, A.
Water Transport Across Cation-Exchange Membrane. I. Experimental Technique. Influence of the Concentration and Temperature on the Water Transport Number,
W76-10620 3A

MAYDA, J.
Lawyers and Ecomanagement,
W76-10753 6E

MCCALLA, T. M.
Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

MCCAULL, J.
Dams of Pork,
W76-10738 6B

MCCLEARY, J. D.
Near Surface Sampler,
W76-10995 5A

MCCLIN, R.
Trace Element Interactions in the Estuarine Zone of the Anasco River, Puerto Rico,
W76-10892 5C

MCDERMOTT, D. J.
Polychlorinated Biphenyls Off Southern California,
W76-10647 5C

MCDONALD, N.
Underlake Sewer Spurs Resort Development,
W76-10685 5D

MCGUIRE, J. M.
A Proposed National Monitoring System for Organics in Water,
W76-10668 5A

MCINTYRE, N. S.
Characterization of Adsorbed Cobalt at the Oxide-Water Interface,
W76-10634 5D

MCMANUS, R. J.
The New Treaty on Vessel Pollution,
W76-10748 6E

MCMILLION, L. G.
Legal Requirements for Monitoring Groundwater Quality,
W76-10656 5G

MCQUIVEY, R. S.
Application of Simple Dam Break Routing Model,
W76-11084 8B

Simplified Routing of Dam Break Waves,
W76-11085 4A

MCWHORTER, J. C.
Transportation of Solids by Water in Pipelines,
W76-10806 8B

MEDVEDEV, P. M.
Structure of Water in the Cell: Review of the Literature, (In Russian),
W76-10974 1A

MEHTA, I.
Studies on Evapotranspiration of Some Aquatic Weeds,
W76-10554 2D

MELVIN, S. W.
Design Considerations in Feedlot Runoff Control,
W76-11039 5D

The State and Regional Situation,
W76-11034 5D

MERTENS, E. W.
A Literature Review of the Biological Impact of Oil Spills in Marine Waters,
W76-11027 5C

MESHITSUKA, G.
Studies on Coagulation Treatment of Spent Water from Pulping Process. Part 2. Coagulation Characteristics of Hemicellulose (In Japanese),
W76-10839 5D

MEYER, G.
Groundwater,
W76-11066 2F

MIDLIGE, F. H.
A Fin Rot Disease of Marine and Euryhaline Fishes in the New York Bight,
W76-10524 5C

MILLER, A. S.
The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement, Volume I,
W76-10574 5G

The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement Volume II,
W76-10575 5G

MILLER, J. D.
Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems using Electron Spectroscopy for Chemical Analysis,
W76-10635 5D

MILLER, R. A.
Hydrologic Effects of Storms of June 24-28, 1974 in Lee and Collier Counties, Florida,
W76-11077 4A

MILLER, R. D.
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

MILLER, W. L.
Water-Quality Data for Canals in Eastern Broward County, Florida, 1969-1974,
W76-11081 7C

MILLS, H. H.
Estimated Erosion Rates on Mount Rainier, Washington,
W76-10951 2J

MILNE, C. M.
Effect of a Livestock Wintering Operation on a Western Mountain Stream,
W76-11059 5A

MILZ, E. A.
Technical Capabilities in Offshore Pipeline Operations to Maximize Safety,
W76-11003 5G

MINER, J. R.
Nature and Behavior of Manure,
W76-11038 5B

MOHNEN, V. A.
Introduction to the Atmospheric Aerosol System,
W76-10911 5A

MOHR, C. M.
Decision Mapping - Tool for Underground Waste Management,
W76-11063 5B

MOODY, D. W.
Gulf Coast Lease Management Inspection Program,
W76-11006 5G

MOODY, W. B.
Seepage Loss from Holding Ponds,
W76-11051 5B

MOORE, J. A.
Waste Management Systems for Roofed Beef Confinement Facilities,
W76-11040 5D

MOORE, J. N.
U. S. Position on Law of the Sea Reviewed,
W76-10743 6E

MOORE, L. J.
The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

MOORE, S. F.
Offshore Oil Spills and the Marine Environment,
W76-11093 5G

Towards a Model of the Effects of Oil on Marine Organisms,
W76-11021 5C

MORGAN, J. J.
Sampling and Analysis of Metals in Air, Water and Waste Products,
W76-10639 5A

MORGAN, N. O.
Biodegrading Poultry Excreta with House Fly Larvae: The Concept and Equipment,
W76-11053 5D

MORISAWA, M.
Multiobjective Planning and Environmental Evaluation of Water Resource Systems,
W76-10610 6G

MORISHITA, I.
Marked Diminution of Dissolved Oxygen in the Hypolimnion of Lake Biwa in August, 1973, (In Japanese),
W76-10976 5C

MORRIS, R. C.
Energy Crisis, Supertankers and Ecology,
W76-10735 5G

MOSELEY, W. B.
Horizontal Random Temperature Structure of the Ocean,
W76-10691 2L

MOYLE, W. R. JR.
Geohydrology of the Anza-Terwilliger Area, Riverside County, California,
W76-11074 4B

MUELLER, J. C.
Detoxification of Bleached Kraft Mill Effluents,
W76-10867 5D

Foam Separation for Detoxification of Bleached Kraft Mill Effluents,
W76-10855 5D

MUKAI, S.
Behavior of Hydrogen and Hydroxyl Ions at the Oxide-Water Interface,
W76-10633 5B

MUKHAMEDZHANOV, M. A.
Subsurface Waters of Erosion Troughs in the Aktyuba Region of the Ural - A Source of Drinking Water Supply,
W76-10943 2F

MULLEN, K. T.
Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities,
W76-10623 5G

NAGEL, H. D.
Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

NAKANO, J.
Studies on Coagulation Treatment of Spent Water from Pulping Process. Part 2. Coagulation Characteristics of Hemicellulose (In Japanese),
W76-10839 5D

NAKATO, T.
A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

NASSIF, S. H.
The Influence of Slope and Rain Intensity on Runoff and Infiltration,
W76-10702 2A

NATARAJAN, K. A.
Adsorption Mechanism of Sulfides at a Platinum-Solution Interface,
W76-10636 5D

NEBOLSINE, R.
Filtration and Backwashing Apparatus for Use with a Water Filtration System,
W76-10977 5F

NEILL, W. H.
Behavioural Thermoregulation and Activity Patterns in the Green Sunfish, Lepomis Cyanellus,
W76-10883 5C

NELSON, J. D. JR.
Metabolism of Mercury Compounds in Microorganisms,
W76-10894 5C

NESBITT, P. M.
Cities Need Sewerless Toilets,
W76-10680 5D

NEWCOME, R. JR.
The Sparta Aquifer System in Mississippi,
W76-11067 7C

NG, K. S.
Foam Separation for Detoxification of Bleached Kraft Mill Effluents,
W76-10855 5D

NIENABER, J. A.
Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

NINOMIYA, K.
Numerical Simulation of Japan Sea Effect Snowfall,
W76-10930 2C

NIXON, C. C.
Samplers for Monitoring Runoff Waters,
W76-10550 5A

NOMIKOS, L. I.
A Transformations of Sulfate Turpentine in Natural Waters (Protsessy prevrashcheniya sul'fatnogo skipidara v prirodnykh vodakh),
W76-10845 5B

NORRSTROM, H.
Effluents from Chlorination and Alkaline Extraction of Pine Sulfate Pulp,
W76-10858 5B

NORSTADT, F. A.
Beef Cattle Feedlots: Impact on Underlying Soil,
W76-11047 5B

NORTH, W. J.
Position Paper on the Effects of Acute Oil Spills,
W76-11028 5C

NORTHCOTE, T. G.
Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

NOSPAL, A.
Design of Alternating Diffuser Pipes,
W76-10952 8B

NOVITZKI, R. P.
Recycling Ground Water in Waushara County, Wisconsin: Resource Management for Cold-Water Fish Hatcheries,
W76-11082 4B

O'BRIEN, P. J.
Decision Mapping - Tool for Underground Waste Management,
W76-11063 5B

O'CONNOR, K. M.
A Discrete Linear Cascade Model for Hydrology,
W76-10946 2E

OBERACKER, D. A.
Pesticide Incineration,
W76-10675 5E

OLIVER, J. C.
An Analysis of Dairy Waste Management Alternatives for Southern California Dairymen,
W76-10534 5G

OLOFFS, P. C.
Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

OLSON, D. T.
Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

ONUF, C. P.
An Analysis of the Main Scientific Papers Dealing with Long Term Low Level Effects of Oil Pollution,
W76-11022 5C

ORLOVA, A. I.
Ecological Variability of Bream in Lithuanian Waters: 2. Age and Growth Rate, (In Russian),
W76-10519 5C

OSBORN, J.
Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma,
W76-10874 4B

OTT, E. K.
Alignment Control Apparatus for Center Pivot Irrigation Equipment,
W76-10957 3F

OVERCASH, M. R.
Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

OWENS, T. G.
Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

OZOLINS, G.
Some International Activities in Environmental Monitoring,
W76-10644 5A

PAINE, M. D.
Legal Aspects of Odor and Dust from Feedlots,
W76-11054 5G

PAINTAL, A. S.
Hydraulic Jump in Circular Sewers,
W76-10686 5D

PALMER, H. D.
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

PANAGIOTAKOPOULOS, D.
A Multi-Objective Framework for Environmental Management Using Goal Programming,
W76-10582 6A

PAPAZAFIRIOU, Z. G.
Linear and Nonlinear Approaches for Short-Term Runoff Estimations in Time-Invariant Open Hydrologic Systems,
W76-10699 2E

PARDUE, G. B.
Production Response of the Bluegill Sunfish, Lepomis Macrochirus Rafinesque, to Added Attachment Surface for Fish-Food Organisms,
W76-10522 2I

PARK, C. C.
The Relationship of Slope and Stream Channel Form in the River Dart, Devon,
W76-10698 2E

PARKER, R. L.
Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

PARLANGE, J-Y.
Capillary Hysteresis and the Relationship Between Drying and Wetting Curves,
W76-10914 2G

PARTRIDGE, H. D.
Sequential Chlorination -- Impact on the Environment,
W76-10860 5D

PASCALE, C. A.
Construction and Testing of Two Waste-Injection Monitor Wells in Northwest Florida,
W76-11070 5B

PATE, F. M.
Disposal of Cattle Feedlot Waste in an Anaerobic Lagoon on the Organic Soils of South Florida--Preliminary Results,
W76-10540 5E

PATTERSON, R. L.
Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

PAYNE, T. R.
Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

PEIPPO, H.
A Model for Water and Phosphorus Distribution on the Island of Goeteborg, (In Swedish),
W76-10963 5B

PELCYGER, R. S.
Indian Water Rights: Some Emerging Frontiers,
W76-10729 6E

PELLETT, J. L.
South Dakota Weather Modification Program, Research Cooperative Studies Under Project Skywater,
W76-10819 3B

PEREZ, J. W.
Ion and Precipitate Flotation of Metal Ions from Solution,
W76-10630 5D

PERRY, M. L.
Nongame Mammal Inventory of the Utah Oil Shale Area,
W76-10823 6G

Raptor Study of Utah Oil Shale Area,
W76-10822 6G

PETROSYAN, L. G.
Adaptation of Feed Yeast to a Cellulosic Effluent Medium (in Armenian with Russian summary),
W76-10847 5D

PHILIPSON, W. R.
Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

PICER, M.
Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

PICER, N.
Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

PICKERING, R. J.
Design of Nationwide Water-Quality Monitoring Networks,
W76-10643 5A

PIERCE, J. W.
Deposition in Upper Patuxent Estuary, Maryland, 1968-1969,
W76-10925 4C

PILLAI, S. C.
Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

PIPES, W. O.
Frequency Distributions for Coliform Bacteria in Water,
W76-10650 5A

POTTER, J. M.
Portable Floating Wave Tripper,
W76-10954 8B

PRATT, G. L.
System Components to Separate Solids and Liquids,
W76-11036 5D

PUESCHEL, R. F.
Recent Developments in Chemical Aerosol Analysis,
W76-10910 5A

PUGH, K. P.
Microbial Interaction with Oil in the Marine Environment,
W76-11015 5C

PURDY, K. L.
Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems using Electron Spectroscopy for Chemical Analysis,
W76-10635 5D

QUARLES, J.
Domestic Wastewater Disinfection, Secondary Treatment,
W76-10771 5D

Fertilizer Manufacturing Point Source Category, Urea Subcategory,
W76-10764 5G

New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

Soap and Detergent Manufacturing Category Pretreatment Standards for New Sources,
W76-10759 5G

Water Programs Secondary Treatment Information,
W76-10770 5D

RADA, E. L.
Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

RAJAGOPAL, R.
Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

RAO, A. M.
Chemical and Microbiological Changes in Poultry Litter Applied to Soil as Influenced by the Time and Method of Application,
W76-10615 5E

RAUNOR, G. S.
Aerosol Production from Land Application of Wastewater by Agricultural Irrigation Equipment,
W76-10625 5D

RECHT, H. L.
Electrochemical Cell for Decreasing the Cyanide and Heavy Metal Content of an Aqueous Solution,
W76-10972 5D

REDMANN, G. A.
Permissible Levels of Heavy Metals in Secondary Effluent for use in a Combined Sewage Treatment-Marine Aquaculture System. II. Development of Guidelines by Methods, of Additions,
W76-10994 5D

REES, F. B.
Technical Capabilities of Offshore Exploration Operations to Maximize Safety amd Environmental Protection,
W76-11004 5G

REID, G. W.
Interdisciplinary/Interinstitutional Requirements for Water Resource Planning: Processes to Enhance Cooperation,
W76-10609 6B

REILLY, F. V.
Identification of Special Hazard Areas List of Communities with Special Hazard Areas,
W76-10773 6F

REIMANN, H.
Oxygen Aeration System for Contaminated Liquids,
W76-10961 5D

REITER, E. R.
Dispersion of Pollutants,
W76-10907 5B

RICH, L. G.
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards System Design,
W76-10512 5D

RICHARDS, K. S.
Channel Width and the Riffle-Pool Sequence,
W76-10924 2E

RIGGS, D. D.
Process of Water Treatment,
W76-10971 5F

RILEY, B. T.
Assessment of Polyvinyl Chloride as a Packaging Material for Distilled Spirits, (Enivronmental Impact Assessment),
W76-10722 6G

RILEY, D. J.
Deepwater Port Site Evaluation,
W76-10766 5G

RILEY, J. P.
Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah,
W76-10815 5B

ROBERTS, W. P.
Deposition in Upper Patuxent Estuary, Maryland, 1968-1969,
W76-10925 4C

ROBY, R. N.
An Environmental Analysis of a Simulated Sea-Floor Mining Operation,
W76-10601 5G

RODINE, J. D.
The Ability of Debris, Heavily Freighted with Coarse Clastic Materials, To Flow on Gentle Slopes,
W76-10711 2J

ROELS, O. A.
The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

ROSEMAN, G. R.
Sequential Chlorination -- Impact on the Environment,
W76-10860 5D

ROSEN, R. H.
A Preliminary Design for a National Environmental Census,
W76-10642 5A

ROSENBERG, N. J.
The Inadvertent Impacts of Agriculture on Weather and Climate and Agricultural Methods for Amelioration of Climatic Stress,
W76-10902 3B

ROSS, J.
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

ROSSI, G.
On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

ROSSINSKII, N. P.
Production Studies on the Electrolytic Method of Recovering Zinc from Effluent Sediments (Proizvodstvennye issledovaniya elektroliticheskogo sposoba regeneratsii tsinka iz osadkov stochnykh vod),
W76-10846 5D

ROUBA, J.
Coagulation of Textile Industry Effluents with Cationic Polyelectrolytes (Koagulacja sciekow przemyslu wlokienniczego przy uzyciu polielektrolitow kationowych),
W76-10836 5D

ROULIER, M. H.
Land Disposal of Wastes: Potential for Groundwater Pollution,
W76-10667 5E

RUBIN, A. J.
Studies on the Toxicity of Ammonia, Nitrate and Their Mixtures to the Common Guppy,
W76-10811 5C

RUBIN, K. A.
The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf,
W76-10734 5G

RUDE, L.
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

RUGG, D. D.
Economic Framework for Groundwater Quality Monitoring,
W76-10657 5G

RUOPP, D. J.
Environmental Levels of PCB'S,
W76-10641 5A

RUSH, K.
Department Opposes Unilateral Extension of U. S. Fisheries Jurisdiction,
W76-10744 6E

RUTHER, J. H.
Virus Survival Patterns in a Tertiary Sewage Treatment-Aquaculture Model System,
W76-10999 5D

RYAN, B. F.
The Growth Rates and Densities of Ice Crystals Between -3C and -21C,
W76-10697 2B

RYCKBORST, H.
The Evaporation and Sedimentation in Man-Made Arade Lake, Southern Portugal,
W76-10703 2D

RYTHER, J. H.
Integrated Systems of Mollusk Culture,
W76-10996 5C

Removal of Inorganic Nitrogen in an Integrated Food Chain System,
W76-10988 5C

The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Foodchain Studies,
W76-10986 5C

The Use of Power Plant Waste Heat in Marine Aquaculture,
W76-10992 5D

SAAS, A.
Incidence De La Charge Polluante Des Eaux Sur Le Comportement Des Radionucleides, (Effect of the Pollutant Burden of Water on the Behaviour of Radionuclides),
W76-10893 5C

Techniques De Determination Radide Des Effets De Synergie Radionucleides - Polluants, (Techniques for Rapid Determination of Effects of Synergy Between Radionuclides and Pollutants),
W76-10891 5A

SABEY, B. R.
Land Application of Sewage Sludge, III. Nitrate Accumulation and Wheat Growth Resulting from Addition of Sewage Sludge and Wood Wastes to Soils,
W76-10841 5E

SANDERS, H. L.
Some Biological Effects Related to the West Falmouth Oil Spill,
W76-11029 5C

SANDERS, W. M. III.
A Strategy for Aquatic Pollutants Fate and Transport Determination,
W76-10665 5B

SANDERSON, E. W.
Groundwater Availability in Champaign County,
W76-10718 4B

Public Groundwater Supplies in McHenry County,
W76-10719 4B

SANGREY, D. A.
Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

SANTANGELO, A.
Trends and Experience in the Primary Treatment of Papermaking Effluents (Indirizzi ed esperienze nel trattamento primario delle acque di scarico delle cartiere),
W76-10852 5D

SANTER, S.
Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

SARUKHANYAN, F. G.
Adaptation of Feed Yeast to a Cellulosic Effluent Medium (in Armenian with Russian summary),
W76-10847 5D

SAUCIER, R. T.
Dredged Material Disposal--Effects and Alternatives,
W76-10724 5E

SAUTER, S.
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

SCHAEFER, V. J.
Inadvertent Effects in Weather Modification,
W76-10909 3B

SCHAEFFER, R.
Incidence De La Charge Polluante Des Eaux Sur Le Comportement Des Radionucleides, (Effect of the Pollutant Burden of Water on the Behaviour of Radionuclides),
W76-10893 5C

SCHILLING, K. E.
Water Supply for the Greater New York Metropolitan Area,
W76-10983 6B

SCHMIDT, K. D.
Monitoring Groundwater Pollution,
W76-10659 5A

SCHMIDT, R. K.
How to Meet Water Cleanup Deadlines,
W76-10862 5D

SCHNELL, R.
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

SCHNESE, W.
Abundance and Biomass of Zooplankton during the Synoptic Investigation of the Shallow Inlets to the South of the Zingst Peninsula (South Baltic) During May/June, 1972. (In German),
W76-10817 5C

SCHROEDER, J. P.
Preventing Water Pollution from Turkey Operations,
W76-10535 5G

SCHROEDER, T. A.
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

SCHWAB, D. J.
A Normal Mode Method for Predicting Storm Surges on a Lake,
W76-10715 2H

SCOTTON, J. W.
Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities.
W76-10623 5G

SEGAR, D. A.
Some Considerations on Monitoring of Trace Metals in Estuaries and Oceans,
W76-10653 5A

SELDMAN, N. N.
Cities Need Sewerless Toilets,
W76-10680 5D

SELEGNY, E.
Water Transport Across Cation-Exchange Membrane. I. Experimental Technique. Influence of the Concentration and Temperature on the Water Transport Number,
W76-10620 3A

SELF, L. S.
Toxicity of Agricultural Chemicals to Larvivorous Fish in Korean Rice Fields,
W76-11095 5C

SELIG, E. I.
The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement, Volume I,
W76-10574 5G

The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement Volume II,
W76-10575 5G

SEPHTON, H. H.
Determination of Surface Equilibria and Mass Transfer Rates in a Concurrent Flow Bubble Column,
W76-10632 5D

SEQUEIRA, R.
Monsoonal Deposition of Sea Salt and Air Pollutants Over Bombay,
W76-10932 5B

SHAFFER, W. R.
Behavioural Thermoregulation and Activity Patterns in the Green Sunfish, Lepomis Cyanellus,
W76-10883 5C

SHAH, C. R.
Conformity of Groundwater Recharge Rate by Tritium Method and Mathematical Modelling,
W76-10700 2F

SHARMA, R. K.
Studies on Evapotranspiration of Some Aquatic Weeds,
W76-10554 2D

SHAW, D. E.
The Growth Rates and Densities of Ice Crystals Between -3C and -21C,
W76-10697 2B

SHETTEL, R. E.
Irrigation Systems Automation,
W76-10955 3F

SHILLING, W. C.
Agricultural Sediment Control for Water Quality Protection,
W76-10617 5G

SHILLINGFORD, T. H.
Shoreline Retaining Wall,
W76-10953 8B

SHIM, J. C.
Toxicity of Agricultural Chemicals to Larvivorous Fish in Korean Rice Fields,
W76-11095 5C

SHIMKO, I. G.
Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

Use of Electrodialysis in the Water Recycling System of Viscose Production (Primenenie elektrodializa v sisteme vodooborota viskoznogo proizodstva),
W76-10848 5D

SHRADER, E. A.
Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv),
W76-10837 5D

SIGLER, W. F.
Studies for Wildlife on Energy Areas,
W76-10820 6G

Studies on the Least Chub (Iotichthys Phlegethontiscope) in Geothermal Activities Area of Snake and Tule Valleys, Utah,
W76-10824 6G

SIKES, J. E. G.
A Clean Piece of Paper,
W76-10842 5D

SILCOX, W. H.
Technical Capabilities in Offshore Completion and Workover Operations to Maximize Safety,
W76-11002 5G

SILER, O. W.
Deepwater Ports: Licensing Procedures and Design Construction, Equipment and Operations,
W76-10767 5G

SIMPSON, F.
Monitoring of Subsurface Waste-Disposal Operations: A Generalized Systems Approach with Examples from Canadian Case Histories,
W76-10662 5D

SINCLAIR, R. A.
Water Quality Characteristics of the Illinois River at Peoria,
W76-10922 5A

SINEV, O. P.
Production Studies on the Electrolytic Method of Recovering Zinc from Effluent Sediments (Proizvodstvennye issledovaniya elektrolitic heskogo sposoba regeneratsii tsinka iz osadkov stochnykh vod),
W76-10846 5D

SINGLETON, F. D. JR.
An Integrated Power Process Model of Water Use and Wastewater Treatment in Chlorine Caustic Production,
W76-10621 5D

SIRMANS, C. F.
The Economic Impact of Recreational Land-Use in an Island Environment: A Case Study of Jekyll Island, Georgia,
W76-10581 6B

SLEATH, J. F. A.
On Rolling-Grain Ripples,
W76-10917 2J

SMART, P. L.
Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

SMITH, C.
Water Pollution Control Act of 1972, Economic Impacts, Non-Ferrous Metals Industry,
W76-10565 5G

SMITH, D. G.
Effect of Vegetation on Lateral Migration of Anastomosed Channels of a Glacier Meltwater River,
W76-10940 4C

SMITH, D. I.
Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

SMITH, F. F.
An Analysis of Dairy Waste Management Alternatives for Southern California Dairymen,
W76-10534 5G

SMITH, J. L.
Water Pollution Control Act of 1972, Economic Impacts, Petroleum Refining Industry,
W76-10560 5G

SMITH, L. M.
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

SMITH, P. C.
Baroclinic Instability in the Denmark Strait Overflow,
W76-10693 2L

SNEYD, A. D.
Seepage Flow Through Homogeneous Soil into a Row of Drain Pipes,
W76-10919 4A

SOCHTIG, H.
Pollution Control through Utilization of Spent Sulfite Liquors from the Pulp Industry as Organic Nitrogen Fertilizer (Ein Beitrag zur umweltfreundlichen Technik durch Verwertung der Sulfitablaugen der Zellstoffindustrie als organischer Stickstoffduenger),
W76-10851 5D

SODERHJELM, L.
The Use of Waste Fibers as Absorption Material in Grass Silage,
W76-10863 5E

SOESANTO, S. S.
Environmental Quality Surveillance in Indonesia,
W76-10655 5A

SOILEAU, H. J.
Combined Drain and Flood Gate,
W76-10968 3F

SOLYOM, P.
Long-Term Stability of Waste Lignins in Aquatic Systems. Part 2. Stability in Saline Water,
W76-10838 5B

SOMASUNDARAN, P.
Advances in Interfacial Phenomena of Particulate/Solution/Gas Systems; Applications to Flotation Research,
W76-10627 5D

Interfacial Chemistry of Particulate Flotation,
W76-10628 5B

SONUGA, J. O.
Entropy Principle Applied to the Rainfall-Runoff Process,
W76-10918 2A

SOSEDOV, I. S.
Investigation of the Hydrologic Characteristics of Talus,
W76-10706 2F

SOUCIE, G.
The Great Maine Lobster War,
W76-10747 6E

Here Come De Sludge,
W76-10746 6E

SPETH, S.
Purification of Waste Water Containing Organic and Inorganic Impurities,
W76-10966 5D

SPITTLER, P.
Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

SPRY, R. J.
Sewers - Relining VS Replacement,
W76-10690 8G

SRINATH, E. G.
Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

ST, L. S.
Some Considerations of the Chronic Effects of Petroleum in the Marine Environment,
W76-11023 5C

STANLEY, H. I.
Relative Growth of Different Species of Marine Algae in Wastewater-Seawater Mixtures,
W76-10989 5C

STARK, R. M.
Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

STARTZ, R.
Water Pollution Control Act of 1972, Economic Impacts, Pulp and Paper Industry,
W76-10559 5G

STEGMAN, J. J.
Accumulation, Release, and Retention of Petroleum Hydrocarbons by the Oyster, Crassostrea Virginica,
W76-11018 5C

STEWART, J. E.
Red Crab (Geryon Quinquedens) and Snow Crab (Chionoecetes Opilio) Resistance to Infection by the Lobster Pathogen Aerococcus Viridans (Var.) Homari,
W76-10882 5C

STEWART, M. J.
Regina Tertiary Treatment Plant Study and Design, (Part II),
W76-10516 5D

STEWART, R. J.
Oil Spills and Offshore Petroleum,
W76-11092 5G

STONEBERG, E. G.
Economic Considerations Involved in Selecting Types of Confinement and Waste Disposal Systems for Swine and Beef,
W76-11043 5D

STOUT, P. R.
Farm Animal Manures: An Overview of Their Role in the Agricultural Environment,
W76-10548 5G

STOWE, R. F.
Diplomatic and Legal Aspects of Remote Sensing,
W76-10584 6E

STRANGE, W. T.
Precipitate Flotation of Calcium Sulfite from Dilute Aqueous Solution with an Anionic Surfactant,
W76-10631 5D

STRAWN, K.
Annual Cycle of Sportfishing Activity at a Warmwater Discharge into Galveston Bay, Texas,
W76-10541 5G

STREET, R. L.
Simulation of Thermally-Influenced Hydrodynamic Flows: Final Report,
W76-10813 2H

STROHAL, P.
Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

STULIK, R. S.
Maps Showing Ground-Water Conditions in the Lower Hassayampa Area, Maricopa County, Arizona--1975,
W76-11068 7C

SUESS, M. J.
Polynuclear Aromatic Hydrocarbon Pollution of the Marine Environment,
W76-11030 5B

SUKHIJA, B. S.
Conformity of Groundwater Recharge Rate by Tritium Method and Mathematical Modelling,
W76-10700 2F

SULLIVAN, J. B.
Is Our Approach to the Oil Pollution Problem too Crude,
W76-11031 5C

SVANKS, K.
Oxidation of Ammonia in Water by Ferrates (VI) and (IV),
W76-10611 5D

SWAIN, A.
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

SYDYKOV, ZH. S.
Subsurface Waters of Erosion Troughs in the Aktyuba Region of the Ural - A Source of Drinking Water Supply,
W76-10943 2F

SZYMANSKI, W. A.
Fiber-Glass-Reinforced Polyesters and Furan Resins for Water- and Waste-Treatment Systems,
W76-10682 8G

TAFT, G.
The Third U. N. Law of the Sea Conference: Major Unresolved Fisheries Issues,
W76-10733 6E

TALBOT, R. C.
Fiber-Glass-Reinforced Polyesters and Furan Resins for Water- and Waste-Treatment Systems,
W76-10682 8G

TATINCLAUX, J-C.
Design of Alternating Diffuser Pipes,
W76-10952 8B

A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

TAYLOR, C. E.
Spark Source Mass Spectrometry: The Optimum Referee Method for Multielement Analysis,
W76-10649 5A

TAYLOR, R. E.
Automatic Water Sprinkler for Irregular Areas,
W76-10959 3F

TEAL, J. M.
Accumulation, Release, and Retention of Petroleum Hydrocarbons by the Oyster, Crassostrea Virginica,
W76-11018 5C

TENG, W. L.
Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

TENORE, K. R.
Comparison of the Food Chain Dynamics of the Polychaete, Nereis Virens Cultured on Animal Tissue and Detritus,
W76-10998 5C

Integrated Systems of Mollusk Culture,
W76-10996 5C

Polyspecies Aquaculture Systems: The Detrital Trophic Level,
W76-10997 5C

TEW, R. W.
Distribution of Stream Pollution in Lake Water,
W76-10712 5B

TEWARI, P. H.
Characterization of Adsorbed Cobalt at the Oxide-Water Interface,
W76-10634 5D

THOMAS, W. O. JR.
Techniques for Estimating Flood Depths for Oklahoma Streams,
W76-11075 4A

THOMPSON, R. G.
An Integrated Power Process Model of Water Use and Wastewater Treatment in Chlorine Caustic Production,
W76-10621 5D

THOMSEN, R. M.
Economic Effects of Agricultural Land-Use Management on Soil Erosion and Farm Income in the Obion-Forked Deer River Basin,
W76-10612 4A

THON, J. G.
Problems of Public Works Projects in the Present Economic Climate,
W76-10980 6C

TODD, D. K.
Application of the Stanford Watershed Model to Nigerian Watersheds,
W76-10923 2A

Development of a Methodology for Monitoring Groundwater Quality,
W76-10658 5A

TONEVA, M.
Foam Formation in Plants for Biological Purification of Effluents from the Manufacture of Kraft Pulp (Penoobrazuvaneto v stantsiite za biologichno prechistvane naotpad' chite vodi ot proizvodstvoto na sulfatnatseluloza),
W76-10833 5D

TONKYN, R. G.
Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

TORNATORE, G.
Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

TOWNSEND, L. R.
Brake Means for an Air-Powered Sprinkler System,
W76-10956 3F

TRAIN, R. F.
Environmental Protection Agency: Policies and Procedures for State Continuing Planning Process,
W76-10762 5G

Fertilizer Manufacturing Point Source Category, Effluent Limitations and Guidelines for Existing Sources and Standards for New Sources for the Phosphate Subcategory,
W76-10768 5G

Marine Sanitation Device Standard,
W76-10758 5D

Organic Chemicals Manufacturing Point Source Category, Ethylene Oxide, Ethylene Glycol, Methyl Amines and Oxo Chemicals Processes,
W76-10769 5G

Timber Products Processing Point Source Category,
W76-10761 5G

TRAIN, R. F.

Timber Products Processing Point Source Category, Proposed Pretreatment Standards for Existing Sources,
W76-10760 5G

TROYAN, N. F.
A Transformations of Sulfate Turpentine in Natural Waters (Protsessy prevrashcheniya sul'fatnogo skipidara v prirodnykh vodakh),
W76-10845 5B

TRUCHAN, J. G.
Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish,
W76-10896 5C

TRUESDELL, A. H.
An Empirical Na-K-Ca Geothermometer for Natural Waters,
W76-10598 2K

TSUDA, M.
Marked Diminution of Dissolved Oxygen in the Hypolimnion of Lake Biwa in August, 1973, (In Japanese),
W76-10976 5C

TSUMURA, K.
Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

TUBBESING, S. K.
Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

TUCEK, F.
Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water, Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci),
W76-10515 5A

Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech),
W76-10514 5A

TUPUREINE, A. D.
Lignosulfonates and Natural Water-Soluble Lignin in the Lielupe River (Lignosul'fonaty i prirodnyi vodorastvorimyi lignin v vode r. Lielupe),
W76-10835 5B

TURNER, R. R.
The Impact of Highway Construction on a North Florida Watershed,
W76-10945 5B

TZOU, K. T. S.
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

VALDES-KRIEG, E.
Determination of Surface Equilibria and Mass Transfer Rates in a Concurrent Flow Bubble Column,
W76-10632 5D

VALI, G.
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

VAN DAM, J. C.
Partial Depletion of Saline Groundwater by Seepage,
W76-10920 2L

VAN DE KREEKE, J.
Tide-Induced Mass Transport; A Flushing Mechanism for Shallow Lagoons,
W76-10947 2L

VAN FOSSEN, L. D.
Swine Manure Collection and Removal Systems,
W76-11037 5D

Swine Systems for Iowa and North Central States,
W76-11041 5D

VANDER PLOEG, R. A.
Trickle Irrigator,
W76-10970 3F

VANDERHOLM, D. H.
Water Quality and Management Characteristics of Feedlot Runoff Holding Ponds,
W76-10545 5D

VANDERHORST, J. R.
The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

VAUGHN, J. M.
Virus Survival Patterns in a Tertiary Sewage Treatment-Aquaculture Model System,
W76-10999 5D

VEKHOV, N. V.
Zooplankton of Lakes of the Bol'Shezemel-Skaya Tundra, (In Russian),
W76-11056 5C

VEMURI, R.
Multiobjective Planning and Environmental Evaluation of Water Resource Systems,
W76-10610 6G

VENABLE, J. H.
Town Maintains Sewers Despite 'Sugar Sand',
W76-10687 5D

VERSHININA, L. K.
Selection of Typical Small Drainage Basins for Investigating and Computing Spring Runoff from Large River Basins,
W76-10705 4A

VISSCHER, H. B.
The Legal Requirement for the Assessment of Inadvertent Weather Modification - An Engineering Viewpoint,
W76-10912 3B

VISWANATH, G. K.
Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

VISWANATHAN, C. V.
Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

VOLK, B. G.
Disposal of Cattle Feedlot Waste in an Anaerobic Lagoon on the Organic Soils of South Florida--Preliminary Results,
W76-10540 5E

VON OERTZEN, J. A.
Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

VORCHHEIMER, N.
Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

VORONOV, YU. V.
Biological Filters (Biologicheskie fil'try),
W76-10850 5D

VREELAND, V.
Uptake, Translocation and Elimination of Individual Chlorobiophenyls by Oysters,
W76-11000 5C

WADE, R.
Water to the Fields: India's Changing Strategy,
W76-10589 3F

WAKAMATSU, T.
Behavior of Hydrogen and Hydroxyl Ions at the Oxide-Water Interface,
W76-10633 5B

WALDEN, C. C.
Detoxification of Bleached Kraft Mill Effluents,
W76-10867 5D

Foam Separation for Detoxification of Bleached Kraft Mill Effluents,
W76-10855 5D

WALLACE, D. C.
Diel Changes in the Feeding Activity and Food Habits of the Spotfin Shiner, Notropis Spilopterus (Cope),
W76-10816 2I

WALLEN, I. E.
Monitoring: The Trigger for Action,
W76-10640 5A

WALLER, B. G.
Water-Quality Data for Canals in Eastern Broward County, Florida, 1969-1974,
W76-11081 7C

WALLIS, I. G.
Rationale for a Water Pollution Code (Part II): Social Assessment,
W76-10592 5G

WANG, H.
Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

WANG, J.
Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

WANG, T. P.
A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

WARD, P.
Frequency Distributions for Coliform Bacteria in Water,
W76-10650 5A

WARNER, D. G.
Safety and Pollution Control - Offshore Petroleum Producing Facilities,
W76-10603 5G

WASSERMANN, U.
Prospect for Sea-Bed Resources in a Recession,
W76-10979 6E

WATANABE, T.
A Biological Study on the Pollution of the Sai-Gawa River and its Tributaries, Ishikawa Prefecture, (In Japanese),
W76-10973 5B

WATKINS, R. V.
Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Animal Feed, Breakfast Cereal, and Wheat Starch Segments of the Grain Mills Point Source Category,
W76-10594 5G

WATSON, G.
Quality of Water Considerations in Arid Area Water Management,
W76-10608 5B

WEBB, A. A.
Purification of Lignosulfonates by Dynamic Membrane Ultrafiltration,
W76-10868 5D

WEERTMAN, J.
Milankovitch Solar Radiation Variations and Ice Age Ice Sheet Sizes,
W76-10949 2C

WERTENBAKER, W.
Anatomy of an Oil Spill,
W76-10597 5B

WESTPHAL, H.
The Total Aerobic Heterotrophic Bacteria Germ Content of Water from the Series of Shallow Inlets to the South of Darss Found by Investigation Using the Cast Plate and the MPN Methods, (In German),
W76-10897 5A

WHELAN, W.
Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

WHINSTON, A. B.
Implementation of a Large Scale Water Quality Data Management System,
W76-10588 5A

WHITE, G. C.
A Simulation Model of Tritium Kinetics in a Freshwater Marsh,
W76-10812 5B

WHITE, S. C.
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards System Design,
W76-10512 5D

WHITE, S. T.
Diel Changes in the Feeding Activity and Food Habits of the Spotfin Shiner, Notropis Spilopterus (Cope),
W76-10816 2I

WHITMAN, J.
Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities.
W76-10623 5G

WICHMAN, W. J.
Trickle Irrigator,
W76-10970 3F

WILBUR, D. J.
Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

WILEY, A. J.
Purification of Lignosulfonates by Dynamic Membrane Ultrafiltration,
W76-10868 5D

WILLIAMS, D. A. R.
Water Quality and the Water and Soil Conservation Act 1967,
W76-10737 5G

WILLIAMS, G. O.
Repeated Profiling of Microstructure Lenses with a Midwater Float,
W76-10692 2L

WILLIS, R.
Optimal Management of the Subsurface Environment: Parameter Identification,
W76-10613 5B

WILSON, E. M.
The Influence of Slope and Rain Intensity on Runoff and Infiltration.
W76-10702 2A

WILSON, L. G.
Groundwater Pollution Monitoring Case Studies,
W76-10661 5A

WINGET, R. N.
Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

Studies for Wildlife on Energy Areas,
W76-10820 6G

WISHART, E. R.
The Growth Rates and Densities of Ice Crystals Between -3C and -21C,
W76-10697 2B

WITTE, W. G.
Evaluation of Water Samples Collected During LANDSAT-1 Overpasses of the Lower Chesapeake Bay Area,
W76-10672 5A

WITTENBRUG, E.
Determination of the Biomass and Detritus Content from Natural Phytoplankton Scoop Samples, (In German),
W76-10864 5A

WOLFE, D. A.
Trace Element Interactions in the Estuarine Zone of the Anasco River, Puerto Rico,
W76-10892 5C

WOLLER, D. M.
Public Groundwater Supplies in McHenry County,
W76-10719 4B

WONG, C. S.
Pelagic Tar in the North Pacific Ocean,
W76-11009 5A

WOOD, L. D.
An Integrated International and Domestic Approach to Civil Liability for Vessel-Source Oil Pollution,
W76-10730 5G

WOOD, W. W. JR.
An Analysis of Dairy Waste Management Alternatives for Southern California Dairymen,
W76-10534 5G

WORKMAN, G. W.
Studies for Wildlife on Energy Areas,
W76-10820 6G

Studies on the Least Chub (Iotichthys Phlegethontiscope) in Geothermal Activities Area of Snake and Tule Valleys, Utah,
W76-10824 6G

WORLIDGE, R. F.
Filter Apparatus,
W76-10975 5D

YAKOVLEV, S. V.
Biological Filters (Biologicheskie fil'try),
W76-10850 5D

YASTREB, E. F.
Use of Electrodialysis in the Water Recycling System of Viscose Production (Primenenie elektrodializa v sisteme vodooborota viskoznogo proizodstva),
W76-10848 5D

YIP, J.
Recycling of Liquid Digested Sewage Sludge on Dredged River Sand,
W76-10501 5D

YOUNG, D. R.
Polychlorinated Biphenyls Off Southern California,
W76-10647 5C

ZALTZMAN, R.
Assessment of Polyvinyl Chloride as a Packaging Material for Distilled Spirits, (Enivronmental Impact Assessment),
W76-10722 6G

ZAMAIMURADOVA, Z. M.
Some Data on Zooplankton of Reservoirs in the Mary and Chardzhou Regions of the Turkmen SSR, (In Russian),
W76-10520 2H

ZARNETT, G. D.
Sorption Capabilities of Soils for Phosphate Removal,
W76-10673 5D

ZEMBRZUSKI, T. J. JR.
Floodflow Characteristics at Proposed Bridge Site on Mohawk River in Towns of Frankfort and Schuyler, Herkimer County, New York,
W76-11079 4A

ZEWDE, E.
Groundwater Availability in Champaign County,
W76-10718 4B

ZEYBERLIKH, N. E.
Subsurface Waters of Erosion Troughs in the Aktyuba Region of the Ural - A Source of Drinking Water Supply,
W76-10943 2F

LIBRARY OF THE GRADUATE SCHOOL OF ...

ORGANIZATIONAL INDEX

ABT ASSOCIATES, INC., CAMBRIDGE, MASS.
Water Pollution Control Act of 1972, Social Impacts, Eight Case Studies.
W76-10569 5G

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, AVONDALE, PA. STROUD WATER RESEARCH CENTER; AND ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, PA. DEPT. OF LIMNOLOGY.
Bacterial Growth Rates and Temperature Optima in a Stream with a Fluctuating Thermal Regime.
W76-10886 5C

AGRICULTURAL RESEARCH AND EDUCATION CENTER BELLE GLADE, FLA.
Disposal of Cattle Feedlot Waste in an Anaerobic Lagoon on the Organic Soils of South Florida--Preliminary Results,
W76-10540 5E

AGRICULTURAL RESEARCH AND EDUCATION CENTER, LAKE ALFRED, FLA.
Antitranspirant Sprays Affecting Fruit Size of Early Amber Peaches,
W76-10725 3F

AGRICULTURAL RESEARCH SERVICE, AUBURN, ALA.
Effect of Soil-Incorporated Dairy Cattle Manure on Runoff Water Quality and Soil Properties,
W76-10539 5B

AGRICULTURAL RESEARCH SERVICE, COLUMBIA, MO. NORTH CENTRAL REGION WATERSHED RESEARCH CENTER.
Soil Water Modeling I: A Generalized Simulator of Steady, Two-Dimensional Flow,
W76-10933 2G

AGRICULTURAL RESEARCH SERVICE, DURANT, OKLA. WATER QUALITY MANAGEMENT LAB.
Effect of Cattle Feedyard Runoff on Soil Infiltration Rates,
W76-10538 5B

AGRICULTURAL RESEARCH SERVICE, FT. COLLINS, COLO.
Beef Cattle Feedlots: Impact on Underlying Soil,
W76-11047 5B

AGRICULTURAL RESEARCH SERVICE, LINCOLN, NEB.
Large Commercial Feedlots - How Wastes are Handled in the West,
W76-11048 5D

AGRICULTURAL RESEARCH SERVICE, LINCOLN, NEBR.
Quality Variation of Feedlot Runoff in Storage,
W76-10549 5B

AGRICULTURAL RESEARCH SERVICE, OXFORD, MISS. SEDIMENTATION LAB.
Steady Laminar Flow in a Stationary Tank with a Spinning Bottom,
W76-11062 8B

AGRICULTURAL RESEARCH SERVICE, PEORIA, ILL. AGRICULTURAL AND NATURAL RESOURCES DIV.
Animal Waste Management--Comments on the National Situation,
W76-11033 5D

AGRICULTURAL RESEARCH SERVICE, WASHINGTON, D. C. ENTOMOLOGY RESEARCH DIV.
Biodegrading Poultry Excreta with House Fly Larvae: The Concept and Equipment,
W76-11053 5D

AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE, DES MOINES, IOWA.
EPA's Role in the Animal Waste Problem: Panel Discussion,
W76-11045 5G

AGRICULTURAL UNIV., WAGENINGEN (NETHERLANDS). DEPT. OF HYDRAULICS AND CATCHMENT HYDROLOGY.
Application of Finite Element Method to Open Channel Flow,
W76-10939 8B

AKADEMIYA NAUK LATVIISKOI SSR. INST. OF WOOD CHEMISTRY.
Lignosulfonates and Natural Water-Soluble Lignin in the Lielupe River (Lignosul'fonaty i prirodnyi vodorastvorimyi lignin v vode r. Lielupe),
W76-10835 5B

AKADEMIYA NAUK LITOVSKOI SSR, VILNIUS. INSTITUT ZOOLOGII I PARIZITOLOGII.
Ecological Variability of Bream in Lithuanian Waters: 2. Age and Growth Rate, (In Russian),
W76-10519 5C

AKADEMIYA NAUK SSSR, MOSCOW.
The Economics of Developing the Resources of the World's Oceans,
W76-10587 6B

AKADEMIYA NAUK SSSR, SVERDLOVSK. INST. OF PLANT AND ANIMAL ECOLOGY.
Some Characteristics of Spleen Growth in the Lake Minnow, (In Russian),
W76-10521 2I

AKADEMIYA NAUK TURKMENSKOI SSR, ASHKHABAD. INSTITUT ZOOLOGII I PARAZITOLOGII.
Some Data on Zooplankton of Reservoirs in the Mary and Chardzhou Regions of the Turkmen SSR, (In Russian),
W76-10520 2H

ALBERTA RESEARCH, EDMONTON. DIV. OF HIGHWAY AND RIVER ENGINEERING.
Oblique Impingement of Circular Turbulent Jets,
W76-10709 8B

AMERICAN INST. OF CHEMICAL ENGINEERS, N.Y.
Advances in Interfacial Phenomena of Particulate/Solution/Gas Systems; Applications to Flotation Research,
W76-10627 5D

AQUA-CHEM, INC., MILWAUKEE, WIS.
Materials Failure Identification Manual for Sea Water Desalination Plants.
W76-10880 3A

ARIZONA UNIV., TUCSON. COLL. OF LAW.
Text and Commentary for Weather Modification Control Law,
W76-10809 3B

ARIZONA UNIV., TUCSON. DEPT. OF AGRICULTURAL ECONOMICS.
Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation,
W76-10585 6B

ARIZONA UNIV., TUCSON. DEPT. OF NUCLEAR ENGINEERING.
Feasibility Study of a Nuclear Power-Sewage Treatment System for the Conservation and Reclamation of Water Resources,
W76-10614 5D

ARIZONA WATER RESOURCES RESEARCH CENTER, TUCSON.
Groundwater Pollution Monitoring Case Studies,
W76-10661 5A

ARMY ENGINEER DISTRICT, KANSAS CITY, MO.
Harry S. Truman Dam and Reservoir, Osage River, Missouri. Appendix E, F, G, (Environmental Impact Statement.
W76-10827 4A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. ENVIRONMENTAL EFFECTS LAB.
Dredged Material Disposal--Effects and Alternatives,
W76-10724 5E

ASHLAND CHEMICAL CO., COLUMBUS, OHIO. RESINS AND PLASTICS DIV.
Fiber-Glass-Reinforced Polyesters and Furan Resins for Water- and Waste-Treatment Systems,
W76-10682 8G

ASSEMBLY OF ENGINEERING MARINE BOARD, WASHINGTON, D. C.
Outer Continental Shelf Resource Development Safety: A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products.
W76-11001 5G

ATMOSPHERIC ENVIRONMENT SERVICE, DOWNSVIEW (ONTARIO).
Use of Log-Normal Distributions for Numerical Calculations of Condensation and Collection,
W76-10694 2B

ATOMIC ENERGY OF CANADA LTD., PINAWA (MANITOBA). WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT.
Characterization of Adsorbed Cobalt at the Oxide-Water Interface,
W76-10634 5D

B. C. RESEARCH LTD., VANCOUVER.
Foam Separation for Detoxification of Bleached Kraft Mill Effluents,
W76-10855 5D

Detoxification of Bleached Kraft Mill Effluents,
W76-10867 5D

BANKS (HARVEY O.), INC., BELMONT, CALIF.
Legal Requirements for Monitoring Groundwater Quality,
W76-10656 5G

BATTELLE PACIFIC NORTHWEST LAB., RICHLAND, WASH. MARINE RESEARCH LAB.
The Role of Dispersion in Fuel Oil Bioassay,
W76-11100 5C

BEAK CONSULTANTS LTD., VANCOUVER (BRITISH COLUMBIA).
A Clean Piece of Paper,
W76-10842 5D

BECHTEL INTERNATIONAL CORP., SAN FRANCISCO, CALIF.
Geothermal Energy Recovery Process,
W76-10967 3A

BEDFORD INST. OF OCEANOGRAPHY, DARTMOUTH (NOVA SCOTIA).
Baroclinic Instability in the Denmark Strait Overflow,
W76-10693 2L

BEDFORD INST. OF OCEANOGRAPHY, DARTMOUTH (NOVA SCOTIA). ATLANTIC OCEANOGRAPHIC LAB.
Distribution of Suspended Oil Particles Following the Grounding of the Tanker Arrow,
W76-11096 5B

BETZ LABS, INC., TREVOSE, PA. (ASSIGNEE).
Water-Soluble Cationic Polymeric Materials and their Use,
W76-10964 5D

BHABHA ATOMIC RESEARCH CENTRE, TROMBAY, BOMBAY (INDIA). AIR MONITORING SECTION.
Monsoonal Deposition of Sea Salt and Air Pollutants Over Bombay,
W76-10932 5B

BIOLOGISCHE ANSTALT HELGOLAND (WEST GERMANY).
Some Reflections on the Biodegradation of Mineral Oils in the Marine Environment,
W76-11016 5B

BOSSIER CITY UTILITIES DEPT., LA.
Town Maintains Sewers Despite 'Sugar Sand',
W76-10687 5D

BOSTOCK, HILL AND RIGBY. BIRMINGHAM, (ENGLAND).
A Feasibility Study of the Control of Pollution from Industrial Waste Waters Discharged into the Lagoon of Venice,
W76-10679 5D

BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH.
Aquatic Macroinvertebrate Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah,
W76-10821 6G

BRISTOL UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
Water Tracing in Tropical Regions, The Use of Fluorometric Techniques in Jamaica,
W76-10701 2F

BRITISH COLUMBIA UNIV., VANCOUVER. WESTWATER RESEARCH CENTRE.
Periphytic and Planktonic Algae of the Lower Fraser River in Relation to Water Quality Conditions,
W76-10504 5C

BRITISH COLUMBIA, VANCOUVER. WESTWATER RESEARCH CENTRE.
Chlorinated Hydrocarbon Residues in Fishes from the Lower Fraser River,
W76-10505 5C

BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Aerosol Production from Land Application of Wastewater by Agricultural Irrigation Equipment,
W76-10625 5D

BROWN AND ROOT, INC., HOUSTON, TEX.
Volume and Strength of a Dolos,
W76-10523 8F

BUREAU OF ALCOHOL, TOBACCO AND FIREARMS, WASHINGTON, D. C.
Assessment of Polyvinyl Chloride as a Packaging Material for Distilled Spirits, (Enivronmental Impact Assessment),
W76-10722 6G

BURK AND ASSOCIATES, INC. (NEW ORLEANS).
Environmental Investigation of Eden Isles,
W76-10510 5G

BURNS AND MCDONNELL, KANSAS CITY, MO.
Underlake Sewer Spurs Resort Development,
W76-10685 5D

BURNS AND ROE CONSTRUCTION CORP., PARAMUS, N. J.
Final Report, Material Evaluation and Development Program, OSW San Diego Test Facility,
W76-10552 3A

Final Report, Horizontal Spray Film (HTEX) and Vertical Tube (VTEX) Evaporator, OSW San Diego Test Facility.
W76-10553 3A

CACI, INC., RESTON, VA. INFORMATION TECHNOLOGY DEPT.
A Comparison of Several Water Quality Indexes,
W76-10926 5A

CALDWELL CONNELL ENGINEERS, MELBOURNE (AUSTRALIA).
Rationale for a Water Pollution Code (Part II): Social Assessment,
W76-10592 5G

CALGARY UNIV., ALBERTA. DEPT. OF GEOGRAPHY.
Effect of Vegetation on Lateral Migration of Anastomosed Channels of a Glacier Meltwater River,
W76-10940 4C

CALIFORNIA INST. OF TECH., PASADENA. W.M. KECK LAB. OF ENVIRONMENTAL ENGINEERING SCIENCE.
Sampling and Analysis of Metals in Air, Water and Waste Products,
W76-10639 5A

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, SACRAMENTO.
Safe Drinking Water Act - Implications for Ground Water Quality Protection,
W76-11064 5F

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, SACRAMENTO. DIV. OF PLANNING AND RESEARCH.
Ground Water Quality Monitoring for California's Needs,
W76-11065 5A

CALIFORNIA UNIV., BERKELEY.
Development of a Methodology for Monitoring Groundwater Quality,
W76-10658 5A

CALIFORNIA UNIV., BERKELEY. DEPT. OF CHEMICAL ENGINEERING; AND CALIFORNIA UNIV., BERKELEY. SEA WATER CONVERSION LAB.
Determination of Surface Equilibria and Mass Transfer Rates in a Concurrent Flow Bubble Column,
W76-10632 5D

CALIFORNIA UNIV., BERKELEY. SCHOOL OF FORESTRY AND CONSERVATION.
Upstream Changes in Fish Populations Following Impoundment of Sagehen Creek, California,
W76-10619 2I

CALIFORNIA UNIV., BERKELEY. SCHOOL OF PUBLIC HEALTH.
Identification and Potential Biological Effects of the Major Components in the Seawater Extract of a Bunker Fuel,
W76-11099 5A

CALIFORNIA UNIV., BERKELEY. WATER RESOURCES CENTER ARCHIVES.
Sources of Information in Water Resources, an Annotated Guide to Printed Materials,
W76-10881 10C

CALIFORNIA UNIV., DAVIS. DEPT. OF SOILS AND PLANT NUTRITION.
Farm Animal Manures: An Overview of Their Role in the Agricultural Environment,
W76-10548 5G

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF BIOLOGY.
Environmental Regulation of the Annual Reproductive Season of Strongylocentrotus Purpuratus (Stimpson),
W76-10888 5C

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF PUBLIC HEALTH.
Irrigation Efficiency in the Production of California Crop Calories and Proteins,
W76-10875 3F

CALIFORNIA UNIV., PARLIER.
Preventing Water Pollution from Turkey Operations,
W76-10535 5G

CALIFORNIA UNIV., RIVERSIDE. AGRICULTURAL EXTENSION SERVICE.
An Analysis of Dairy Waste Management Alternatives for Southern California Dairymen,
W76-10534 5G

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA. INST. OF GEOPHYSICS AND PLANETARY PHYSICS.
Repeated Profiling of Microstructure Lenses with a Midwater Float,
W76-10692 2L

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF ECONOMICS.
Economic Framework for Groundwater Quality Monitoring,
W76-10657 5G

CAMBRIDGE UNIV. (ENGLAND). DEPT. OF ENGINEERING.
On Rolling-Grain Ripples,
W76-10917 2J

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Automated Determination of Carbon in Natural Waters,
W76-10936 5A

Modified Curcumin and Dianthrimide Methods for the Determination of Boron in the Presence of High Levels of Nitrate and Organics,
W76-10937 5A

CANADA CENTRE FOR INLAND WATERS, BURLINGTON, ONTARIO, HYDRAULIC DIV.
Sampling Techniques in Urban Runoff Quality Studies,
W76-10509 5A

CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
Implementation of a Large Scale Water Quality Data Management System,
W76-10588 5A

CEA CENTRE D'ETUDES NUCLEAIRES DE FONTENAY-AUX-ROSES (FRANCE).
Incidence De La Charge Polluante Des Eaux Sur Le Comportement Des Radionucleides, (Effect of the Pollutant Burden of Water on the Behaviour of Radionuclides),
W76-10893 5C

CENTER FOR THE ENVIRONMENT AND MAN, INC., HARTFORD, CONN.
Environmental Impact Assessment, Water Quality Analysis, Connecticut River.
W76-10577 5G

CENTRALNE LABORATORIUM DZIEWIARSTWA (POLAND).
Coagulation of Textile Industry Effluents with Cationic Polyelectrolytes (Koagulacja sciekow przemyslu wlokienniczego przy uzyciu polielektrolitow kationowych),
W76-10836 5D

CENTRE D'ETUDES ET DE RECHERCHES DE BIOLOGIE ET D'OCEANOGRAPHIE MEDICALE, NICE (FRANCE).
Use of A Trophodynamic Chain of the Benthic Type for the Study of Transfers of Metallic Pollutants, (In French),
W76-10944 5C

CHEMICO PROCESS PLANTS CO., EL MONTE, CALIF. ENVIROGENICS SYSTEMS.
Acute Toxicity of Selected Toxicants to Six Species of Fish,
W76-10900 5C

CHERKASSKII ZAVOD KHIMICHESKOGO VOLOKNA (USSR).
Use of Electrodialysis in the Water Recycling System of Viscose Production (Primenenie elektrodializa v sisteme vodooborota viskoznogo proizodstva),
W76-10848 5D

CLEMSON UNIV., S.C. DEPT. OF ENVIRONMENTAL SYSTEMS ENGINEERING.
How to Design Aerated Lagoon Systems to Meet 1977 Effluent Standards System Design,
W76-10512 5D

CLYDE AND PRATT, SALT LAKE CITY, UTAH.
Coal Mining, Development and Processing -- The Associated Water Problems,
W76-10727 6E

COAST GUARD, WASHINGTON, D.C.
Deepwater Port Site Evaluation,
W76-10766 5G

Deepwater Ports: Licensing Procedures and Design Construction, Equipment and Operations,
W76-10767 5G

COASTAL PLAIN EXPERIMENT STATION, TIFTON, GA. DEPT. OF ENTOMOLOGY AND FISHERIES.
Water Quality in a Recirculating Raceway System for Fish Culture,
W76-10546 5G

COLD REGIONS RESEARCH AND ENGINEERING LABORATORY, HANOVER, N. H.
Identification of Nuclei and Concentrations of Chemical Species in Snow Crystals Sampled at the South Pole,
W76-10696 2C

COLORADO STATE UNIV., FORT COLLINS.
Land Application of Sewage Sludge, III. Nitrate Accumulation and Wheat Growth Resulting from Addition of Sewage Sludge and Wood Wastes to Soils,
W76-10841 5E

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF ATMOSPHERIC SCIENCES.
Dispersion of Pollutants,
W76-10907 5B

COLORADO STATE UNIV., FORT COLLINS. FLUID MECHANICS PROGRAM.
Wind-Tunnel Simulation of Atmospheric Flow and Dispersion,
W76-10908 5A

COLORADO UNIV., BOULDER, COLO. INST. OF BEHAVIORAL SCIENCE.
A Selected Annotated Bibliography on Fish and Wildlife Implications of Missouri Basin Water Allocation,
W76-10825 4C

COLORADO UNIV., BOULDER. INST. OF BEHAVIORAL SCIENCE.
Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment,
W76-10826 4C

COLUMBIA UNIV., NEW YORK. SCHOOL OF LAW.
A New International Law for the Deep Seabed Regime,
W76-10726 6E

COMMISSARIAT A L'ENERGIE ATOMIQUE, CADARACHE (FRANCE). CENTRE D'ETUDES NUCLEAIRES.
Techniques De Determination Radide Des Effets De Synergie Radionucleides - Polluants, (Techniques for Rapid Determination of Effects of Synergy Between Radionuclides and Pollutants),
W76-10891 5A

COMMISSION OF THE EUROPEAN COMMUNITIES, ISPRA (ITALY). JOINT NUCLEAR RESEARCH CENTER.
On the Calculation of the Mean Residence Time in Monomictic Lakes,
W76-10704 2H

COMMITTEE ON COMMERCE (U. S. SENATE). COMMITTEE ON COMMERCE NATIONAL OCEAN POLICY STUDY.
National Ocean Policy: Priorities for the Future,
W76-10591 6E

COMMONWEALTH ASSOCIATES, INC., JACKSON, MICH.
Management of Groundwater Quality Data,
W76-10660 5A

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF SOILS.
Some Observations on the Joss-Waldvogel Rainfall Disdrometer,
W76-10928 2B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, SYDNEY (AUSTRALIA), DIV. OF CLOUD PHYSICS.
The Growth Rates and Densities of Ice Crystals Between -3C and -21C,
W76-10697 2B

CONNECTICUT AGRICULTURAL EXPERIMENT STATION, NEW HAVEN.
Capillary Hysteresis and the Relationship Between Drying and Wetting Curves,
W76-10914 2G

CONNECTICUT UNIV., STORRS.
Physical Growth and Behavioral Development of Mice Receiving Chlorine and Fluorine,
W76-10551 5C

CONSERVATION FOUNDATION, WASHINGTON, D. C.
Rookery Bay: Ecological Constraints on Coastal Development,
W76-10741 6G

CORNELL UNIV., ITHACA, N. Y. DEPT. OF AGRONOMY.
Transport of Water and Heat in a Frozen Permeameter,
W76-10713 2G

CORNELL UNIV., ITHACA, N. Y. SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Optimal Management of the Subsurface Environment: Parameter Identification,
W76-10613 5B

Remote Sensing of Ground and Surface Water Contamination by Leachate from Landfill,
W76-10666 5A

CORPS OF ENGINEERS, NEW YORK. NORTHEASTERN U.S. WATER SUPPLY STUDY.
Water Supply for the Greater New York Metropolitan Area,
W76-10983 6B

CROWN ZELLERBACH CORPORATION, CAMAS, WASH.
Environmental and Social Factors (in the Paper Industry),
W76-10861 5G

DAMES AND MOORE, ATLANTA, GA.
The Legal Requirement for the Assessment of Inadvertent Weather Modification - An Engineering Viewpoint,
W76-10912 3B

DART ENVIRONMENT AND SERVICES CO., LOS ANGELES, CALIF. (ASSIGNEE).
Metal Recovery from Waste Treatment Sludges,
W76-10960 5D

DELAWARE UNIV., NEWARK.
Manure and the Nitrate Problem,
W76-10616 5E

DELAWARE UNIV., NEWARK. COLL. OF MARINE STUDIES.
A Public Authority to Manage the Atlantic Outer Continental Shelf,
W76-11097 6E

DELAWARE UNIV., NEWARK. DEPT. OF ECONOMICS.
Prices and Property Rights in the Fisheries,
W76-10586 6C

DEPARTMENT OF ENERGY, MINES AND RESOURCES, OTTAWA (ONTARIO). MINERAL SCIENCES DIV.
Electrochemical Properties of the Oxide-Solution Interface in Relation to Flotation,
W76-10629 5B

DEPARTMENT OF STATE, WASHINGTON, D. C.
Diplomatic and Legal Aspects of Remote Sensing,
W76-10584 6E

Department Opposes Unilateral Extension of U. S. Fisheries Jurisdiction,
W76-10744 6E

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WASTEWATER TECHNOLOGY CENTRE.
Recycling of Liquid Digested Sewage Sludge on Dredged River Sand,
W76-10501 5D

DEPARTMENT OF THE ENVIRONMENT, VICTORIA (BRITISH COLUMBIA). FROZEN SEA RESEARCH GROUP.
Oil in Sea Ice,
W76-11098 5B

DEVELOPMENT, PLANNING AND RESEARCH ASSOC., INC., MANHATTAN, KANS.
Water Pollution Control Act of 1972, Economic Impacts, Leather Tanning Industry.
W76-10561 5G

Water Pollution Control Act of 1972, Economic Impacts, Fertilizer Industry.
W76-10562 5G

DOBROCKY SEATECH LTD., VICTORIA (BRITISH COLUMBIA).
Dispersion of Dyed Sea-Water Discharged from Moving Vessels in Coastal Waters,
W76-11086 5B

DORNBUSCH (DAVID M.) AND CO., INC., SAN FRANCISCO, CALIF.
Benefits from Water Pollution Abatement, Property Values,
W76-10580 5G

DOUGLAS UNITED NUCLEAR, INC., RICHLAND, WASHINGTON.
An Investigation of Effluent Control Standards and Practices (Atomic Energy Production),
W76-10828 5G

DREXEL UNIV., PHILADELPHIA, PA. DEPT. OF ENVIRONMENTAL ENGINEERING AND SCIENCE.
Frequency Distributions for Coliform Bacteria in Water,
W76-10650 5A

DUKE UNIV., BEAUFORT, N. C.
Effects of Mirex, Methoxychlor and Malathion on Development of Crabs,
W76-10899 5C

DUKE UNIV., DURHAM, N. C. SCHOOL OF FORESTRY.
Water Quality and Economic Criteria for Rural Wastewater and Water Supply Systems,
W76-10583 5D

EASTERN MICHIGAN UNIV., YPSILANTI. DEPT. OF BIOLOGY.
Diel Changes in the Feeding Activity and Food Habits of the Spotfin Shiner, Notropis Spilopterus (Cope),
W76-10816 2I

ECODYNE CORP., UNION, N. J.
How to Meet Water Cleanup Deadlines,
W76-10862 5D

ECONOMIC RESEARCH SERVICE, EAST LANSING, MICH. FARM PRODUCTION ECONOMICS DIV.
An Economic Appraisal of Alternative Dairy Waste Management Systems Designed for Pollution Control,
W76-10547 5D

EG AND G, BIONOMICS, WAREHAM, MASS.
Chronic Toxicity of Atrazine to Selected Aquatic Invertebrates and Fishes,
W76-10517 5C

Chronic Toxicity of Lindane to Selected Aquatic Invertebrates and Fishes,
W76-10895 5C

ENERGY RESOURCES CO., INC., CAMBRIDGE, MASS.
A Preliminary Design for a National Environmental Census,
W76-10642 5A

ENVIRO CONTROL, INC., ROCKVILLE, MD.
Assessment of the Benefits of Environmental Remote Sensing,
W76-10670 5A

ENVIRONMENTAL LAW INST., WASHINGTON, D. C.
The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement, Volume I,
W76-10574 5G

The Water Pollution Control Act of 1972, Institutional Assessment, Enforcement Volume II,
W76-10575 5G

ENVIRONMENTAL PROTECTION AGENCY, KANSAS CITY, KANS. SURVEILLANCE AND ANALYSIS DIV.
An Evaluation of Automatic Wastewater Compositors,
W76-10652 5A

ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF AIR AND WATER PROGRAMS. WASHINGTON, D. C.
Development Document for Effluent Limitations Guidelines and New Source Performance Standards: Feedlot Point Source Category,
W76-10829 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C.
Environmental Levels of PCB'S,
W76-10641 5A

New Source NPDES Permits Preparation of Environmental Impact Statements,
W76-10757 6G

Marine Sanitation Device Standard,
W76-10758 5D

Soap and Detergent Manufacturing Category Pretreatment Standards for New Sources,
W76-10759 5G

Timber Products Processing Point Source Category, Proposed Pretreatment Standards for Existing Sources,
W76-10760 5G

Timber Products Processing Point Source Category,
W76-10761 5G

Environmental Protection Agency: Policies and Procedures for State Continuing Planning Process,
W76-10762 5G

Preparation of State Water Quality Management Plans.
W76-10763 5G

Fertilizer Manufacturing Point Source Category, Urea Subcategory,
W76-10764 5G

Environmental Protection Agency: Grants and Other Federal Assistance, State and Local Assistance.
W76-10765 5G

Fertilizer Manufacturing Point Source Category, Effluent Limitations and Guidelines for Existing Sources and Standards for New Sources for the Phosphate Subcategory,
W76-10768 5G

Organic Chemicals Manufacturing Point Source Category, Ethylene Oxide, Ethylene Glycol, Methyl Amines and Oxo Chemicals Processes,
W76-10769 5G

Water Programs Secondary Treatment Information,
W76-10770 5D

Domestic Wastewater Disinfection, Secondary Treatment,
W76-10771 5D

Oil Pollution Prevention,
W76-10772 5G

Ink Formulating Point Source Category, Pretreatment Standards for Existing Sources,
W76-10774 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. EFFLUENT GUIDELINES DIV.
Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Animal Feed, Breakfast Cereal, and Wheat Starch Segments of the Grain Mills Point Source Category,
W76-10594 5G

Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textile, Friction Materials and Sealing Devices Segment of the Asbestos Manufacturing Point Source Category,
W76-10595 5G

ENVIRONMENTAL PROTECTION AGENCY WASHINGTON, D. C. OFFICE OF AIR AND WATER PROGRAMS.
Agricultural Sediment Control for Water Quality Protection,
W76-10617 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF TOXIC SUBSTANCES.
Monitoring: The Trigger for Action,
W76-10640 5A

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C. OFFICE OF WATER PROGRAM OPERATIONS.
Municipal Wastewater Treatment Works, Model Facility Plan For A Small, Rural Community.
W76-10511 5D

ENVIRONMENTAL RESEARCH LAB., ATHENS, GA.
Spark Source Mass Spectrometry: The Optimum Referee Method for Multielement Analysis,
W76-10649 5A

A Strategy for Aquatic Pollutants Fate and Transport Determination,
W76-10665 5B

A Proposed National Monitoring System for Organics in Water,
W76-10668 5A

Capabilities and Limitations in Identifying and Measuring Aquatic Pollutants,
W76-10669 5A

ENVIRONMENTAL RESEARCH LAB., DULUTH, MINN.
Comparative Toxicity of Sewage-Effluent Disinfection to Freshwater Aquatic Life,
W76-10898 5C

EXETER UNIV. (ENGLAND), DEPT. OF GEOGRAPHY.
The Relationship of Slope and Stream Channel Form in the River Dart, Devon,
W76-10698 2E

EXXON RESEARCH AND ENGINEERING CO., FLORHAM PARK, N. J.
Oil Ports on the Continental Shelf,
W76-10984 5G

FEDERAL DISASTER ASSISTANCE ADMINISTRATION, WASHINGTON, D. C.
Directory of Disaster-Related Technology,
W76-10502 10C

FEDERAL INSURANCE ADMINISTRATION, WASHINGTON, D. C.
Identification of Special Hazard Areas List of Communities with Special Hazard Areas,
W76-10773 6F

FINNISH PULP AND PAPER RESEARCH INST. HELSINKI.
The Use of Waste Fibers as Absorption Material in Grass Silage,
W76-10863 5E

FISCHER AND BEATTY, FORT COLLINS, COLO.
Equitable Apportionment of Interstate Ground Waters,
W76-10728 4B

FISHERIES AND MARINE SERVICE, HALIFAX (NOVA SCOTIA). DEPT. OF ENVIRONMENT.
Red Crab (Geryon Quinquedens) and Snow Crab (Chionoecetes Opilio) Resistance to Infection by the Lobster Pathogen Aerococcus Viridans (Var.) Homari,
W76-10882 5C

FLORIDA UNIV., GAINESVILLE. DEPT. OF AGRICULTURAL ENGINEERING.
Peach Irrigation in Florida,
W76-10749 3F

FLORIDA UNIV., GAINESVILLE. DEPT. OF FOOD AND RESOURCE ECONOMICS.
Enabling Legislation: Possibilities for the Commercial Fishing Industry,
W76-10593 6E

FOUNDATION FOR APPLIED ECOLOGY, EDAM (NETHERLANDS).
'Ware the Wadden Sea,
W76-10985 6G

FRONTIER MACHINERY CO., WALLA WALLA, WASH. (ASSIGNEE).
Alignment Control Apparatus for Center Pivot Irrigation Equipment,
W76-10957 3F

GEOLOGICAL SURVEY, ALBANY, N.Y.
Floodflow Characteristics at Proposed Bridge Site on Mohawk River in Towns of Frankfort and Schuyler, Herkimer County, New York,
W76-11079 4A

GEOLOGICAL SURVEY, ALBUQUERQUE, N. MEX.
Ground-Water Levels in New Mexico, 1974,
W76-11073 2F

GEOLOGICAL SURVEY, BAY SAINT LOUIS, MISS.
U.S. Geological Survey Water Quality Monitor, Operations Manual,
W76-11080 5A

GEOLOGICAL SURVEY, BAY ST. LOUIS, MISS., AND GEOLOGICAL SURVEY, RESTON, VA.
Simplified Routing of Dam Break Waves,
W76-11085 4A

GEOLOGICAL SURVEY, DENVER, COLO.
Bog Stratigraphy, Radiocarbon Dates, and Pinedale to Holocene Glacial History in the Front Range, Colorado,
W76-11071 2C

Modeling Solute Transport in Ground Water,
W76-11076 5B

GEOLOGICAL SURVEY, JACKSON, MISS.
The Sparta Aquifer System in Mississippi,
W76-11067 7C

Flood Frequency of Mississippi Streams,
W76-11083 4A

GEOLOGICAL SURVEY, MADISON, WIS.
Recycling Ground Water in Waushara County, Wisconsin: Resource Management for Cold-Water Fish Hatcheries,
W76-11082 4B

GEOLOGICAL SURVEY, MADISON, WIS. WATER RESOURCES DIV.
Water Resources Data for Wisconsin. Part 1. Surface Water Records. Part 2. Water Quality Records.
W76-10832 7C

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
An Empirical Na-K-Ca Geothermometer for Natural Waters,
W76-10598 2K

Water-Quality Investigation, Eel River, California,
W76-11069 5A

Geohydrology of the Anza-Terwilliger Area, Riverside County, California,
W76-11074 4B

Variation in Concentration of Selected Water-Quality Constituents in the Sacramento River at Bend Bridge, California,
W76-11078 5A

GEOLOGICAL SURVEY, OKLAHOMA CITY, OKLA.
Techniques for Estimating Flood Depths for Oklahoma Streams,
W76-11075 4A

GEOLOGICAL SURVEY, RESTON, VA.
Regulation and Supervision of Outer Continental Shelf Operations on the Pacific Coast,
W76-11005 5G

Gulf Coast Lease Management Inspection Program,
W76-11006 5G

Groundwater,
W76-11066 2F

Greater Pittsburgh Regional Studies, Reports and Maps, April 1976.
W76-11072 7C

Application of Simple Dam Break Routing Model,
W76-11084 8B

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
Design of Nationwide Water-Quality Monitoring Networks,
W76-10643 5A

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Construction and Testing of Two Waste-Injection Monitor Wells in Northwest Florida,
W76-11070 5B

Hydrologic Effects of Storms of June 24-28, 1974 in Lee and Collier Counties, Florida,
W76-11077 4A

Water-Quality Data for Canals in Eastern Broward County, Florida, 1969-1974,
W76-11081 7C

GEOLOGICAL SURVEY, TUCSON, ARIZ.
Maps Showing Ground-Water Conditions in the Lower Hassayampa Area, Maricopa County, Arizona--1975,
W76-11068 7C

GEORGIA MARINE SCIENCE CENTER, SAVANNAH.
The Economic Impact of Recreational Land-Use in an Island Environment: A Case Study of Jekyll Island, Georgia,
W76-10581 6B

GEORGIA UNIV., ATHENS. DEPT. OF AGRONOMY.
Chemical and Microbiological Changes in Poultry Litter Applied to Soil as Influenced by the Time and Method of Application,
W76-10615 5E

GIDROKHIMICHESKII INSTITUT, NOVOCHERKASSK (USSR).
A Transformations of Sulfate Turpentine in Natural Waters (Protsessy prevrashcheniya sul'fatnogo skipidara v prirodnykh vodakh),
W76-10845 5B

GILLETTE CO. RESEARCH INST., ROCKVILLE, MD.
Feasibility of Using Sewage Sludge in Highway Embankment Construction,
W76-10624 5E

GLASGOW UNIV. (SCOTLAND). DEPT. OF ZOOLOGY.
The Respiratory Strategies of two Species of Freshwater Gastropods (Ancylus Fluviatilis Mull and Planorbis Contortus Linn) in Relation to Temperature, Oxygen Concentration, Body Size and Season,
W76-10889 5C

GRAND RAPIDS CITY ENGINEER OFFICE, MICH.
Sewers - Relining VS Replacement,
W76-10690 8G

GRAND RAPIDS INDUSTRIAL WASTE PLANT, MINN.
Town Gives Primary and Secondary Treatment to Blandin's Effluent,
W76-10857 5D

GREATER CHICAGO METROPOLITAN SANITARY DISTRICT, ILL. SEWER DESIGN SECTION.
Hydraulic Jump in Circular Sewers,
W76-10686 5D

GREENO (JOHN S.), INC., CINCINNATI, OHIO. (ASSIGNEE).
Reaction Arm for Rotary Sprinkler,
W76-10978 3F

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
Meteorological Aspects of the Oahu Flood of 19 April 1974,
W76-10807 2B

HENRY KRUMB SCHOOL OF MINES, NEW YORK.
Interfacial Chemistry of Particulate Flotation,
W76-10628 5B

HOOKER CHEMICALS AND PLASTICS CORP., NIAGARA FALLS, N.Y.
Sequential Chlorination -- Impact on the Environment,
W76-10860 5D

HOUSTON UNIV., TEX.
An Integrated Power Process Model of Water Use and Wastewater Treatment in Chlorine Caustic Production,
W76-10621 5D

HUMBLE OIL AND REFINING CO., HOUSTON, TEX.
Safety and Pollution Control - Offshore Petroleum Producing Facilities,
W76-10603 5G

Technical Capabilities of Offshore Exploration Operations to Maximize Safety amd Environmental Protection,
W76-11004 5G

HYDROTECHNIC CORP., NEW YORK. (ASSIGNEE).
Filtration and Backwashing Apparatus for Use with a Water Filtration System,
W76-10977 5F

IIT ELECTRO-PHYSICS LAB., INC., COLUMBIA, MD.
Monitoring Estuarine Circulation and Ocean Waste Dispersion Using an Integrated Satellite-Aircraft-Drogue Approach,
W76-10671 5A

ILLINOIS STATE DEPT. OF TRANSPORTATION, SPRINGFIELD. DIV. OF WATERWAYS.
Illinois Laws Relating to Waterways 1973.
W76-10720 6E

ILLINOIS STATE WATER SURVEY, PEORIA. WATER QUALITY SECTION.
Water Quality Characteristics of the Illinois River at Peoria,
W76-10922 5A

Some Water Quality Aspects in a Nascent Impoundment in Central Illinois,
W76-10950 5B

ILLINOIS STATE WATER SURVEY, URBANA.
Groundwater Availability in Champaign County,
W76-10718 4B

Public Groundwater Supplies in McHenry County,
W76-10719 4B

Urban-Industrial Effects on Clouds and Precipitation,
W76-10905 4C

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF AGRICULTURAL ENGINEERING.
Water Quality and Management Characteristics of Feedlot Runoff Holding Ponds,
W76-10545 5D

Aerobic Waste Treatment,
W76-11035 5D

INDIAN INST. OF SCIENCE. BANGALORE. DEPT. OF BIOCHEMISTRY.
Factors in the Purification of Flowing Sewage and Activated Sludge Process - Part 2,
W76-10513 5D

INSTITUT RUDJER BOSKOVIC, ZAGREB (YUGOSLAVIA).
Determination of 14C-DDT Radioactivity in Sea Water and Marine Suspended Matter by Liquid Scintillation,
W76-10518 5A

INSTITUTE FOR LOCAL SELF-RELIANCE, WASHINGTON, D.C.
Cities Need Sewerless Toilets,
W76-10680 5D

INSTITUTE OF HYDROLOGY, WALLINGFORD (ENGLAND).
Application of a Residence Time Model to Dilution Gauging, with Particular Reference to the Problem of Changing Discharge,
W76-10935 2E

INSTITUTE OF PAPER CHEMISTRY, APPLETON, WIS.
Purification of Lignosulfonates by Dynamic Membrane Ultrafiltration,
W76-10868 5D

IOWA AGRICULTURAL AND HOME ECONOMICS EXPERIMENT STATION, AMES.
The State and Regional Situation,
W76-11034 5D

Swine Manure Collection and Removal Systems,
W76-11037 5D

Design Considerations in Feedlot Runoff Control,
W76-11039 5D

Swine Systems for Iowa and North Central States,
W76-11041 5D

IOWA STATE UNIV., AMES.
Animal Waste Management Conference.
W76-11032 5D

Waste Application to Soils,
W76-11042 5D

Economic Considerations Involved in Selecting Types of Confinement and Waste Disposal Systems for Swine and Beef,
W76-11043 5D

Legal Aspects of Livestock Production and Waste Management,
W76-11044 5D

IOWA STATE UNIV., AMES. CENTER FOR AGRICULTURAL AND RURAL DEVELOPMENT.
Water Pollution Control Act of 1972, Economic Impacts, Irrigated and Non-Irrigated Agriculture.
W76-10564 5G

IOWA STATE UNIV., AMES. DEPT. OF CIVIL ENGINEERING; AND IOWA STATE UNIV., AMES. ENGINEERING RESEARCH INST.
Loess Distribution by Variable Winds,
W76-10941 2J

IOWA UNIV., IOWA CITY. INST. OF HYDRAULIC RESEARCH.
A Laboratory Investigation of the Mechanics and Hydraulics of River Ice Jams,
W76-10714 2C

JAPAN GOVERNMENT INDUSTRIAL RESEARCH INST., SHIKOKU.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant: Activated Sludge Treatment, Lime Treatment, and Activated Carbon Adsorption Treatment (In Japanese),
W76-10854 5D

KANAZAWA UNIV. (JAPAN). BIOLOGY INST.
A Biological Study on the Pollution of the Sai-Gawa River and its Tributaries, Ishikawa Prefecture, (In Japanese),
W76-10973 5B

KANSAS STATE UNIV., MANHATTAN. DEPT. OF AGRICULTURAL ENGINEERING.
Samplers for Monitoring Runoff Waters,
W76-10550 5A

Performance of Feedlot Runoff Control Facilities in Kansas,
W76-11058 5D

KARLSRUHE UNIV. (WEST GERMANY). INSTITUT FUER HYDROMECHANIK.
Fluid-Mechanics Aspects in the Design of Sewage Outfalls into the Sea (Stroemungsmechanische Entwurfsaspekte fuer Abwassereinleitungen ins Meer),
W76-10678 5E

KARLSRUHE UNIV. (WEST GERMANY). INSTITUT FUER SIEDLUNGSWASSERWIRTSCHAFT.
Pollutional Effects of Suspended, Sedimented and Eroded Particulate Material in the Aqueous Environment,
W76-10663 5C

KARNATAKA REGIONAL ENGINEERING COLL., SURATKAL (INDIA).
Adsorption Mechanism of Sulfides at a Platinum-Solution Interface,
W76-10636 5D

KENTUCKY UNIV., LEXINGTON. DEPT. OF CHEMICAL ENGINEERING.
Precipitate Flotation of Calcium Sulfite from Dilute Aqueous Solution with an Anionic Surfactant,
W76-10631 5D

KYOTO UNIV., (JAPAN). DEPT. OF MINERAL SCIENCE AND TECHNOLOGY.
Behavior of Hydrogen and Hydroxyl Ions at the Oxide-Water Interface,
W76-10633 5B

LABORATOIRE DE PHYSIOLOGIE DES ETRES MARINS DE L'INSTITUT OCEANOGRAPHIQUE, PARIS, FRANCE.
Effects of Three Emulsifying Agents Against Crude Oil on the Primary Productivity of an Experimental Community of Benthic Diatoms,
W76-10831 5C

LAGOS UNIV. (NIGERIA).
Entropy Principle Applied to the Rainfall-Runoff Process,
W76-10918 2A

LAKESIDE EQUIPMENT CORP. BARTLETT, ILL.
How to Use and Select a Screw Pump,
W76-10681 8C

LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, N. Y.
The Environmental Impact of Deep-Sea Mining,
W76-10602 5G

LANCHESTER POLYTECHNIC, COVENTRY(ENGLAND).
Channel Width and the Riffle-Pool Sequence,
W76-10924 2E

LANCY LABS., ZELIENOPLE, PA.
Water Pollution Abatement Technology: Capabilities and Costs, Metal Finishing Industry,
W76-10555 5D

LAW OF THE SEA CONFERENCE, NEW YORK.
The Law of the Sea at the Caracas Session: A Brief Evaluation,
W76-10732 6E

LEHIGH-NORTHAMPTON COUNTIES JOINT PLANNING COMMISSION, LEHIGH VALLEY PA.
Water Supply and Sewage Facilities Plan Update - 1970 (1974 Supplement),
W76-10508 5G

LENINGRAD INST. OF HEMATOLOGY AND BLOOD TRANSFUSION (USSR).
Structure of Water in the Cell: Review of the Literature, (In Russian),
W76-10974 1A

LITTLE (ARTHUR D.), INC., CAMBRIDGE, MASS.
Decision Mapping - Tool for Underground Waste Management,
W76-11063 5B

LITTLE (ARTHUR D.), INC., SAN FRANCISCO, CALIF.
Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume I),
W76-10572 5G

Water Pollution Control Act of 1972, Regional Impacts, San Francisco Bay/Central Valley, (Volume II),
W76-10573 5G

MACDONALD COLL., MONTREAL (QUEBEC).
A Method for Determining the Irrigation Requirement in Antigua, W. I.,
W76-10981 3F

MADISON COLL., HARRISONBURG, VA. DEPT. OF GEOLOGY.
Deposition in Upper Patuxent Estuary, Maryland, 1968-1969,
W76-10925 4C

MARINE LABORATORY OF GENERAL AND COMPARATIVE PHYSIOLOGY, PARIS, FRANCE.
Marine Molysmology: The Primary Production of Experimental Ecosystems Set up in the Rance River Estuary. Effect of Crude Oil,
W76-10830 5C

MARINE MINERALS TECHNOLOGY CENTER, TIBURON, CALIF.
An Environmental Analysis of a Simulated Sea-Floor Mining Operation,
W76-10601 5G

MARINE TECHNOLOGY SOCIETY, WASHINGTON, D.C.
Marine Technology Society Eighth Annual Conference Preprints,
W76-10600 5G

MARYLAND UNIV. BALTIMORE COUNTY, BALTIMORE. DEPT. OF BIOLOGICAL SCIENCES.
The Anomalous Influence of Salinity on Temperature Tolerances of Summer and Winter Population of the Copepod Eurytemora Affinis,
W76-10884 5C

MARYLAND UNIV., COLLEGE PARK.
Metabolism of Mercury Compounds in Microorganisms,
W76-10894 5C

MARYLAND UNIV., COLLEGE PARK. DEPT. OF MICROBIOLOGY.
Survival of Human Pathogens in the Marine Environment,
W76-10890 5C

MASSACHUSETTS INST. OF TECH. CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
Offshore Oil Spills and the Marine Environment,
W76-11093 5G

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF OCEAN ENGINEERING.
Oil Spills and Offshore Petroleum,
W76-11092 5G

MASSACHUSETTS UNIV., AMHERST. DEPT. OF AGRICULTURAL AND FOOD ECONOMICS.
The Impact on Dairy Farm Organization of Alternative Manure Disposal Systems. A Method of Assessing the Cost of Environmental Regulation,
W76-11061 5D

MATHEMATICA, INC. PHILADELPHIA, PA. REGIONAL AND ENVIRONMENTAL STUDIES,
Literature Review: Movement of Spilled Oil at Sea,
W76-10599 5B

MCGILL UNIV., MONTREAL (QUEBEC). DEPT. OF CIVIL ENGINEERING AND APPLIED MECHANICS.
A Multi-Objective Framework for Environmental Management Using Goal Programming,
W76-10582 6A

MEKEE (ARTHUR G.) AND CO., CLEVELAND, OHIO.
Water Pollution Abatement Technology: Capabilities and Costs, Iron and Steel Industry,
W76-10558 5D

META SYSTEMS, INC., CAMBRIDGE, MASS.
Water Pollution Control Act of 1972, Municipal Options.
W76-10568 5G

METEOROLOGIE NATIONALE, PARIS (FRANCE).
Possible Urban Effects on Maximum Daily Rainfall at Paris, St. Louis and Chicago,
W76-10929 4C

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF AGRICULTURAL ECONOMICS.
A Summary of State Regulations Pertaining to Animal Waste Management in the North Central Region of the United States,
W76-11060 5G

MICHIGAN STATE UNIV., EAST LANSING. INST. OF WATER RESEARCH.
The Impact of Highway Construction on a North Florida Watershed,
W76-10945 5B

MICHIGAN WATER RESOURCES COMMISSION, EAST LANSING; AND MICHIGAN BUREAU OF WATER MANAGEMENT, EAST LANSING.
Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish,
W76-10896 5C

MID WEST RESEARCH INST., KANSAS CITY, MO.
Water Pollution Abatement Technology: Capabilities and Costs, Control of Water Pollution from Selected Nonpoint Sources.
W76-10567 5D

MINISTERSTVO SELSKOGO KHOZYAISTVA, MOSCOW (USSR).
Zooplankton of Lakes of the Bol'Shezemel-Skaya Tundra, (In Russian),
W76-11056 5C

MINISTRY OF FOREIGN AFFAIRS, NAIROBI (KENYA). LEGAL DIV.
Settlement of Disputes Arising Under the Law of the Sea Convention,
W76-10590 6E

MINNESOTA UNIV., ST. PAUL. DEPT. OF AGRICULTURAL ENGINEERING.
Waste Management Systems for Roofed Beef Confinement Facilities,
W76-11040 5D

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF AGRICULTURAL AND BIOLOGICAL ENGINEERING.
Transportation of Solids by Water in Pipelines,
W76-10806 8B

MISSOURI UNIV., COLUMBIA. DEPT. OF CIVIL ENGINEERING.
Electrochemical Production of Free Radicals for Wastewater Treatment,
W76-10876 5D

MISSOURI UNIV., ROLLA. DEPT. OF METALLURGICAL AND NUCLEAR ENGINEERING.
Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems using Electron Spectroscopy for Chemical Analysis,
W76-10635 5D

MONTANA STATE UNIV., BOZEMAN. DEPT. OF AGRICULTURAL ENGINEERING.
Effect of a Livestock Wintering Operation on a Western Mountain Stream,
W76-11059 5A

MORGAN, LEWIS AND BOCKIUS, WASHINGTON, D. C.
The Role of the Coastal Zone Management Act of 1972 in the Development of Oil and Gas from the Outer Continental Shelf,
W76-10734 5G

MUNICIPAL ENVIRONMENTAL RESEARCH LAB., CINCINNATI, OHIO.
Land Disposal of Wastes: Potential for Groundwater Pollution,
W76-10667 5E

Pesticide Incineration,
W76-10675 5E

Do Regulated Freight Rates Discourage Recycling,
W76-10676 5G

NAGOYA UNIVERSITY, JAPAN, FACULTY OF AGRICULTURE.
Biodegradation of Components of Pulp Waste Effluents by Bacteria. (3). Degradation of Lignin Preparation from Waste Liquor of Oxygen-Alkali Pulping (In Japanese),
W76-10840 5D

NARA WOMEN'S UNIV. (JAPAN). ZOOLOGICAL INST.
Marked Diminution of Dissolved Oxygen in the Hypolimnion of Lake Biwa in August, 1973, (In Japanese),
W76-10976 5C

NATIONAL ACADEMY OF SCIENCES, WASHINGTON, D. C.
Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume II.
W76-11007 5C

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, LANGLEY STATION, VA. LANGLEY RESEARCH CENTER.
Evaluation of Water Samples Collected During LANDSAT-1 Overpasses of the Lower Chesapeake Bay Area,
W76-10672 5A

NATIONAL BUREAU OF ECONOMIC RESEARCH, INC., NEW HAVEN, CONN.
Water Pollution Control Act of 1972, Economic Impacts, Metal Finishing Industry,
W76-10556 5G

Water Pollution Control Act of 1972, Economic Impacts, Iron and Steel Industry,
W76-10557 5G

Water Pollution Control Act of 1972, Economic Impacts, Pulp and Paper Industry,
W76-10559 5G

Water Pollution Control Act of 1972, Economic Impacts, Petroleum Refining Industry,
W76-10560 5G

Water Pollution Control Act of 1972, Economic Impacts, Plant Closures.
W76-10563 5G

Water Pollution Control Act of 1972, Economic Impacts, Non-Ferrous Metals Industry,
W76-10565 5G

Water Pollution Control Act of 1972, Economic Impacts, Textile Industry.
W76-10566 5G

NATIONAL GEOPHYSICAL RESEARCH INST., HYDERABAD (INDIA).
Conformity of Groundwater Recharge Rate by Tritium Method and Mathematical Modelling,
W76-10700 2F

NATIONAL INST. OF HEALTH, RESEARCH AND DEVELOPMENT, DJAKARTA (INDONESIA).
Environmental Quality Surveillance in Indonesia,
W76-10655 5A

NATIONAL INST. OF HEALTH, SEOUL (REPUBLIC OF KOREA).
Toxicity of Agricultural Chemicals to Larvivorous Fish in Korean Rice Fields,
W76-11095 5C

NATIONAL MARINE FISHERIES SERVICE, BEAUFORT, N. C. ATLANTIC ESTUARINE FISHERIES CENTER.
Trace Element Interactions in the Estuarine Zone of the Anasco River, Puerto Rico,
W76-10892 5C

Final Environmental Statement, Construction of Artificial Reefs in the Atlantic Ocean Off Cape Henry, Virginia.
W76-11094 8B

NATIONAL MARINE FISHERIES SERVICE, HIGHLANDS, N. J. SANDY HOOK SPORT FISHERIES MARINE LAB.; AND NATIONAL MARINE FISHERIES SERVICE, HIGHLANDS, N. J. MIDDLE ATLANTIC COASTAL FISHERIES CENTER.
A Fin Rot Disease of Marine and Euryhaline Fishes in the New York Bight,
W76-10524 5C

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO. ENVIRONMENTAL RESEARCH LABS.
Recent Developments in Chemical Aerosol Analysis,
W76-10910 5A

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, MIAMI, FLA. ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LAB.
A Two-Dimensional Numerical Model of Estuarine Circulation: The Effects of Altering Depth and River Discharge,
W76-10948 2L

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, MIAMI, FLA. ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABS.
Some Considerations on Monitoring of Trace Metals in Estuaries and Oceans,
W76-10653 5A

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ROCKVILLE, MD.
Earthwatch-Sentinel for the Future,
W76-10645 5A

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D. C.
National Oceanic and Atmospheric Administration: Coastal Zone Management Program, Administration Grants, Allocation of Section 306 Funds to States,
W76-10754 6E

Coastal Zone Management Program Development Grants, Outer Continental Shelf,
W76-10755 6E

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D. C. TASK FORCE ON THE LAW OF THE SEA.
The Third U. N. Law of the Sea Conference: Major Unresolved Fisheries Issues,
W76-10733 6E

NATIVE AMERICAN RIGHTS FUND, BOULDER, COLO.
Indian Water Rights: Some Emerging Frontiers,
W76-10729 6E

NATURAL HISTORY STATE MUSEUM, VERNAL, UTAH.
Nongame Mammal Inventory of the Utah Oil Shale Area,
W76-10823 6G

NATURAL RESOURCES DEFENSE COUNCIL, N. Y., NEW YORK.
PCB'S in the Environment,
W76-10739 5C

NAVAL RESEARCH LAB., WASHINGTON, D. C.
Horizontal Random Temperature Structure of the Ocean,
W76-10691 2L

NAVAL UNDERWATER SYSTEM CENTER, NEWPORT, R. I. MATERIAL AND CHEMISTRY BRANCH.
Trace Metal Analysis by Atomic Emission Using a D.C. Argon Plasma,
W76-10651 5A

NEBRASKA UNIV., LINCOLN. DEPT. OF AGRICULTURAL CLIMATOLOGY.
The Inadvertent Impacts of Agriculture on Weather and Climate and Agricultural Methods for Amelioration of Climatic Stress,
W76-10902 3B

NEBRASKA UNIV., LINCOLN. INST. OF AGRICULTURE AND NATURAL RESOURCE.
Physical and Chemical Properties of Outdoor Beef Cattle Feedlot Runoff,
W76-10543 5B

NEVADA UNIV., LAS VEGAS. DEPT. OF BIOLOGICAL SCIENCES.
Distribution of Stream Pollution in Lake Water,
W76-10712 5B

NEVADA UNIV., RENO. DESERT RESEARCH INST.; AND NEVADA UNIV., LAS VEGAS. CENTER FOR WATER RESOURCES RESEARCH.
Quality of Water Considerations in Arid Area Water Management,
W76-10608 5B

NEVADA UNIV., RENO. LAB. OF ATMOSPHERIC PHYSICS.
Supersaturation and Time Dependence of Ice Nucleation from the Vapor on Single Crystal Substrates,
W76-10695 3B

NEW BRUNSWICK UNIVERSITY, FREDERICTON. DEPT. OF CIVIL ENGINEERING.
Longitudinal Dispersion for Flow Over Rough Beds,
W76-10921 5B

NEW ENGLAND RIVER BASINS COMMISSION, BOSTON, MASS.
Strategies for Natural Resource Decision-Making: Comments on the Staff Report,
W76-10503 6E

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRONOMY.
Predicting Consumptive use with Climatological Data,
W76-10873 2D

NEW MEXICO UNIV., ALBUQUERQUE. DEPT. OF BIOLOGY.
Tropic Status of Selected Northern New Mexico Lakes,
W76-10808 5C

NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA), SCHOOL OF MATHEMATICS.
An Example of the Modification of Ocean Currents by Bottom Topography,
W76-10931 2L

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY.
Interboard Plan for the Greater Finger Lakes - Oswego River Basin,
W76-10506 4A

NEW YORK STATE DEPT. OF HEALTH, ALBANY. BUREAU OF PUBLIC WATER SUPPLY.
Comprehensive Water Supply Study for New York State,
W76-10982 6B

NEWCASTLE-UPON-TYNE UNIV. (ENGLAND). DEPT. OF ZOOLOGY.
Impact of Chronic and Acute Oil Pollution on Sea Birds,
W76-11020 5C

NIGERIA UNIV., NSUKKA. DEPT. OF CIVIL ENGINEERING.
Application of the Stanford Watershed Model to Nigerian Watersheds,
W76-10923 2A

NORTH CAROLINA COOPERATIVE SPORT FISHERY UNIT, RALEIGH.
Production Response of the Bluegill Sunfish, Lepomis Macrochirus Rafinesque, to Added Attachment Surface for Fish-Food Organisms,
W76-10522 2I

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING.
Lysimeter Studies with Long Term Application of Swine Lagoon Effluent,
W76-11055 5B

NORTH CAROLINA UNIV., AT CHAPEL HILL. SCHOOL OF PUBLIC HEALTH.
Characterization and Treatment of Brine Wastewaters From the Cucumber Pickle Industry,
W76-10805 3E

NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF AGRICULTURAL ENGINEERING.
System Components to Separate Solids and Liquids,
W76-11036 5D

Nature and Behavior of Manure,
W76-11038 5B

NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF MATERIALS SCIENCE AND ENGINEERING; AND NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF GEOLOGICAL SCIENCES.
Milankovitch Solar Radiation Variations and Ice Age Ice Sheet Sizes,
W76-10949 2C

OAK RIDGE NATIONAL LAB., TENN.
Environmental Control in Animal Shelters Using Power Plant Thermal Effluents,
W76-10507 5G

OFFICE OF WATER RESEARCH AND TECHNOLOGY, WASHINGTON, D.C.
OWRT Interest in New Technologies for Water Treatment,
W76-10677 5G

DDT in Water, A Bibliography, Volume 2.
W76-10877 5C

Water Reuse, a Bibliography, Volume 5.
W76-10878 5D

Agricultural Runoff, A Bibliography, Volume 2.
W76-10879 5B

OHIO COOPERATIVE WILDLIFE RESEARCH UNIV, COLUMBUS.
A Simulation Model of Tritium Kinetics in a Freshwater Marsh,
W76-10812 5B

OHIO STATE UNIV., COLUMBUS. DEPT. OF CHEMICAL ENGINEERING.
Oxidation of Ammonia in Water by Ferrates (VI) and (IV),
W76-10611 5D

OHIO STATE UNIV., COLUMBUS. DEPT. OF CIVIL ENGINEERING.
Studies on the Toxicity of Ammonia, Nitrate and Their Mixtures to the Common Guppy,
W76-10811 5C

OKLAHOMA UNIV., NORMAN. BUREAU OF WATER AND ENVIRONMENTAL RESOURCES RESEARCH.
Interdisciplinary/Interinstitutional Requirements for Water Resource Planning: Processes to Enhance Cooperation,
W76-10609 6B

ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. APPLIED SCIENCE SECTION.
Sorption Capabilities of Soils for Phosphate Removal,
W76-10673 5D

OREGON STATE UNIV., CORVALLIS. DEPT. OF STATISTICS; AND OREGON STATE UNIV., CORVALLIS. DEPT.OF MATHEMATICS.
Pulsed Dispersion of Trace Chemical Concentrations in a Saturated Sorbing Porous Medium,
W76-10915 5B

PACIFIC NORTHWEST ENVIRONMENTAL RESEARCH LAB., CORVALLIS, OREG.
Report of Kelly's Falls Pond, Hillsborough County, New Hampshire,
W76-10525 5C

Report on Powder Mill Pond, Hillsborough County, New Hampshire.
W76-10526 5C

Report on Glen Lake, Hillsborough County, New Hampshire.
W76-10527 5C

Report on Sebasticook Lake, Penobscot County, Maine.
W76-10528 5C

Report on Lake Winnepesaukee, Carroll and Belknap Counties, New Hampshire.
W76-10529 5C

PAN AMERICAN HEALTH ORGANIZATION, MEXICO CITY.
Flow of Toxic Metals in the Environment,
W76-10638 5B

PAN AMERICAN HEALTH ORGANIZATION, WASHINGTON, D. C.
Environmental Monitoring in Latin America and the Caribbean,
W76-10654 5A

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. MINERAL PROCESSING SECTION.
Ion and Precipitate Flotation of Metal Ions from Solution,
W76-10630 5D

POOL (CHARLES) AND ASSOCIATES, INC., KETCHIKAN, ALASKA.
Comparing Inflow and Infiltration,
W76-10683 5D

PRINCETON UNIV., N.J. DEPT. OF GEOLOGY.
Ocean Boundaries and Petroleum Resources,
W76-10596 6E

PUERTO RICO UNIV., MAYAGUEZ. INST. FOR POLICY STUDIES AND LAW.
Lawyers and Ecomanagement,
W76-10753 6E

RAIN BIRD SPRINKLER MFG., CORP., GLENDORA, CALIF. (ASSIGNEE).
Trickle Irrigator,
W76-10970 3F

RHODE ISLAND UNIV., KINGSTON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
An Analog Model of the Chipuxet Aquifer, Rhode Island,
W76-10814 2F

ROBERT A. TAFT SANITARY ENGINEERING CENTER, CINCINNATI, OHIO.
Report on Pollution of Interstate Waters of the Connecticut River.
W76-10626 5A

ROCKWELL INTERNATIONAL, CANOGA PARK, CALIF. ROCKETDYNE DIV.
Water Contamination Detection,
W76-10648 5A

ROCKWELL INTERNATIONAL CORP., EL SEGUNDO, CALIF. (ASSIGNEE).
Electrochemical Cell for Decreasing the Cyanide and Heavy Metal Content of an Aqueous Solution,
W76-10972 5D

ROCKWELL INTERNATIONAL, THOUSAND OAKS, CALIF. SCIENCE CENTER.
Urban Aerosols and Inadvertent Weather Modification,
W76-10913 4C

ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE, MIAMI, FLA.
Numerical Simulation of Japan Sea Effect Snowfall,
W76-10930 2C

ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE, MIAMI, FLA.

Tide-Induced Mass Transport; A Flushing Mechanism for Shallow Lagoons,
W76-10947 2L

ROSTOCK UNIV. (EAST GERMANY). DEPT. OF BIOLOGY.
Abundance and Biomass of Zooplankton during the Synoptic Investigation of the Shallow Inlets to the South of the Zingst Peninsula (South Baltic) During May/June, 1972. (In German),
W76-10817 5C

Determination of the Biomass and Detritus Content from Natural Phytoplankton Scoop Samples, (In German),
W76-10864 5A

Benthogenic Phytodetritus in Eutrophic Coastal Waters as an Energy Source for Secondary Producers, (In German),
W76-10866 5C

ROUEN UNIV. (FRANCE). LAB. OF MACROMOLECULAR CHEMISTRY.
Water Transport Across Cation-Exchange Membrane. I. Experimental Technique. Influence of the Concentration and Temperature on the Water Transport Number,
W76-10620 3A

RUHRCHEMIE AKTIENGESELLSCHAFT, OBERHAUSEN (WEST GERMANY). (ASSIGNEE).
Purification of Waste Water Containing Organic and Inorganic Impurities,
W76-10966 5D

SAINT MARY'S UNIV., SAN ANTONIO, TEX. SCHOOL OF LAW.
A Proposal for Adoption of A Legal Doctrine of Groundstream Water Interrelationship in Texas,
W76-10731 4B

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT, CALIF.
Problems of Public Works Projects in the Present Economic Climate,
W76-10980 6C

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
Barium in Southern California Coastal Waters: A Potential Indicator of Marine Drilling Contamination,
W76-11089 5A

SKOPJE UNIV. (YUGOSLAVIA).
Design of Alternating Diffuser Pipes,
W76-10952 8B

SLETCO, BEIRUT (LEBANON).
The Influence of Slope and Rain Intensity on Runoff and Infiltration.
W76-10702 2A

SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
Network Design Considerations for the Global Environmental Monitoring System (GEMS) of the United Nations,
W76-10646 5A

SMITHSONIAN INSTITUTION, CAMBRIDGE, MASS. CENTER FOR SHORT-LIVED PHENOMENA.
Directory of EPA, State and Local Environmental Quality Monitoring and Assessment Activities.
W76-10623 5G

SOIL CONSERVATION SERVICE, ANN ARBOR, MICH.
Pollution Abatement Systems for Farm Animal Wastes in Southeast Michigan,
W76-11057 5D

SOIL CONSERVATION SERVICE, DES MOINES, IOWA.
Soil Conservation Service Program in Animal Waste Management,
W76-11046 5G

SOIL CONSERVATION SERVICE, HONOLULU, HAWAII.
Disposal Lagoon.
W76-10618 5D

SOIL CONSERVATION SERVICE, MADISON, WIS.
Controlling Barnyard Runoff,
W76-11049 5D

SOIL CONSERVATION SERVICE, TEMPLE, TEX.
Seepage Loss from Holding Ponds,
W76-11051 5B

SOIL CONSERVATION SERVICE, WASHINGTON, D. C.
Matching Resources and People,
W76-10723 6B

SOUTH DAKOTA DEPT. OF NATURAL RESOURCES DEVELOPMENT, PIERRE. DIV. OF WEATHER MODIFICATION.
South Dakota Weather Modification Program, Research Cooperative Studies Under Project Skywater,
W76-10819 3B

SOUTH DAKOTA STATE UNIV., BROOKINGS. DEPT. OF AGRICULTURAL ENGINEERING.
Field and Laboratory Evaluation of Bi-Level Drainage Theory,
W76-10934 4A

SOUTH DAKOTA STATE UNIV., BROOKINGS. WATER RESOURCES INST.
Pollution Potential of Runoff from Livestock Feeding Operations,
W76-10531 5B

SOUTH DAKOTA UNIV., VERMILLION. SCHOOL OF LAW.
South Dakota's System of Water Management and its Relation to Land Use and Economic Development,
W76-10721 4A

SOUTHAMPTON UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
A Note on the Contribution of Fog Drip to Streamflow,
W76-10927 2B

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT, EL SEGUNDO.
Polychlorinated Biphenyls Off Southern California,
W76-10647 5C

SOUTHERN METHODIST UNIV., DALLAS, TEX. INST. OF TECH.
Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications, (Vol 1),
W76-10604 6A

Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Appendices, (Vol. 2),
W76-10605 6A

Solving Discrete-Variable Multiple-Constraint Non Linear Programs: The Decision State Method, (Vol. 3),
W76-10606 6A

SOUTHWESTERN GREAT PLAINS RESEARCH CENTER BUSHLAND, TEX.
Plant Measurements as Indicators of Crop Water Deficit,
W76-10622 3F

SPESSARD L. HOLLAND LAW CENTER, GAINESVILLE, FLA.
A Sound Water Plan for South Florida Implementation of the 1972 Water Resources Act,
W76-10742 6E

STANDARD OIL CO. OF CALIFORNIA, HUNTINGTON BEACH. WESTERN OPERATIONS DIV.
Technical Capabilities in Offshore Completion and Workover Operations to Maximize Safety,
W76-11002 5G

STANFORD UNIV., CALIF. DEPT. OF CIVIL ENGINEERING.
Simulation of Thermally-Influenced Hydrodynamic Flows: Final Report,
W76-10813 2H

STANFORD UNIV., CALIF. DEPT. OF GEOLOGY.
The Ability of Debris, Heavily Freighted with Coarse Clastic Materials, To Flow on Gentle Slopes,
W76-10711 2J

STATE UNIV. OF NEW YORK AT ALBANY. ATMOSPHERIC SCIENCES RESEARCH CENTER.
Inadvertent Effects in Weather Modification,
W76-10909 3B

Introduction to the Atmospheric Aerosol System,
W76-10911 5A

STATE UNIV. OF NEW YORK AT BINGHAMTON. DEPT. OF GEOLOGICAL SCIENCES; AND STATE UNIV. OF NEW YORK AT BINGHAMTON. SCHOOL OF ADVANCED TECHNOLOGY.
Multiobjective Planning and Environmental Evaluation of Water Resource Systems,
W76-10610 6G

SUSSEX UNIV., BRIGHTON (ENGLAND). INST. OF DEVELOPMENT STUDIES.
Water to the Fields: India's Changing Strategy,
W76-10589 3F

SWEDISH FOREST PRODUCTS RESEARCH LAB., STOCKHOLM.
The Fiberlog, a New Monitor for Fibrous Effluents,
W76-10843 5A

Effluents from Chlorination and Alkaline Extraction of Pine Sulfate Pulp,
W76-10858 5B

SWEDISH WATER AND AIR POLLUTION RESEARCH LABORATORY, STOCKHOLM, SWEDEN.
Long-Term Stability of Waste Lignins in Aquatic Systems. Part 2. Stability in Saline Water,
W76-10838 5B

TECHNICAL UNIV. OF DENMARK, LYNGBY. INST. OF HYDRODYNAMICS AND HYDRAULIC ENGINEERING.
Experimental and Theoretical Investigations in an Oscillatory Turbulent Boundary Layer, W76-10916 8B

TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS). DEPT. OF CIVIL ENGINEERING.
Partial Depletion of Saline Groundwater by Seepage, W76-10920 2L

TENNESSEE UNIV., KNOXVILLE. DEPT. OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY.
Economic Effects of Agricultural Land-Use Management on Soil Erosion and Farm Income in the Obion-Forked Deer River Basin, W76-10612 4A

TENNESSEE VALLEY AUTHORITY, KNOXVILLE.
Upstream Flood Lowering in Reservoirs, W76-10938 4A

TETRA TECH, INC., PASADENA, CALIF.
Water Quality Analysis, Columbia River. W76-10579 5G

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF WILDLIFE AND FISHERIES SCIENCES.
Annual Cycle of Sportfishing Activity at a Warmwater Discharge into Galveston Bay, Texas, W76-10541 5G

TEXAS A AND M. UNIV., COLLEGE STATION. WATER RESOURCES INST.
The Effect of Changing Input andProduct Prices on the Demand for Irrigation Water in Texas, W76-10810 3F

Adjustments Due to a Declining Groundwater Supply: High Plains of Northern Texas and Western Oklahoma, W76-10874 4B

TEXAS AGRICULTURAL EXTENSION SERVICE, COLLEGE STATION.
Legal Aspects of Odor and Dust from Feedlots, W76-11054 5G

THESSALONIKI UNIV., SALONIKA (GREECE). HYDRAULICS AND LAND RECLAMATION LAB.
Linear and Nonlinear Approaches for Short-Term Runoff Estimations in Time-Invariant Open Hydrologic Systems, W76-10699 2E

TOKYO UNIVERSITY, JAPAN, FACULTY OF AGRICULTURE,
Studies on Coagulation Treatment of Spent Water from Pulping Process. Part 2. Coagulation Characteristics of Hemicellulose (In Japanese), W76-10839 5D

TRONDHEIM UNIV. (NORWAY). VASSDRAGS-OG HAVNELABORATORIET.
Seabed Scour by Currents Near Platforms, W76-11087 8B

UKRAINSKII INSTITUT INZHENEROV VODNOGO KHOZAISTVA (USSR).
Production Studies on the Electrolytic Method of Recovering Zinc from Effluent Sediments (Proizvodstvennye issledovaniya elektroliticheskogo sposoba regeneratsii tsinka iz osadkov stochnykh vod), W76-10846 5D

UNITED NATIONS DEVELOPMENT PROGRAM, KOTA (INDIA). CHAMBAL LAND AND WATER USE AND MANAGEMENT PROJECT.
Studies on Evapotranspiration of Some Aquatic Weeds, W76-10554 2D

UNIVERSITY COLL., GALWAY (IRELAND).
A Discrete Linear Cascade Model for Hydrology, W76-10946 2E

UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.
Microbial Interaction with Oil in the Marine Environment, W76-11015 5C

UNIVERSITY OF STRATHCLYDE, GLASGOW (SCOTLAND). DEPT. OF CIVIL ENGINEERING.
Density Current Surges I--Their Role in the Initial Dispersion of A Surface Field, W76-10707 5B

Density Current Surges II--The Movement of Surges in a Turbulent Environment and Their Role in Surface Field Dispersion, W76-10708 5B

UNIVERSITY OF WALES INST. OF SCIENCE AND TECHNOLOGY, CARDIFF. DEPT. OF APPLIED BIOLOGY.
A Rapid Method for the Simultaneous Determination of Paraquat and Diquat in Pond and River Waters by Pyrolysis and Gas Chromatography, W76-10870 5A

UPPSALA UNIV. (SWEDEN).
A Model for Water and Phosphorus Distribution on the Island of Goeteborg, (In Swedish), W76-10963 5B

UTAH CENTER FOR WATER RESOURCES RESEARCH, LOGAN.
Development of a Water Quaity Simulation Model Applicable to Great Salt Lake, Utah, W76-10815 5B

UTAH STATE DIV. OF WILDLIFE RESOURCES, SALT LAKE CITY.
Studies for Wildlife on Energy Areas, W76-10820 6G

UTAH STATE UNIV., LOGAN.
Studies on the Least Chub (Iotichthys Phlegethontiscope) in Geothermal Activities Area of Snake and Tule Valleys, Utah, W76-10824 6G

UTAH UNIV., SALT LAKE CITY. DEPT. OF BIOLOGY.
Life History and Ecology of Megarcys Signata (Plecoptera: Perlodidae), Mill Creek, Wasatch Mountains, Utah, W76-10887 2I

UTAH UNIVERSITY, SALT LAKE CITY.
Raptor Study of Utah Oil Shale Area, W76-10822 6G

UTAH WATER RESEARCH LAB., LOGAN.
Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 1). W76-10570 5G

Water Pollution Control Act of 1972, Regional Impacts, Colorado River Basin, (Part 2), W76-10571 5G

Flow Resistance in Broad Shallow Grassed Channels, W76-10710 2E

VIENNA UNIV. (AUSTRIA). INSTITUT FUER ANALYTISCHES CHEMIE.
Atomic-Absorption Determination of Vanadium and Molybdenum in Tap Water and Mineral Waters After Anion-Exchange Separation, W76-10869 5A

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY; VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. CENTER FOR ENVIRONMENTAL STUDIES.
Temperatures Selected and Avoided by Fish at Various Acclimation Temperatures, W76-10885 5C

VRIJE UNIVERSITEIT, AMSTERDAM (NETHERLANDS). INST. OF EARTH SCIENCES.
The Evaporation and Sedimentation in Man-Made Arade Lake, Southern Portugal, W76-10703 2D

VSESOYUZNYI NAUCHNO-ISSLEDOVATEL'SKII INSTITUT ISKUSSTVENNOGO VOLOKNA (ALL-UNION SCIENTIFIC RESEARCH INSTITUTE FOR MAN-MADE FIBERS), USSR.
Full-Scale Tests of an Installation for Purification of Viscose Production Effluents by Electroflotation (Proizvodstvennye ispytaniya ustanovki elektroflotatsionnoi ochistki stochnykh vod viskoznykh proizvodstv), W76-10837 5D

VYSOKA SKOLA CHEMICKO-TECHNOLOGICKA, PRAGUE (CZECHOSLOVAKIA). DEPT. OF WATER TECHNOLOGY.
Residual Organic Matter in Activated Sludge Process Effluents VIII. Separation by Molecular Weights on Sephadex Columns (Zbytkove latky po aktivacnim procesu VIII. Deleni podle molekulovych hmotnosti na sephadexech), W76-10514 5A

Residual Organic Matter in Activated Sludge Process Effluents. IX. Isolation from Water, Fractionation on Aluminum Oxide Columns and Attempts of Identification (Zbytkove latsy po aktivacnim procesu. IX. Izolace z vodneho prostredi, deleni na kyslicniku hlinitem a pokusy o identifikaci), W76-10515 5A

WAIKATO UNIV., HAMILTON (NEW ZEALAND). DEPT. F MATHEMATICS.
Seepage Flow Through Homogeneous Soil into a Row of Drain Pipes, W76-10919 4A

WASHINGTON UNIV., SEATTLE. DEPT. OF ATMOSPHERIC SCIENCES.
Atmospheric Effects of Pollutants, W76-10903 5A

Particle Emissions from a Large Kraft Paper Mill and Their Effects on the Microstructure of Warm Clouds, W76-10904 5A

WASHINGTON UNIV., SEATTLE. DEPT. OF GEOLOGICAL SCIENCES.
Estimated Erosion Rates on Mount Rainier, Washington,
W76-10951 2J

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Nutrient Transports Through Lancaster Sound in Relation to the Arctic Ocean's Reactive Silicate Budget and the Outflow of Bering Strait Waters.
W76-10717 5B

WATER RESOURCES ENGINEERS, INC., SPRINGFIELD, VA.
Water Quality Analysis, Santee River Basin,
W76-10578 5G

WATER RESOURCES ENGINEERS, INC., WALNUT CREEK, CALIF.
Water Quality Analysis, Iowa-Cedar River Basin.
W76-10576 5G

WATER TECHNOLOGY SERVICE, INC., CLEVELAND, OHIO. (ASSIGNEE).
Process of Water Treatment,
W76-10971 5F

WESTERN SCIENTIFIC SERVICES, INC., FORT COLLINS, COLO.
WSSI Final Report for the Colorado River Basin Pilot Project,
W76-10818 3B

WESTINGHOUSE OCEANIC DIV., ANNAPOLIS, MD.
Transport of Chlorinated Hydrocarbons in Sediments of the Upper Chesapeake Bay,
W76-10607 5B

WINDSOR UNIV. (ONTARIO). DEPT. OF GEOLOGY.
Monitoring of Subsurface Waste-Disposal Operations: A Generalized Systems Approach with Examples from Canadian Case Histories,
W76-10662 5D

WISCONSIN DEPARTMENT OF NATURAL RESOURCES, MADISON.
Sources of Polychlorinated Biphenyls in Wisconsin,
W76-10844 5B

WISCONSIN STATE DEPT. OF AGRICULTURE, MADISON. FOOD AND STANDARDS DIV.
Farm Animal Waste Management: What our Milk Market Requires,
W76-11050 5D

WISCONSIN UNIV., MADISON. DEPT. OF ZOOLOGY; AND WISCONSIN UNIV., MADISON. LAB. OF LIMNOLOGY.
Behavioural Thermoregulation and Activity Patterns in the Green Sunfish, Lepomis Cyanellus,
W76-10883 5C

WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.
A Normal Mode Method for Predicting Storm Surges on a Lake,
W76-10715 2H

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Polycyclic Aromatic Compounds in Nature,
W76-10865 5B

The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Foodchain Studies,
W76-10986 5C

A Kinetic Approach to the Effect of Temperature on Algal Growth,
W76-10987 5C

Removal of Inorganic Nitrogen in an Integrated Food Chain System,
W76-10988 5C

Relative Growth of Different Species of Marine Algae in Wastewater-Seawater Mixtures,
W76-10989 5C

Permissible Levels of Heavy Metals in Secondary Effluent for Use in a Combined Sewage Treatment-Marine Aquaculture System. I. Monitoring During Pilot Operation,
W76-10993 5D

Permissible Levels of Heavy Metals in Secondary Effluent for use in a Combined Sewage Treatment-Marine Aquaculture System. II. Development of Guidelines by Methods, of Additions,
W76-10994 5D

Near Surface Sampler,
W76-10995 5A

Integrated Systems of Mollusk Culture,
W76-10996 5C

Uptake, Translocation and Elimination of Individual Chlorobiophenyls by Oysters,
W76-11000 5C

Offshore Oil: Technology - And Emotion,
W76-11090 5G

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS. DEPT. OF BIOLOGY.
Heat Exchangers for Use in the Culturing of Marine Organisms,
W76-10990 5G

Social, Political, Regulatory and Marketing Problems of Marine Waste-Food Recycling Systems,
W76-10991 5G

The Use of Power Plant Waste Heat in Marine Aquaculture,
W76-10992 5D

Polyspecies Aquaculture Systems: The Detrital Trophic Level,
W76-10997 5C

Comparison of the Food Chain Dynamics of the Polychaete, Nereis Virens Cultured on Animal Tissue and Detritus,
W76-10998 5C

Virus Survival Patterns in a Tertiary Sewage Treatment-Aquaculture Model System,
W76-10999 5D

WORLD HEALTH ORGANIZATION, GENEVA (SWITZERLAND).
International Conference on Environmental Sensing and Assessment, Volumes 1 and 2.
W76-10637 5A

Some International Activities in Environmental Monitoring,
W76-10644 5A

WYOMING UNIV., LARAMIE. DEPT. OF ATMOSPHERIC SCIENCE.
Heterogeneous Ice Nucleation in the Presence of Aliphatic Amines and Ammonia,
W76-10716 3B

YUGOSLAVIC ACADEMY OF SCIENCE AND ARTS, ZAGREB. INST. FOR PHYSICS OF THE ATMOSPHERE.
Some Characteristics of A Dusty Rain in Yugoslavia,
W76-10906 5A

ACCESSION NUMBER INDEX

W76-10501 5D
W76-10502 10C
W76-10503 6E
W76-10504 5C
W76-10505 5C
W76-10506 4A
W76-10507 5G
W76-10508 5G
W76-10509 5A
W76-10510 5G
W76-10511 5D
W76-10512 5D
W76-10513 5D
W76-10514 5A
W76-10515 5A
W76-10516 5D
W76-10517 5C
W76-10518 5A
W76-10519 5C
W76-10520 2H
W76-10521 2I
W76-10522 2I
W76-10523 8F
W76-10524 5C
W76-10525 5C
W76-10526 5C
W76-10527 5C
W76-10528 5C
W76-10529 5C
W76-10530 5D
W76-10531 5B
W76-10532 5D
W76-10533 5G
W76-10534 5G
W76-10535 5G
W76-10536 5G
W76-10537 5D
W76-10538 5B
W76-10539 5B
W76-10540 5E
W76-10541 5G
W76-10542 5B
W76-10543 5B
W76-10544 5G
W76-10545 5D
W76-10546 5G
W76-10547 5D
W76-10548 5G
W76-10549 5B
W76-10550 5A
W76-10551 5C
W76-10552 3A
W76-10553 3A
W76-10554 2D
W76-10555 5D
W76-10556 5G
W76-10557 5G
W76-10558 5D
W76-10559 5G
W76-10560 5G
W76-10561 5G
W76-10562 5G
W76-10563 5G
W76-10564 5G
W76-10565 5G
W76-10566 5G
W76-10567 5D
W76-10568 5G
W76-10569 5G
W76-10570 5G
W76-10571 5G
W76-10572 5G
W76-10573 5G
W76-10574 5G
W76-10575 5G
W76-10576 5G
W76-10577 5G
W76-10578 5G
W76-10579 5G
W76-10580 5G
W76-10581 6B
W76-10582 6A
W76-10583 5D
W76-10584 6E
W76-10585 6B
W76-10586 6C
W76-10587 6B
W76-10588 5A
W76-10589 3F
W76-10590 6E
W76-10591 6E
W76-10592 5G
W76-10593 6E
W76-10594 5G
W76-10595 5G
W76-10596 6E
W76-10597 5B
W76-10598 2K
W76-10599 5B
W76-10600 5G
W76-10601 5G
W76-10602 5G
W76-10603 5G
W76-10604 6A
W76-10605 6A
W76-10606 6A
W76-10607 5B
W76-10608 5B
W76-10609 6B
W76-10610 6G
W76-10611 5D
W76-10612 4A
W76-10613 5B
W76-10614 5D
W76-10615 5E
W76-10616 5E
W76-10617 5G
W76-10618 5D
W76-10619 2I
W76-10620 3A
W76-10621 5D
W76-10622 3F
W76-10623 5G
W76-10624 5E
W76-10625 5D
W76-10626 5A
W76-10627 5D
W76-10628 5B
W76-10629 5B
W76-10630 5D
W76-10631 5D
W76-10632 5D
W76-10633 5B
W76-10634 5D
W76-10635 5D
W76-10636 5D
W76-10637 5A
W76-10638 5B
W76-10639 5A
W76-10640 5A
W76-10641 5A
W76-10642 5A
W76-10643 5A
W76-10644 5A
W76-10645 5A
W76-10646 5A
W76-10647 5C
W76-10648 5A
W76-10649 5A
W76-10650 5A
W76-10651 5A
W76-10652 5A
W76-10653 5A
W76-10654 5A
W76-10655 5A
W76-10656 5G
W76-10657 5G
W76-10658 5A
W76-10659 5A
W76-10660 5A
W76-10661 5A
W76-10662 5D
W76-10663 5C
W76-10664 5A
W76-10665 5B
W76-10666 5A
W76-10667 5E
W76-10668 5A
W76-10669 5A
W76-10670 5A
W76-10671 5A
W76-10672 5A
W76-10673 5D
W76-10674 5E
W76-10675 5E
W76-10676 5G
W76-10677 5G
W76-10678 5E
W76-10679 5D
W76-10680 5D
W76-10681 8C
W76-10682 8G
W76-10683 5D
W76-10684 5D
W76-10685 5D
W76-10686 5D
W76-10687 5D
W76-10688 5B
W76-10689 8C
W76-10690 8G
W76-10691 2L
W76-10692 2L
W76-10693 2L
W76-10694 2B
W76-10695 3B
W76-10696 2C
W76-10697 2B
W76-10698 2E
W76-10699 2E
W76-10700 2F
W76-10701 2F
W76-10702 2A
W76-10703 2D
W76-10704 2H
W76-10705 4A
W76-10706 2F
W76-10707 5B
W76-10708 5B
W76-10709 8B
W76-10710 2E
W76-10711 2J
W76-10712 5B
W76-10713 2G
W76-10714 2C
W76-10715 2H
W76-10716 3B
W76-10717 5B
W76-10718 4B
W76-10719 4B
W76-10720 6E
W76-10721 4A
W76-10722 6G
W76-10723 6B
W76-10724 5E
W76-10725 3F
W76-10726 6E
W76-10727 6E
W76-10728 4B
W76-10729 6E
W76-10730 5G
W76-10731 4B
W76-10732 6E
W76-10733 6E
W76-10734 5G
W76-10735 5G
W76-10736 6E
W76-10737 5G
W76-10738 6B
W76-10739 5C
W76-10740 5G
W76-10741 6G
W76-10742 6E
W76-10743 6E
W76-10744 6E
W76-10745 6E
W76-10746 6E
W76-10747 6E
W76-10748 6E
W76-10749 3F
W76-10750 6E
W76-10751 6E
W76-10752 6E
W76-10753 6E
W76-10754 6E
W76-10755 6E
W76-10756 5G
W76-10757 6G
W76-10758 5D
W76-10759 5G
W76-10760 5G
W76-10761 5G
W76-10762 5G
W76-10763 5G
W76-10764 5G
W76-10765 5G
W76-10766 5G
W76-10767 5G
W76-10768 5G
W76-10769 5G
W76-10770 5D
W76-10771 5D
W76-10772 5G
W76-10773 6F
W76-10774 5G
W76-10775 6E
W76-10776 6E
W76-10777 6E
W76-10778 6E
W76-10779 6E
W76-10780 6E
W76-10781 6E
W76-10782 6E
W76-10783 6E
W76-10784 6E
W76-10785 6E
W76-10786 6E
W76-10787 6E
W76-10788 6E
W76-10789 6E
W76-10790 6E
W76-10791 6E
W76-10792 6E
W76-10793 6E
W76-10794 6E
W76-10795 6E
W76-10796 6E
W76-10797 6E
W76-10798 6E
W76-10799 6E
W76-10800 6E
W76-10801 6E
W76-10802 6E
W76-10803 6E
W76-10804 6E
W76-10805 3E
W76-10806 8B
W76-10807 2B
W76-10808 5C
W76-10809 3B
W76-10810 3F
W76-10811 5C
W76-10812 5B

W76-10813	2H	W76-10892	5C	W76-10971	5F	W76-11050	5D
W76-10814	2F	W76-10893	5C	W76-10972	5D	W76-11051	5B
W76-10815	5B	W76-10894	5C	W76-10973	5B	W76-11052	5D
W76-10816	2I	W76-10895	5C	W76-10974	1A	W76-11053	5D
W76-10817	5C	W76-10896	5C	W76-10975	5D	W76-11054	5G
W76-10818	3B	W76-10897	5A	W76-10976	5C	W76-11055	5B
W76-10819	3B	W76-10898	5C	W76-10977	5F	W76-11056	5C
W76-10820	6G	W76-10899	5C	W76-10978	3F	W76-11057	5D
W76-10821	6G	W76-10900	5C	W76-10979	6E	W76-11058	5D
W76-10822	6G	W76-10901	3B	W76-10980	6C	W76-11059	5A
W76-10823	6G	W76-10902	3B	W76-10981	3F	W76-11060	5G
W76-10824	6G	W76-10903	5A	W76-10982	6B	W76-11061	5D
W76-10825	4C	W76-10904	5A	W76-10983	6B	W76-11062	8B
W76-10826	4C	W76-10905	4C	W76-10984	5G	W76-11063	5B
W76-10827	4A	W76-10906	5A	W76-10985	6G	W76-11064	5F
W76-10828	5G	W76-10907	5B	W76-10986	5C	W76-11065	5A
W76-10829	5G	W76-10908	5A	W76-10987	5C	W76-11066	2F
W76-10830	5C	W76-10909	3B	W76-10988	5C	W76-11067	7C
W76-10831	5C	W76-10910	5A	W76-10989	5C	W76-11068	7C
W76-10832	7C	W76-10911	5A	W76-10990	5G	W76-11069	5A
W76-10833	5D	W76-10912	3B	W76-10991	5G	W76-11070	5B
W76-10834	5D	W76-10913	4C	W76-10992	5D	W76-11071	2C
W76-10835	5B	W76-10914	2G	W76-10993	5D	W76-11072	7C
W76-10836	5D	W76-10915	5B	W76-10994	5D	W76-11073	2F
W76-10837	5D	W76-10916	8B	W76-10995	5A	W76-11074	4B
W76-10838	5B	W76-10917	2J	W76-10996	5C	W76-11075	4A
W76-10839	5D	W76-10918	2A	W76-10997	5C	W76-11076	5B
W76-10840	5D	W76-10919	4A	W76-10998	5C	W76-11077	4A
W76-10841	5E	W76-10920	2L	W76-10999	5D	W76-11078	5A
W76-10842	5D	W76-10921	5B	W76-11000	5C	W76-11079	4A
W76-10843	5A	W76-10922	5A	W76-11001	5G	W76-11080	5A
W76-10844	5B	W76-10923	2A	W76-11002	5G	W76-11081	7C
W76-10845	5B	W76-10924	2E	W76-11003	5G	W76-11082	4B
W76-10846	5D	W76-10925	4C	W76-11004	5G	W76-11083	4A
W76-10847	5D	W76-10926	5A	W76-11005	5G	W76-11084	8B
W76-10848	5D	W76-10927	2B	W76-11006	5G	W76-11085	4A
W76-10849	5D	W76-10928	2B	W76-11007	5C	W76-11086	5B
W76-10850	5D	W76-10929	4C	W76-11008	5B	W76-11087	8B
W76-10851	5D	W76-10930	2C	W76-11009	5A	W76-11088	6C
W76-10852	5D	W76-10931	2L	W76-11010	5B	W76-11089	5A
W76-10853	5G	W76-10932	5B	W76-11011	5B	W76-11090	5G
W76-10854	5D	W76-10933	2G	W76-11012	5B	W76-11091	6C
W76-10855	5D	W76-10934	4A	W76-11013	5B	W76-11092	5G
W76-10856	5G	W76-10935	2E	W76-11014	5C	W76-11093	5G
W76-10857	5D	W76-10936	5A	W76-11015	5C	W76-11094	8B
W76-10858	5B	W76-10937	5A	W76-11016	5B	W76-11095	5C
W76-10859	3E	W76-10938	4A	W76-11017	5C	W76-11096	5B
W76-10860	5D	W76-10939	8B	W76-11018	5C	W76-11097	6E
W76-10861	5G	W76-10940	4C	W76-11019	5C	W76-11098	5B
W76-10862	5D	W76-10941	2J	W76-11020	5C	W76-11099	5A
W76-10863	5E	W76-10942	2F	W76-11021	5C	W76-11100	5C
W76-10864	5A	W76-10943	2F	W76-11022	5C		
W76-10865	5B	W76-10944	5C	W76-11023	5C		
W76-10866	5C	W76-10945	5B	W76-11024	5C		
W76-10867	5D	W76-10946	2E	W76-11025	5B		
W76-10868	5D	W76-10947	2L	W76-11026	5B		
W76-10869	5A	W76-10948	2L	W76-11027	5C		
W76-10870	5A	W76-10949	2C	W76-11028	5C		
W76-10871	5D	W76-10950	5B	W76-11029	5C		
W76-10872	5G	W76-10951	2J	W76-11030	5B		
W76-10873	2D	W76-10952	8B	W76-11031	5C		
W76-10874	4B	W76-10953	8B	W76-11032	5D		
W76-10875	3F	W76-10954	8B	W76-11033	5D		
W76-10876	5D	W76-10955	3F	W76-11034	5D		
W76-10877	5C	W76-10956	3F	W76-11035	5D		
W76-10878	5D	W76-10957	3F	W76-11036	5D		
W76-10879	5B	W76-10958	3B	W76-11037	5D		
W76-10880	3A	W76-10959	3F	W76-11038	5B		
W76-10881	10C	W76-10960	5D	W76-11039	5D		
W76-10882	5C	W76-10961	5D	W76-11040	5D		
W76-10883	5C	W76-10962	3F	W76-11041	5D		
W76-10884	5C	W76-10963	5B	W76-11042	5D		
W76-10885	5C	W76-10964	5D	W76-11043	5D		
W76-10886	5C	W76-10965	3F	W76-11044	5D		
W76-10887	2I	W76-10966	5D	W76-11045	5G		
W76-10888	5C	W76-10967	3A	W76-11046	5G		
W76-10889	5C	W76-10968	3F	W76-11047	5B		
W76-10890	5C	W76-10969	5C	W76-11048	5D		
W76-10891	5A	W76-10970	3F	W76-11049	5D		

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
East Central Oklahoma State University, Agricultural Livestock Wastes	W76-10615--10618 10829 11032--11055 11057--11061	34
ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W76-10882--10893	12
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W76-10620--10621 10623--10690	70
Illinois State Water Survey, Hydrology	W76-10691--10719 10901--10943 10945--10952	80
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W76-10832--10863 10865 10867--10872	39
National Water Well Association, Water Well Construction Technology	W76-11063--11065	3
University of Florida, Eastern U. S. Water Law	W76-10720--10724 10726--10748 10750--10804 10827--10828	85
University of Wisconsin, Eutrophication	W76-10986--11000	15
University of Wisconsin, Water Resources Economics	W76-10581--10595 10979--10985	22
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W76-10611--10614 10805--10812 10814--10815 10873--10876	18

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
Agricultural Research Service	W76-11062	1
BioSciences Information Service	W76-10554, 10598 10619, 10622 10725, 10749 10816--10817 10864, 10866 10897, 10944 10962--10963 10965, 10969 10973--10974 10976, 11056 11095	21
Bureau of Reclamation	W76-10818--10819	2
Biological Consultant and Information Services (Effects of Pollutants (Aquatic Life)	W76-10551 10830--10831 10894--10896 10898--10900 11007--11031	34
Fish and Wildlife Service	W76-10825--10826	2
National Commission on Water Quality	W76-10555--10580	26
Ocean Engineering Information Service (Patents)	W76-10953--10961 10964 10966--10968 10970--10972 10975 10977--10978	19
Ocean Engineering Information Service (Outer Continental Shelf)	W76-10596--10597 10599--10603 11001--11006 11086--11094 11096--11100	27
Office of Water Research and Technology	W76-10552--10553 10604--10610 10813 10877--10880	14
U. S. Geological Survey	W76-11066--11085	20

★U.S. GOVERNMENT PRINTING OFFICE: 1976-210-951/32

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

LIBRARY U. OF A.

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
- 6 WATER RESOURCES PLANNING
- 7 RESOURCES DATA
- 8 ENGINEERING WORKS
- 9 MANPOWER, GRANTS, AND FACILITIES
- 10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

AN EQUAL OPPORTUNITY EMPLOYER

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PRINTED MATTER

a. John Littlewood
Documents Division
220 D Library

LIBRARY

LIBRARY U. OF I. URBANA-CHAMPAIGN

LIBRARY OF THE U. S. GEOLOGICAL SURVEY

BOUND BY
HNM

UNIVERSITY OF ILLINOIS-URBANA
3 0112 084232401